

TOSHIBA

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2010-3

PRODUCT GUIDE

Photocouplers and Photorelays



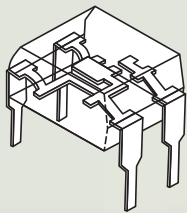
S E M I C O N D U C T O R

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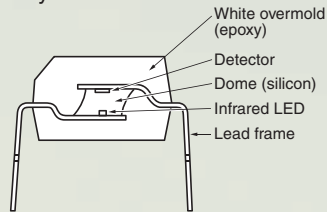
Preface

As a type of isolator favored by manufacturers, photocouplers now serve as noise protectors in many electronic devices.

Toshiba's photocouplers consist of either a GaAs or GaAlAs infrared LED(s) and a silicon photodetector(s) housed in a white mold package. GaAlAs LEDs are adopted in high-speed photo-IC types due to their high-speed and high-light output. Toshiba's innovative white mold packaging also greatly contributes to high sensitivity, high CTR and superb reliability.



Perspective view of the TLP521-1



Cross section of the TLP521-1

Extensive Line of Products

To meet customers' various needs, we offer an extensive product portfolio shown below as well as general-purpose photocouplers.

1. Photo-IC couplers: High speed and advanced functions (highly integrated detectors)
2. Zero-crossing phototriac couplers: Phototriac-output devices with zero-crossing detection
3. Photovoltaic couplers: MOSFET gate drive (high voltage output achieved using a photodiode array)
4. Photorelays (MOSFET-output devices):
AC-DC switches (MOSFET output)
Mechanical relay replacement

Safety Standard Approvals

UL approval has been obtained under file number E67349 for most of our photocouplers. EN60747-5-2-approved photocouplers are also offered with a wide selection of output (transistor, thyristor, triac, IC output and photorelay). The designs of these devices meet other standards including IEC380/VDE0806, IEC60950/EN60950 and IEC60065/EN60065.

Small-Package Products

Toshiba offers a wide variety of photocouplers in a small package to meet the space-saving requirement of increasingly smaller and thinner end products. Packaging options include mini-flat packages (MFSOPs) and half-pitch (1.27 mm) mini-flat SOP packages.

Overseas Manufactured Photocouplers

Part of the general-purpose photocouplers with transistor and triac outputs are manufactured by Toshiba Semiconductor Thailand Co., Ltd. This will help customers procure components locally for overseas assembly of end products.

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2 New Products

Transistor-Output Coupler Certified for Reinforced Insulation in a Mini-Flat Package: TLP284/-4 TLP285/-4

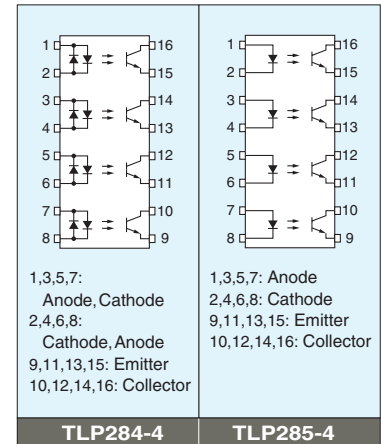
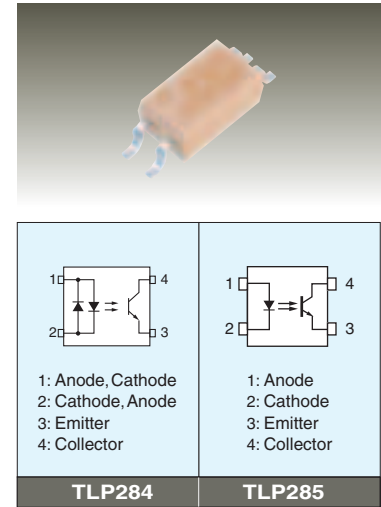
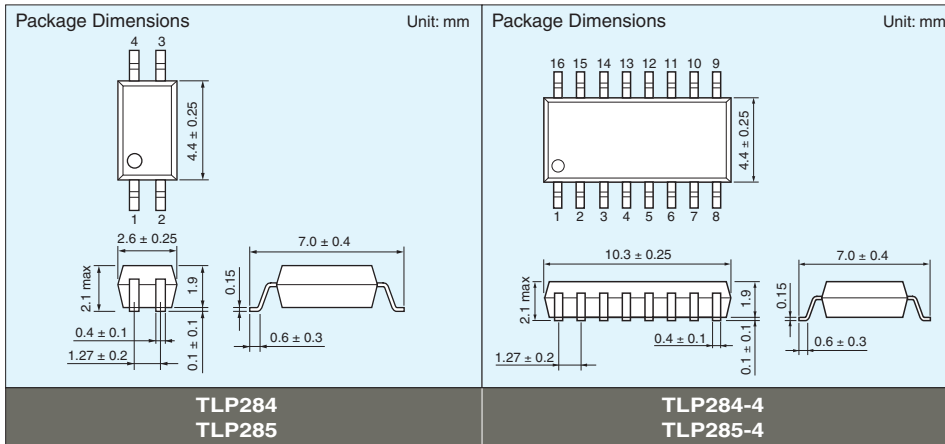
The TLP284, TLP284-4, TLP285 and TLP285-4 are new additions to Toshiba's portfolio of transistor-output photocouplers in the mini-flat SOP4 package that comply with international safety standards for reinforced insulation.

TLP284/TLP284-4: AC input, single/quad

TLP285/TLP285-4: DC input, single/quad

These photocouplers feature an isolation voltage of 3750 Vrms (min) and an extended operating temperature range ($T_a = -55^{\circ}\text{C}$ to 110°C). Thus, they are suitable for a wide variety of applications, including power supplies requiring high-density board assembly, hybrid ICs, home appliances, communications equipment and programmable controllers.

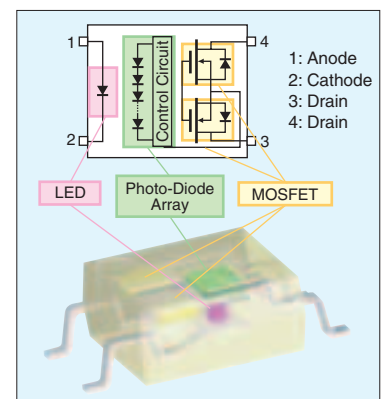
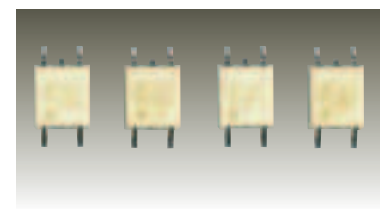
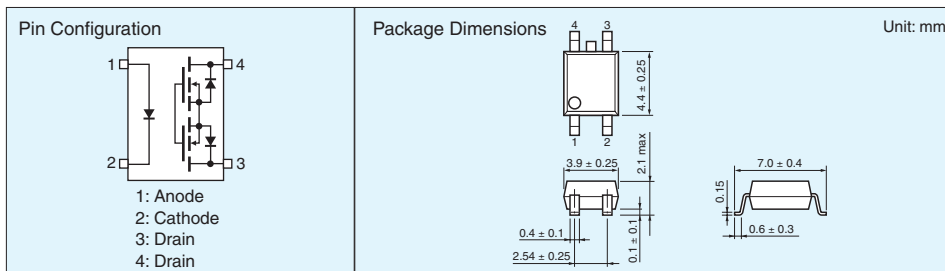
- Collector-emitter voltage: 80 V (min)
- UL-recognized: UL1577 (File No. E67349)
- BSI-approved: BS EN60065: 2002
: BS EN60950-1: 2006
- VDE-approved: EN60747-5-2
Maximum operating isolation voltage: 707 Vpk
Maximum permissible overvoltage: 6000 Vpk
- Creepage/clearance: 5.0 mm (min)
Isolation thickness: 0.4 mm (min)
- Isolation voltage: 3750 Vrms (min)



TLP170 Series: Photorelays with Low Trigger LED Current

Semiconductor photorelays have long service life, provide high reliability, reduce power consumption and save board space. Thus, mechanical relays are quickly being replaced by photorelays. For electric and electronic manufacturers, power consumption is becoming an increasingly important factor as energy-saving efforts are being promoted to preserve the global environment. To address such situations, the TLP170 Series feature an LED trigger current (I_{FT}) of only 1 mA due to the use of an improved output photodiode array. The TLP170 Series is offered with an off-state voltage of 60 V, 200 V, 350 V and 600 V to meet the needs of a wide range of applications.

	Off-State Voltage	On-State Current	On-State Resistance
TLP170A	60 V	0.4 A	2 Ω
TLP170D	200 V	0.2 A	8 Ω
TLP170G	350 V	0.1 A	50 Ω
TLP170J	600 V	0.09 A	60 Ω



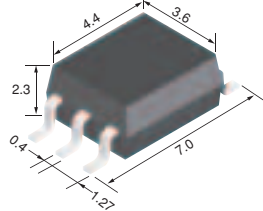
2 New Products

Photocouplers with Reinforced Insulation in the SO6 Package

Despite the same footprint size as the MFSOP6 package, the new SO6 package provides reinforced insulation, offering clearance and creepage distances of ≥ 5 mm; an internal isolation thickness of ≥ 0.4 mm; and an isolation voltage of 3750 Vrms.

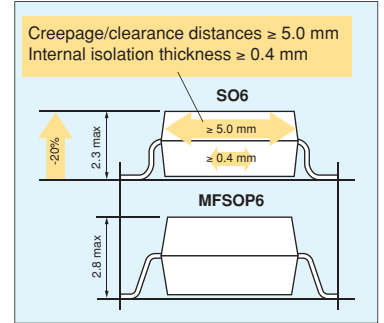
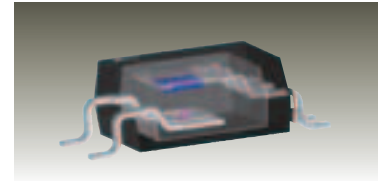
Additionally, the SO6 features the maximum PCB mounted height of 2.3 mm, approximately 20% lower than the MFSOP6. This makes the photocouplers ideal for low-profile applications.

- Clearance/creepage: ≥ 5 mm
- Internal Faraday shield: ≥ 0.4 mm
- Thin package: ≤ 2.3 mm
- Isolation voltage: 3750 Vrms (min)



Part Number	Data rate (typ.)	Output	Vcc
TLP104	1 Mbit/s	Open-collector	Up to 30 V
TLP109	1 Mbit/s	Open-collector	Up to 30 V
TLP116A	20 Mbit/s	Totem pole	5 V
TLP118	20 Mbit/s	Open-collector	5 V
TLP2360*	20 Mbit/s	Totem pole	3.3 V

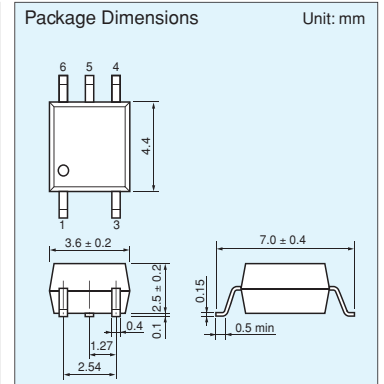
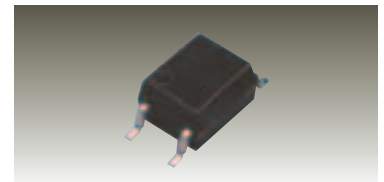
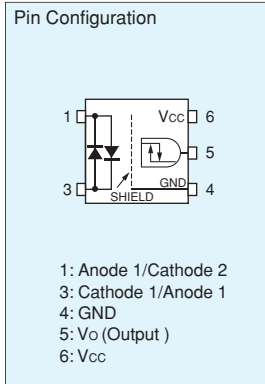
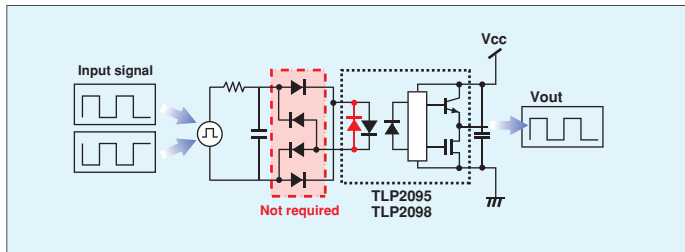
*: Under development. Specifications subject to change without notice. For the latest information, please contact your nearest Toshiba sales representative.



TLP2095/TLP2098: Photocouplers with a Dual-Polarity AC Input

The TLP2095 and TLP2098 are new additions to a family of photocouplers with a 5-Mbit/s IC output and can accept an input signal of positive and negative polarities. The TLP2095 and TLP2098 eliminate the need for external rectifier devices such as bridge diodes, which would otherwise be required for the input signal whose polarity may change like the one from a programmable logic controller (PLC).

- Package: MFSOP6
 - Low input current threshold: 3 mA (max)
 - Vcc = 3 V to 20 V
 - Data rate (typ.): 5 Mbit/s
 - Totem-pole output
- (TLP2095: Buffer logic, TLP2098: Inverter logic)

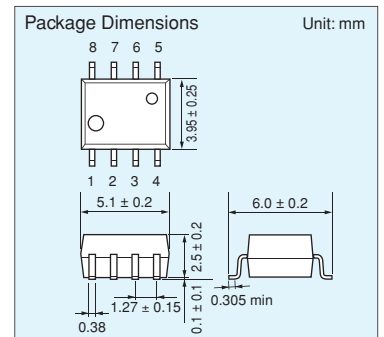
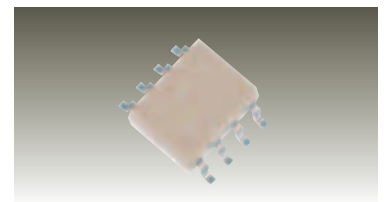
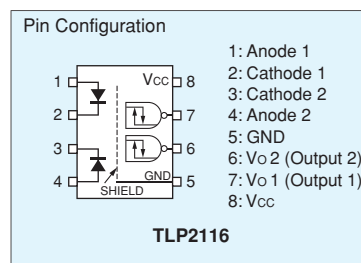
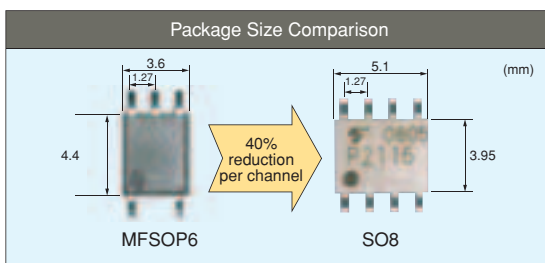


Note: Under development. For the latest information, please contact your nearest Toshiba sales representative

Dual-Channel High-Speed Photo-IC Couplers in a New Package

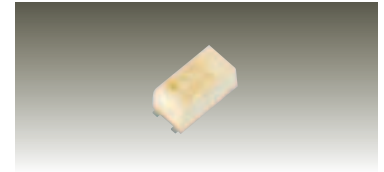
Toshiba is extending its offerings of high-speed photo-IC couplers housed in the new SO8 package. The dual-channel photo-IC couplers in the SO8 package occupy approximately 40% less board space, which helps reduce product size and costs.

Data rate (typ.)	5 Mbit/s		15 to 20 Mbit/s	20 Mbit/s
Supply voltage	4.5 to 20 V		5 V	3.3 V
Single-channel couplers in MFSOP	TLP105	TLP108	TLP116	TLP2066
Dual-channel couplers in SO8	TLP2105	TLP2108	TLP2116	TLP2166A



Low-CR Photorelays for Semiconductor Testers and Measurement Instruments: TLP32xx Series

The **TLP32xx** photorelay series exhibits lower output pin capacitance (C_{OFF}) and on-state resistance (R_{ON}) than their predecessors. The **TLP32xx** feature CR values of 2.5 pF· Ω , 5 pF· Ω and 10 pF· Ω , which are approximately equivalent to those of reed relays. These photorelays have been developed to meet the requirements for high-speed operation, high reliability and small form factor being demanded for testers and measuring instruments for rapidly evolving semiconductor devices and mobile equipment. Besides, the **TLP32xx** Series is housed in the 4-pin SSOP, and can achieve high-density board assembly of 50 devices/inch².



Part Number	Package	Off-State Voltage V_{OFF} (min)	On-State Current I_{ON} (max)	On-State Resistance R_{ON} (typ.)	Off-State Capacitance C_{OFF} (typ.)	Trigger Current I_{FT} (max)	
TLP3220	SSOP4	100 V	80 mA	8 Ω	6 pF	5 mA	
TLP3217			120 mA	7.5 Ω	5 pF		
(NEW) TLP3218			40 mA	16 Ω	2.5 pF		
(NEW) TLP3219		80 V	200 mA	5 Ω	6.5 pF	3 mA	
TLP3212			400 mA	1 Ω	20 pF		
TLP3213			80 mA	25 Ω	0.6 pF		
TLP3214		40 V	40 V	250 mA	2 Ω	5 pF	4 mA
TLP3215				300 mA	1 Ω	10 pF	
TLP3216				120 mA	10 Ω	1 pF	
(NEW) TLP3216A				120 mA	6.5 Ω	1.65 pF	
TLP3240				120 mA	12 Ω	0.45 pF	
TLP3241				140 mA	7 Ω	0.7 pF	
TLP3230		20 V	20 V	160 mA	5 Ω	1 pF	3 mA
TLP3231				450 mA	0.8 Ω	5 pF	
TLP3250				200 mA	3 Ω	0.8 pF	
TLP3203				900 mA	0.18 Ω	40 pF	

Photo-IC Couplers in a New USOP Package

The new TLP3312 is the smallest photorelay in the Toshiba's coupler portfolio. While functionally identical to the TLP3212, the TLP3312 is housed in the new USOP4 package, which reduces board space requirement by approximately 25% compared to SSOP without compromising the C_{OFF} and R_{ON} characteristics.

The TLP3312 is an ideal solution for a wide variety of applications that require size reduction and low CR such as testers and measuring instruments, as well as size-critical applications.

The following shows the electrical characteristics of the TLP3312.

P/N	Package	V_{OFF} (min)	I_{ON} (max)	R_{ON} (typ.)	C_{OFF} (typ.)	I_{FT} (max)
TLP3312	USOP4	60 V	400 mA	1 Ω	20 pF	3 mA

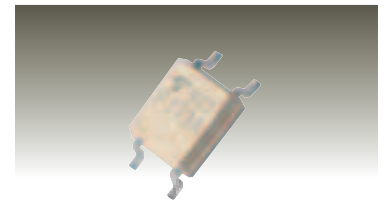


Ideal as a low-cost replacement of a mechanical relay: TLP173A Series

The rewards for using semiconductor photorelays are obvious—they have long service life, increase system reliability, reduce power consumption and save board space. Mechanical relays are quickly being replaced by photorelays as electrical and electronic manufacturers make greater efforts to preserve the global environment and natural resources. On the other hand, mechanical relays, which have been pervasively used in a wide range of applications, are generally less expensive than photorelays. Therefore, the migration to photorelays is being slow for cost-critical applications.

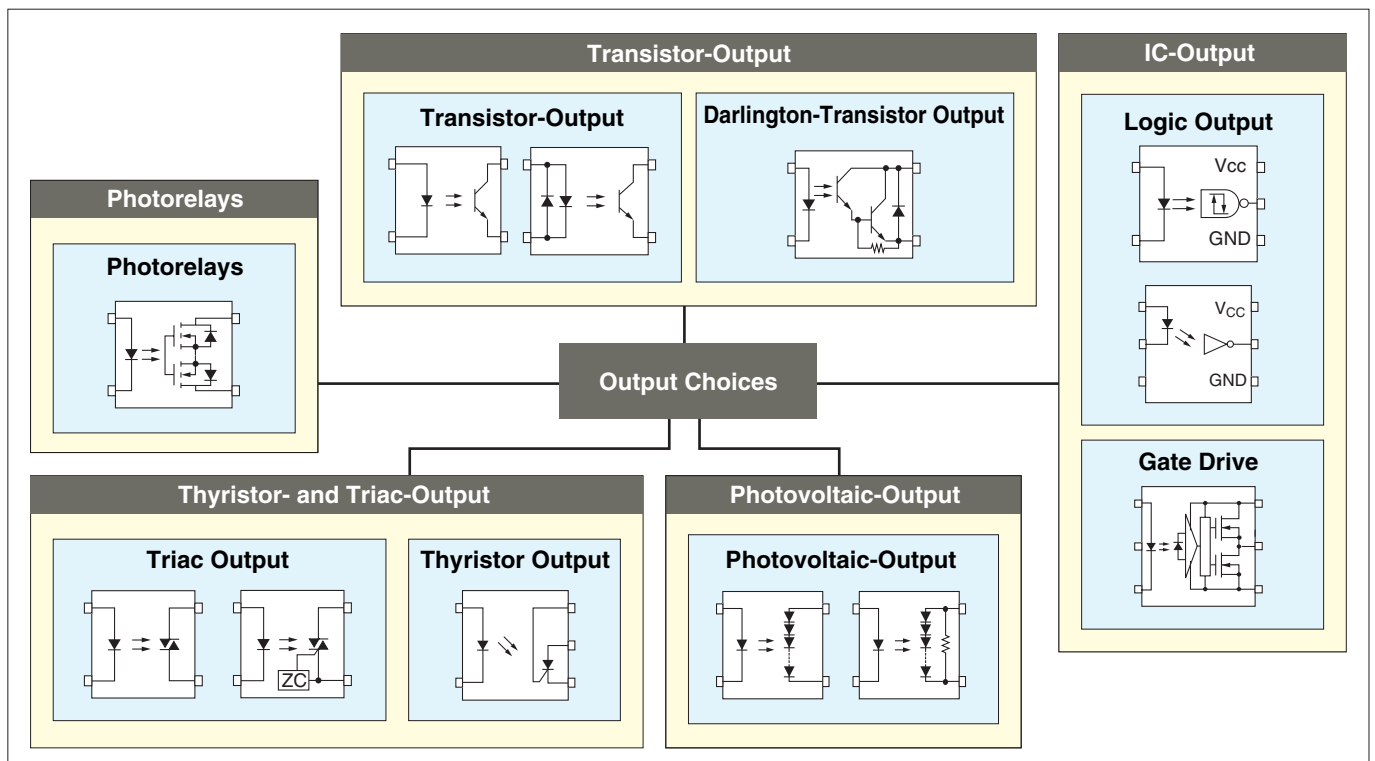
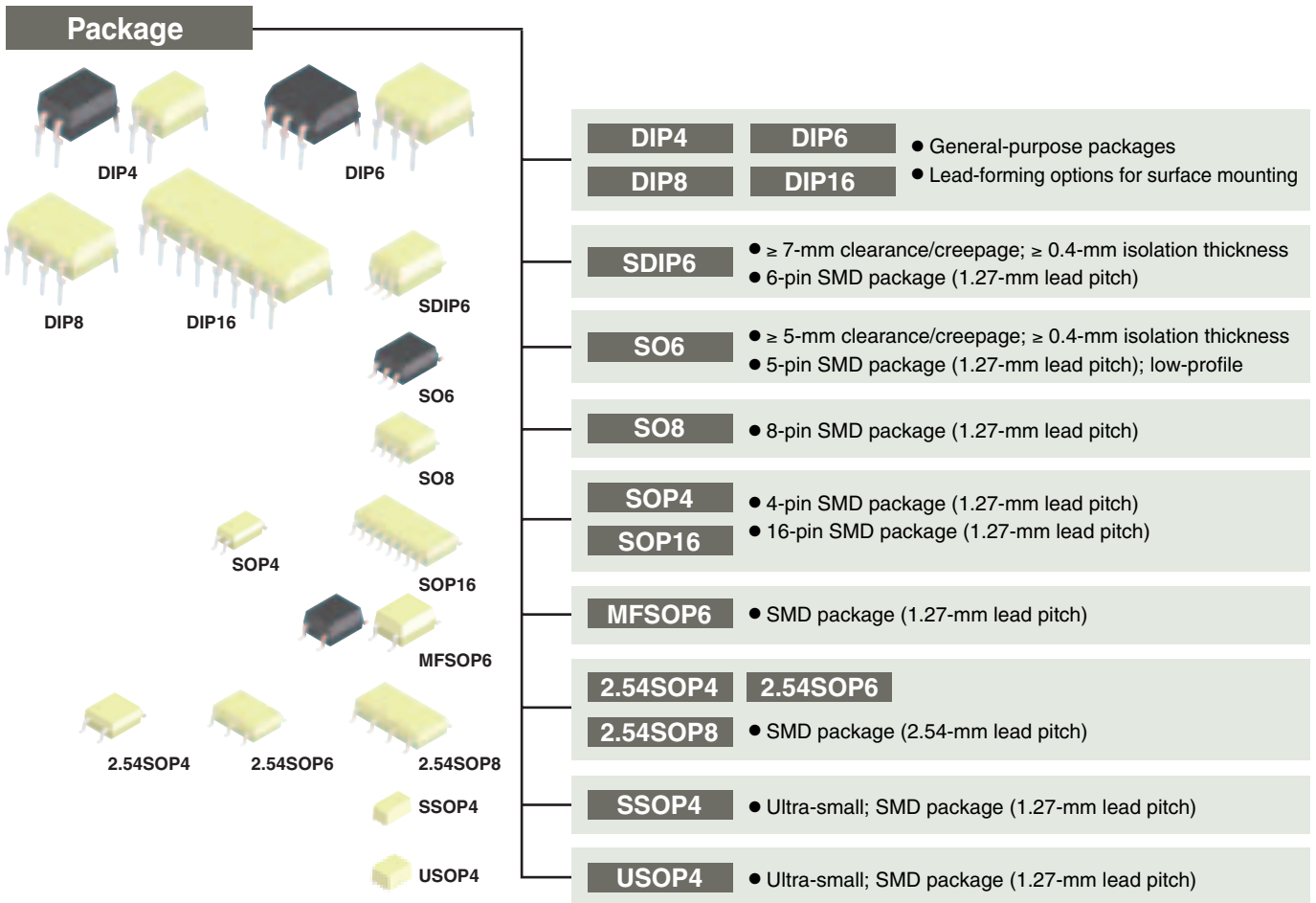
The new TLP173A is targeted as an economical replacement for a mechanical relay. Designed for low-voltage and low-current applications and because of single-chip integration of a photo-receptor, the TLP173A compares more or less favorably with mechanical relays in terms of price. It has been applied for approval under multiple international safety standards such as UL/cUL and VDE and will open up new application areas.

	(New)TLP170A	(New)TLP170D	(New)TLP170G	(New)TLP170J	(New)TLP173A
Trigger current(max) I_{FT}	1mA				2mA
Off-state voltage(min) V_{off}	60 V	200 V	350 V	600 V	60 V
On-state current(max) I_{ON}	0.4 A	0.2 A	0.1 A	0.09 A	0.07 A
On-state resistance(max) R_{ON}	2 Ω	8 Ω	50 Ω	60 Ω	50 Ω
Turn-on time(max) t_{ON}	8 ms	8 ms	5 ms	8 ms	5 ms
Turn-off time(max) t_{OFF}	3 ms				5 ms
Isolation voltage(min) BVs	1500 Vrms				3750 Vrms
Package	2.54SOP4				MFSOP6
Function	Normally open				




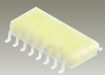




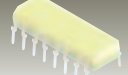
3 Photocoupler Product Tree

Photocoupler Product Tree



4 Selection Guide

1 Transistor-Output and Darlington-Transistor-Output Photocouplers

Features		Package								
		Channel	SOP4	SOP16	MFSOP6	DIP6	DIP4	DIP8	DIP16	
Isolation Voltage	Channel	Single	Quad	Single	Single	Single	Dual	Quad		
General-purpose	2500 Vrms	TLP281	TLP281-4		TLP531 TLP532	TLP521-1	TLP504A TLP521-2	TLP521-4		
	3750 Vrms	TLP285	TLP285-4	TLP131 TLP181						
	4000 Vrms				TLP731 TLP732 TLP733 TLP734					
	5000 Vrms				TLP631 TLP632	TLP621 TLP781	TLP621-2	TLP621-4		
	Low I _F	3750 Vrms			TLP124 TLP137					
		5000 Vrms				TLP331 TLP332	TLP624	TLP624-2	TLP624-4	
	High V _{CEO}	5000 Vrms					TLP628	TLP628-2	TLP628-4	
	High I _F	5000 Vrms					TLP629	TLP629-2	TLP629-4	
	AC input	2500 Vrms	TLP280	TLP280-4						
		3750 Vrms	TLP284	TLP284-4	TLP130 TLP180					
5000 Vrms					TLP630	TLP620	TLP620-2	TLP620-4		
Low I _F		3750 Vrms			TLP126					
		5000 Vrms					TLP626	TLP626-2	TLP626-4	
High I _F	5000 Vrms				TLP330	TLP320	TLP320-2	TLP320-4		
Darlington	2500 Vrms				TLP570 TLP571 TLP572	TLP523	TLP523-2	TLP523-4		
				TLP127						
	High V _{CEO}	5000 Vrms				TLP371 TLP372 TLP373	TLP627	TLP627-2	TLP627-4	

4 Selection Guide

New Products with Reinforced Insulation in a Small, Surface-Mount SOP Package (≥ 5-mm Clearance/Creepage and ≥ 0.4-mm Internal Isolation Thickness)

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Rank	Min	Max	@I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC
TLP284 ⁽⁴⁾		SOP4 Lead pitch = 1.27 mm AC Input SEMKO-approved TST part recm'ed	–	50	600	±5 mA, 5 V	80 V	3750 Vrms	○/○	△	○ ⁽¹⁾	◎	◎
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP284-4		SOP16 4-channel version of the TLP284 Lead pitch = 1.27 mm AC Input SEMKO-approved	–	50	600	±5 mA, 5 V	80 V	3750 Vrms	○/○	△	○ ⁽¹⁾		△
			GB	100	600								
TLP285 ⁽⁴⁾		SOP4 Lead pitch = 1.27 mm SEMKO-approved TST part recm'ed	–	50	600	5 mA, 5 V	80 V	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
			YH	75	150								
			GRL	100	200								
			GRH	150	300								
BLL	200	400											
TLP285-4		SOP16 4-channel version of the TLP285 Lead pitch = 1.27 mm SEMKO-approved	–	50	600	5 mA, 5 V	80 V	3750 Vrms	○/○	△	○ ⁽¹⁾		△
			GB	100	600								

General-Purpose, Transistor-Output Photocouplers

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾												
			Rank	Min	Max	@I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC								
TLP124		Mini-flat MFSOP6 Low input drive current	–	100	1200	1 mA, 0.5 V	80 V	3750 Vrms	○/○												
			BV	200	1200																
TLP131		Mini-flat MFSOP6 Internal base connection	–	50	600	5 mA, 5 V	80 V	3750 Vrms	○/○												
			Y	50	150																
			GR	100	300																
			BL	200	600																
TLP137		Mini-flat MFSOP6 Low input drive current Internal base connection	–	100	1200	1 mA, 0.5 V	80 V	3750 Vrms	○/○												
			BV	200	1200																
			–	50	600									5 mA, 5 V	80 V	3750 Vrms	○/○	△	○ ⁽¹⁾	◎	◎
			Y	50	150																
GR	100	300																			
BL	200	600																			
GB	100	600																			
YH	75	150																			
GRL	100	200																			
GRH	150	300																			
BLL	200	400																			
TLP181 ⁽⁴⁾		Mini-flat MFSOP6 SEMKO-approved TST part recm'ed	–	50	600	5 mA, 5 V	80 V	3750 Vrms	○/○	△	○ ⁽¹⁾	◎	◎								
			Y	50	150																
			GR	100	300																
			BL	200	600																
			GB	100	600																
			YH	75	150																
			GRL	100	200																
			GRH	150	300																
			BLL	200	400																
			TLP281 ⁽⁴⁾		SOP4 Lead pitch = 1.27 mm SEMKO-approved TST part recm'ed									–	50	600	5 mA, 5 V	80 V	2500 Vrms	○/○	○ ⁽¹⁾
Y	50	150																			
GR	100	300																			
BL	200	600																			
GB	100	600																			
YH	75	150																			
GRL	100	200																			
GRH	150	300																			
BLL	200	400																			

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Note 3: Some CTR ranks may be limited in production quantities. For details, please contact your nearest Toshiba sales representative.

Note 4: Product manufactured by Toshiba Semiconductor (Thailand) Co., Ltd. [TST] is recommended. See page 38 for detail. Japan product is non-promotional item.

General-Purpose, Transistor-Output Photocouplers (continued)

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Rank	Min	Max	@ I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC
TLP281-4		SOP16 4-channel version of the TLP281 Lead pitch = 1.27 mm SEMKO-approved	–	50	600	5 mA, 5 V	80 V	2500 Vrms	○/○	△	○ ⁽¹⁾	○	○
			GB	100	600								
TLP331		DIP6 Low input drive current Internal base connection	–	100	1200	1 mA, 0.5 V	55 V	5000 Vrms	○/○				
			BV	200	1200								
TLP332		DIP6 Low input drive current	–	100	1200	1 mA, 0.5 V	55 V	5000 Vrms	○/○				
			BV	200	1200								
TLP504A		DIP8	–	50	600	5 mA, 5 V	55 V	2500 Vrms	○/–				
			GB	100	600								
TLP521-1 ⁽⁴⁾		DIP4 TST part recm'ed	–	50	600	5 mA, 5 V	55 V	2500 Vrms	○/○				
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP521-2 ⁽⁴⁾		DIP8 Dual-channel version of the TLP521-1 TST part recm'ed	–	50	600	5 mA, 5 V	55 V	2500 Vrms	○/○				
			GB	100	600								
TLP521-4		DIP16 4-channel version of the TLP521-1	A	50	600	5 mA, 5 V	55 V	2500 Vrms	○/○				
			GB	100	600								
TLP531		DIP6 Internal base connection	–	50	600	5 mA, 5 V	55 V	2500 Vrms	○/○				
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP532		DIP6 High EMI immunity	–	50	600	5 mA, 5 V	55 V	2500 Vrms	○/○				
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP621 ⁽⁴⁾ TLP621F ⁽⁴⁾		DIP4 UL-approved (double protection) SEMKO-approved TST part recm'ed	–	50	600	5 mA, 5 V	55 V	5000 Vrms	○/○	○	○	○	○
			Y	50	150								
			GR	100	300								
			BL	200	600								
TLP621-2 ⁽⁴⁾ TLP621F-2 ⁽⁴⁾		DIP8 Dual-channel version of the TLP621 SEMKO-approved TST part recm'ed	–	50	600	5 mA, 5 V	55 V	5000 Vrms	○/○	△	○	○	○
			GB	100	600								

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

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EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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Note 4: Product manufactured by Toshiba Semiconductor (Thailand) Co.,Ltd. [TST] is recommended. See page 38 for detail. Japan product is non-promotional item.

4 Selection Guide

General-Purpose, Transistor-Output Photocouplers (continued)

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Rank	Min	Max	@ I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC
TLP621-4		DIP16 4-channel version of the TLP621	–	50	600	5 mA, 5 V	55 V	5000 Vrms	○/○	△	○	◎	◎
			GB	100	600								
TLP624		DIP4 Low input drive current	–	100	1200	1 mA, 5 V	55 V	5000 Vrms	○/–	△	△	◎	◎
			BV	200	1200								
TLP624-2		DIP8 Dual-channel version of the TLP624	–	100	1200	1 mA, 5 V	55 V	5000 Vrms	○/–	△	△	◎	◎
			BV	200	1200								
TLP624-4		DIP16 4-channel version of the TLP624	–	100	1200	1 mA, 5 V	55 V	5000 Vrms	○/–	△	△	◎	◎
			BV	200	1200								
TLP628		DIP4 High V _{CEO}	–	50	600	5 mA, 5 V	350 V	5000 Vrms	○/–	△	△	△	△
			GB	100	600								
TLP628-2		DIP8 Dual-channel version of the TLP628	–	50	600	5 mA, 5 V	350 V	5000 Vrms	○/–	△	△	△	△
			GB	100	600								
TLP628-4		DIP16 4-channel version of the TLP628	–	50	600	5 mA, 5 V	350 V	5000 Vrms	○/–	△	△	△	△
			GB	100	600								
TLP629		DIP4 High input current I _F = 150 mA	–	20	80	100 mA, 1 V	55 V	5000 Vrms	○/–	△	△	△	△
			BV	200	800								
TLP629-2		DIP8 Dual-channel version of the TLP629	–	20	80	100 mA, 1 V	55 V	5000 Vrms	○/–	△	△	△	△
			BV	200	800								
TLP629-4		DIP16 4-channel version of the TLP629	–	20	80	100 mA, 1 V	55 V	5000 Vrms	○/–	△	△	△	△
			BV	200	800								
TLP631		DIP6 Internal base connection	–	50	600	5 mA, 5 V	55 V	5000 Vrms	○/○				
			GB	100	600								
			GR	100	300								

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

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Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Note 3: Some CTR ranks may be limited in production quantities. For details, please contact your nearest Toshiba sales representative.

General-Purpose, Transistor-Output Photocouplers (continued)

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Rank	Min	Max	@ I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC
TLP632		DIP6 High EMI immunity	–	50	600	5 mA, 5 V	55 V	5000 Vrms	○/○				
			GB	100	600								
			GR	100	300								
TLP731		DIP6 SEMKO-approved Internal base connection	–	50	600	5 mA, 5 V	55 V	4000 Vrms	○/○	△	○	◎	◎
			GB	100	600								
			GR	100	300								
TLP732		DIP6 SEMKO-approved	–	50	600	5 mA, 5 V	55 V	4000 Vrms	○/○	△	○	◎	◎
			GB	100	600								
			GR	100	300								
TLP733 TLP733F		DIP6 SEMKO-approved Internal base connection	–	50	600	5 mA, 5 V	55 V	4000 Vrms	○/–	△	○	◎	◎
			GB	100	600								
			GR	100	300								
TLP734 TLP734F		DIP6 SEMKO-approved	–	50	600	5 mA, 5 V	55 V	4000 Vrms	○/–	△	○	◎	◎
			GB	100	600								
			GR	100	300								
TLP781 TLP781F		DIP 4 High isolation voltage UL-approved (double protection)	–	50	600	5 mA, 5 V	80 V	5000 Vrms	○/○ ⁽⁵⁾	△	○	◎	◎
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
			YH	75	150								
			GRL	100	200								
			GRH	150	300								
BLL	200	400											

AC-Input, Transistor-Output Photocouplers

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾				V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Rank	Min	Max	@ I _F , V _{CE}			UL/cUL	TÜV	VDE	BSI	IEC
TLP126		Mini-flat MFSOP6 AC input Low input drive current	–	100	1200	± 1 mA, 0.5 V	80 V	3750 Vrms	○/○				
TLP130		Mini-flat MFSOP6 AC input Internal base connection	–	50	600	±5 mA, 5 V	80 V	3750 Vrms	○/○				
			GB	100	600								
TLP180 ⁽⁴⁾		Mini-flat MFSOP6 AC input SEMKO-approved TST part recm'ed	–	50	600	±5 mA, 5 V	80 V	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP280 ⁽⁴⁾		SOP4 Lead pitch = 1.27 mm AC input SEMKO-approved TST part recm'ed	–	50	600	±5 mA, 5 V	80 V	2500 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
			Y	50	150								
			GR	100	300								
			BL	200	600								
			GB	100	600								
TLP280-4		SOP16 4-channel version of the TLP280 Lead pitch = 1.27 mm AC input SEMKO-approved	–	50	600	±5 mA, 5 V	80 V	2500 Vrms	○/○	△	○ ⁽¹⁾	◎	◎
			GB	100	600								

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Note 3: Some CTR ranks may be limited in production quantities. For details, please contact your nearest Toshiba sales representative.

Note 4: Product manufactured by Toshiba Semiconductor (Thailand) Co., Ltd. [TST] is recommended. See page 38 for detail. Japan product is non-promotional item.

Note 5: For safety standard compliance criteria including the operating temperature conditions, please contact your nearest Toshiba representative.

4 Selection Guide

AC-Input, Transistor-Output Photocouplers (continued)

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾			V _{CEO}	BV _s	Safety Standards ⁽²⁾					
			Rank	Min	Max			@I _F , V _{CE}	UL/cUL	TÜV	VDE	BSI	IEC
TLP320		DIP4 High input current AC input I _F = 150 mA	–	20	80	±100 mA, 1 V	55 V	5000 Vrms	○/○			○	○
TLP320-2		DIP8 Dual-channel version of the TLP320	–	20	80	±100 mA, 1 V	55 V	5000 Vrms	○/○			○	○
TLP320-4		DIP16 4-channel version of the TLP320	–	20	80	±100 mA, 1 V	55 V	5000 Vrms	○/○			○	○
TLP330		DIP6 High input current AC input I _F = 150 mA Internal base connection	–	20	80	±100 mA, 1 V	55 V	5000 Vrms	○/○				
TLP620 ⁽⁴⁾ TLP620F ⁽⁴⁾		DIP4 AC input SEMKO-approved TST part recom'ed	– Y GR BL GB	50 50 100 200 100	600 150 300 600 600	±5 mA, 5 V	55 V	5000 Vrms	○/○	△	○	○	○
TLP620-2 ⁽⁴⁾ TLP620F-2 ⁽⁴⁾		DIP8 Dual-channel version of the TLP620 SEMKO-approved TST part recom'ed	– GB	50 100	600 600	±5 mA, 5 V	55 V	5000 Vrms	○/○	△	○	○	○
TLP620-4		DIP16 4-channel version of the TLP620	– GB	50 100	600 600	±5 mA, 5 V	55 V	5000 Vrms	○/○	△	○	○	○
TLP626		DIP4 Low input drive current AC input	– BV	100 200	1200	±1 mA, 0.5 V	55 V	5000 Vrms	○/–	△	△	○	○
TLP626-2		DIP8 Dual-channel version of the TLP626	– BV	100 200	1200	±1 mA, 0.5 V	55 V	5000 Vrms	○/–	△	△	○	○
TLP626-4		DIP16 4-channel version of the TLP626	– BV	100 200	1200	±1 mA, 0.5 V	55 V	5000 Vrms	○/–	△	△	○	○
TLP630		DIP6 AC input High isolation voltage Internal base connection	– GB	50 100	600	±5 mA, 5 V	55 V	5000 Vrms	○/○				

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Note 3: Some CTR ranks may be limited in production quantities. For details, please contact your nearest Toshiba sales representative.

Note 4: Product manufactured by Toshiba Semiconductor (Thailand) Co.,Ltd. [TST] is recommended. See page 38 for detail. Japan product is non-promotional item.

Darlington-Transistor-Output Photocouplers

Part Number	Pin Configuration	Features	CTR (%) ⁽³⁾		V _{CE(sat)}		V _{CEO}	BV _s	Safety Standards ⁽²⁾				
			Min	@I _F , V _{CE}	Max	@I _C , I _F			UL/cUL	TÜV	VDE	BSI	IEC
TLP127		Mini-flat MFSOP6 High V _{CEO}	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	2500 Vrms	○/○	△	○ ⁽¹⁾	◎	◎
TLP371		DIP6 High V _{CEO} SEMKO-approved Internal base connection	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○			△	△
TLP372		DIP6 High V _{CEO} SEMKO-approved	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○			△	△
TLP373		DIP6 High V _{CEO} Long emitter-collector distance SEMKO-approved	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○			△	△
TLP523		DIP4	500	1 mA, 1 V	1 V	50 mA, 10 mA	55 V	2500 Vrms	○/○				
TLP523-2		DIP8 Dual-channel version of the TLP523	500	1 mA, 1 V	1 V	50 mA, 10 mA	55 V	2500 Vrms	○/○				
TLP523-4		DIP16 4-channel version of the TLP523	500	1 mA, 1 V	1 V	50 mA, 10 mA	55 V	2500 Vrms	○/○				
TLP570		DIP6 High EMI immunity	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	35 V	2500 Vrms	○/○				
TLP571		DIP6 Internal base connection	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	35 V	2500 Vrms	○/—				
TLP572		DIP6 Built-in R _{BE}	1000	1 mA, 1.2 V	1.2 V	100 mA, 10 mA	55V	2500 Vrms	○/—				
TLP627 ⁽⁴⁾		DIP4 High V _{CEO} SEMKO-approved TST part recm'ed	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○	△	○	◎	◎
TLP627-2 ⁽⁴⁾		DIP8 Dual-channel version of the TLP627 SEMKO-approved TST part recm'ed	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○	△	○	◎	◎
TLP627-4		DIP16 4-channel version of the TLP627	1000	1 mA, 1 V	1.2 V	100 mA, 10 mA	300 V	5000 Vrms	○/○	△	○	◎	◎

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4








For the latest information, please contact your nearest Toshiba sales representative.

Note 3: Some CTR ranks may be limited in production quantities. For details, please contact your nearest Toshiba sales representative.

Note 4: Product manufactured by Toshiba Semiconductor (Thailand) Co.,Ltd. [TST] is recommended. See page 38 for detail. Japan product is non-promotional item.

4 Selection Guide

2 Photocouplers for Logic Signal Transmission

Package										
Data Rate (Typ.)	Output	MFSOP6	SO6	SO8		SDIP6	DIP6	DIP8		JEDEC
				1ch	2ch			1ch	2ch	
0.3 Mbit/s	Open-collector (Darlington)			TLP2403*1				TLP553		6N138 6N139
1 Mbit/s	Open-collector	(TLP112)*2 (TLP112A)*2 (TLP114A)*2	TLP109	TLP2409*1		TLP719	TLP512	TLP550 TLP551 TLP559 TLP651 TLP750 TLP751 TLP759		6N135 6N136
		IPM drive (TLP114A(IGM))*3	TLP109(IGM) TLP104	TLP2409(IGM)*1 TLP2404*1		TLP714*1		TLP559(IGM) TLP759(IGM) TLP754*1		
5 Mbit/s	Totem-pole	TLP105 TLP108		TLP2405*1 TLP2408*1		TLP715 TLP718				
	Dual polarity input	TLP2095 TLP2098								
5 Mbit/s	3-state							TLP555 TLP558 TLP2200		
	Open-collector	(TLP113)*4 (TLP115)*4 (TLP115A)*4					TLP513	TLP552 TLP554 TLP2630 TLP2631		6N137
15 to 20 Mbit/s	Totem-pole	5 V (TLP116)*5 3.3 V TLP2066	TLP116A TLP2360*1			TLP2116 TLP2166A	TLP716			
	Open-collector	5 V	TLP118	TLP2418*1		TLP2118	TLP708*1			
50 Mbit/s	Totem-pole	5 V	TLP117							

*1: Under development as of January 2010. For the latest information, please contact your nearest Toshiba sales representative.

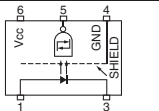
*2: TLP109 recommended

*3: TLP109(IGM) recommended

*4: TLP118 recommended

*5: TLP116A recommended

Photocouplers for Logic Signal Transmission at 50 Mbit/s (Typ.)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output Form	IFHL (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP117		Mini-flat MFSOP6 High speed: 50 Mbit/s V _{CC} = 5 V	30 ns	Totem pole output (Inverter logic)	5 mA	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾		

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

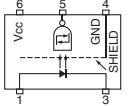
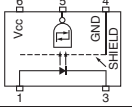
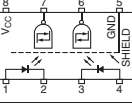
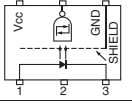
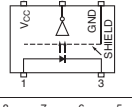
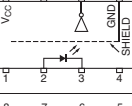
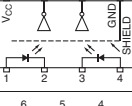
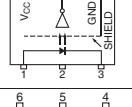
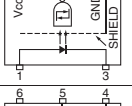
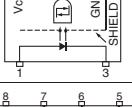
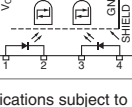
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Photocouplers for Logic Signal Transmission at 15 to 20 Mbit/s (Typ.)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output Form	I _{FHL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP116		Mini-flat MFSOP6 High speed: 20 Mbit/s V _{CC} = 5 V, TLP116A recm'ed	60 ns	Totem pole output (Inverter logic)	5 mA	3750 V _{rms}	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP116A		SO6 (reinforced insulation) High speed: 20 Mbit/s V _{CC} = 5 V	60 ns	Totem pole output (Inverter logic)	5 mA	3750 V _{rms}	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP2116		SO8 High speed: 15 Mbit/s V _{CC} = 5 V Dual-channel version	75 ns	Totem pole output (Inverter logic)	5 mA	2500 V _{rms}	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP716 TLP716F		SDIP6 High speed: 15 Mbit/s V _{CC} = 5 V High isolation voltage	75 ns	Totem pole output (Inverter logic)	6.5 mA	5000 V _{rms}	○/○	○	○		
TLP118		SO6 (reinforced insulation) High speed: 20 Mbit/s V _{CC} = 5 V T _{opr} = 125°C (max)	60 ns	Open-collector (Inverter logic)	5 mA	3750 V _{rms}	○/○		△		
TLP2418*		SO8 High speed: 15 Mbit/s V _{CC} = 5 V	75 ns	Open-collector (Inverter logic)	5 mA	3750 V _{rms}	△/△		△		
TLP2118		SO8 High speed: 15 Mbit/s V _{CC} = 5 V Dual-channel version	75 ns	Open-collector (Inverter logic)	5 mA	2500 V _{rms}	○/○		△		
TLP708*		SDIP6 High speed: 15 Mbit/s V _{CC} = 5 V High isolation voltage	75 ns	Open-collector (Inverter logic)	5 mA	5000 V _{rms}	△/△		△		
TLP2066		Mini-flat MFSOP6 High speed: 20 Mbit/s V _{CC} = 3.3 V	60 ns	Totem pole output (Inverter logic)	5 mA	3750 V _{rms}	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP2360*		SO6 (reinforced insulation) High speed: 20 Mbit/s V _{CC} = 3.3 V	60 ns	Totem pole output (Inverter logic)	5 mA	3750 V _{rms}	○/○		△		
TLP2166A		SO8 High speed: 15 Mbit/s V _{CC} = 3.3 V Dual-channel version	75 ns	Totem pole output (Inverter logic)	3 mA	2500 V _{rms}	○/○	△	○ ⁽¹⁾		

*Under development. Specifications subject to change without notice. For the latest information, please contact your nearest Toshiba sales representative.

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

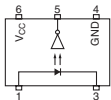
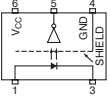
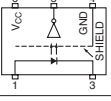
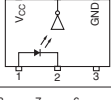
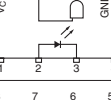
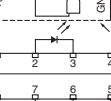
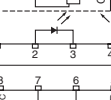
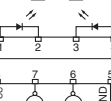
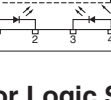
TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

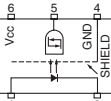
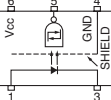
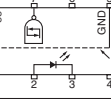
For the latest information, please contact your nearest Toshiba sales representative.

4 Selection Guide

Photocouplers for Logic Signal Transmission at 10 Mbit/s (Typ.)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output Form	I _{FH} , I _{FL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP113		Mini-flat MFSOP6 Logic output V _{CC} = 5 V TLP118 recm'd	120 ns (Topr = 25°C)	Open-collector	10 mA	2500 Vrms	○/○				
TLP115		Mini-flat MFSOP6 High CMR version of the TLP113 V _{CC} = 5 V, TLP118 recm'd	120 ns (Topr = 25°C)	Open-collector	10 mA	2500 Vrms	○/○				
TLP115A		Mini-flat MFSOP6 Highly sensitive version of the TLP115 V _{CC} = 5 V, TLP118 recm'd	120 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/○				
TLP513		DIP6 6-pin package version of the TLP552 V _{CC} = 5 V	120 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/—				
TLP552		DIP8 Logic output V _{CC} = 5 V	120 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/—				
TLP554		DIP8 High CMR version of the TLP552 V _{CC} = 5 V	120 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/○				
TLP2601		DIP8 High CMR V _{CC} = 5 V	75 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/○				
TLP2630		DIP8 Dual-channel version of the 6N137 and the TLP552 V _{CC} = 5 V	75 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/○				
TLP2631		DIP8 High CMR Dual-channel version of the TLP554 V _{CC} = 5 V	75 ns (Topr = 25°C)	Open-collector	5 mA	2500 Vrms	○/○				

Photocouplers for Logic Signal Transmission at 5 Mbit/s (Typ.)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output Form	I _{FH} , I _{FL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP105		Mini-flat MFSOP6 V _{CC} = 4.5 to 20 V Low input operation IPM drive	250 ns	Totem pole output (Buffer logic)	1.6 mA	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP108		Mini-flat MFSOP6 V _{CC} = 4.5 to 20 V Low input operation IPM drive	250 ns	Totem pole output (Inverter logic)	1.6 mA	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP2405*		SO8 V _{CC} = 4.5 to 20 V Low input operation IPM drive	250 ns	Totem pole output (Buffer logic)	1.6 mA	3750 Vrms	△/△		△		

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Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

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Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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Photocouplers for Logic Signal Transmission at 5 Mbit/s (Typ.) (Continued)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output Form	I _{FH} , I _{FL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP2408*		SO8 V _{CC} = 4.5 to 20 V Low input operation IPM drive	250 ns	Totem pole output (Inverter logic)	1.6 mA	3750 Vrms	△ / △		△		
TLP555		DIP8 Low input current V _{CC} = 4.5 to 20 V	400 ns (Topr = 25°C)	3-state (Buffer logic)	1.6 mA	2500 Vrms	○ / ○				
TLP558		DIP8 Inverting logic version of the TLP555 V _{CC} = 4.5 to 20 V	400 ns (Topr = 25°C)	3-state (Inverter logic)	1.6 mA	2500 Vrms	○ / ○				
TLP715 TLP715F		SDIP6 IPM drive High CMR V _{CC} = 4.5 to 20 V	250 ns	Totem pole output (Buffer logic)	3 mA	5000 Vrms	○ / ○	○	○		
TLP718 TLP718F		SDIP6 IPM drive High CMR V _{CC} = 4.5 to 20 V	250 ns	Totem pole output (Inverter logic)	3 mA	5000 Vrms	○ / ○	○	○		
TLP2095		Mini-flat MFSOP6 Dual polarity input version of the TLP105 V _{CC} = 3 to 20 V	250 ns	Totem pole output (Buffer logic)	3 mA	3750 Vrms	○ / ○		△		
TLP2098		Mini-flat MFSOP6 Dual polarity input version of the TLP108 V _{CC} = 3 to 20 V	250 ns	Totem pole output (Inverter logic)	3 mA	3750 Vrms	○ / ○		△		
TLP2105		SO8 Dual-channel version for the TLP105 V _{CC} = 4.5 to 20 V	250 ns	Totem pole output (Buffer logic)	1.6 mA	3750 Vrms	○ / ○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP2108		SO8 Dual-channel version for the TLP108 V _{CC} = 4.5 to 20 V	250 ns	Totem pole output (Inverter logic)	1.6 mA	3750 Vrms	○ / ○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP2200		DIP8 Low input current V _{CC} = 4.5 to 20 V	400 ns	3-state (Buffer logic)	1.6 mA	2500 Vrms	○ / ○				

Photocouplers for Logic Signal Transmission at 1 Mbit/s (Typ.)

Part Number	Pin Configuration	Features	Data Rate (NRZ) (Typ.)	CTR	@ I _F	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP109		SO6 (reinforced insulation) Creepage/clearance ≥ 5 mm Isolation thickness ≥ 0.4 mm	1 Mbit/s	20% (min)	16 mA	3750 Vrms	○ / ○	△	○ ⁽¹⁾		
TLP2409*		SO8 Topr = 125°C(max) SO8 version of the TLP109	1 Mbit/s	20% (min)	16 mA	3750 Vrms	△ / △		△		

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EN 60747-5-2-approved with option V4 or D4

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3 Selection Guide

Photocouplers for Logic Signal Transmission at 1 Mbit/s (Typ.) (Continued)

Part Number	Pin Configuration	Features	Data Rate (NRZ) (Typ.)	CTR	@IF	BVs	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP112		Mini-flat MFSOP6 High speed High CMR TLP109 recm'ed	1 Mbit/s	10% (min)	16 mA	2500 Vrms	○/○				
TLP112A		Mini-flat MFSOP6 High CTR version of the TLP112 TLP109 recm'ed	1 Mbit/s	20% (min)	16 mA	2500 Vrms	○/○				
TLP114A		Mini-flat MFSOP6 High CMR version of the TLP112A TLP109 recm'ed	1 Mbit/s	20% (min)	16 mA	3750 Vrms	○/○	○ ⁽¹⁾	○ ⁽¹⁾		
TLP512		DIP6 6-pin package version of the TLP550	1 Mbit/s	20% (min)	16 mA	2500 Vrms	○/—				
TLP550		DIP8 High CMR	1 Mbit/s	10% (min) (19% min for rank 0)	16 mA	2500 Vrms	○/○				
TLP551		DIP8 Internal base connection	1 Mbit/s	10% (min) (19% min for rank 0)	16 mA	2500 Vrms	○/○				
TLP2403*		SO8 Low input current SO8 version of the TLP553	300 kbit/s	400% (min)	0.5 mA	3750 Vrms	△/△		△		
TLP553		DIP8 Low input drive current	300 kbit/s	400% (min)	0.5 mA	2500 Vrms	○/—				
TLP559		DIP8 High CMR version of the TLP550	1 Mbit/s	20% (min)	16 mA	2500 Vrms	○/○				
TLP651		DIP8 Internal base connection	1 Mbit/s	10% (min) (19% min for rank 0)	16 mA	5000 Vrms	○/○				
TLP719 TLP719F		SDIP6 High CMR	1 Mbit/s	20% (min)	16 mA	5000 Vrms	○/○	○	○		
TLP750 TLP750F		DIP8 High CMR SEMKO-approved	1 Mbit/s	10% (min) (19% min for rank 0)	16 mA	5000 Vrms	○/○	△	○	◎	◎
TLP751 TLP751F		DIP8 Internal base connection SEMKO-approved	1 Mbit/s	10% (min)	16 mA	5000 Vrms	○/○	△	○	◎	◎

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EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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Photocouplers for Logic Signal Transmission at 1 Mbit/s (Typ.) (Continued)

Part Number	Pin Configuration	Features	Data Rate (NRZ) (Typ.)	CTR	@IF	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP759 TLP759F		DIP8 IEC60950-compliant version of the TLP559 SEMKO-approved	1 Mbit/s	20% (min)	16 mA	5000 V _{rms}	○/○	△	○	◎	◎
TLP2530		DIP8 Dual-channel version of the 6N135 and the TLP550	1 Mbit/s	7% (min)	16 mA	2500 V _{rms}	○/○				
TLP2531		DIP8 Dual-channel version of the 6N136 and the TLP550	1 Mbit/s	19% (min)	16 mA	2500 V _{rms}	○/○				

IPM-Drive Photocouplers

Part Number	Pin Configuration	Features	Data Rate (NRZ) (Typ.)	Output Form/CTR	I _{FH} , I _{FL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP104		SO6 (reinforced insulation) IPM drive T _{opr} = 125°C (max)	550 ns	Open-collector	5 mA	3750 V _{rms}	○/○		○ ⁽¹⁾		
TLP2404		SO8 IPM drive T _{opr} = 125°C (max) SO8 version of the TLP104	550 ns	Open-collector (Inverter logic)	5 mA	3750 V _{rms}	△/△		△		
TLP714 TLP714F		SDIP6 (reinforced insulation) IPM drive T _{opr} = 125°C (max) High isolation voltage	550 ns	Open-collector (Inverter logic)	5 mA	5000 V _{rms}	△/△		△		
TLP754* TLP754F*		DIP8 IPM drive	550 ns	Open-collector	5 mA	5000 V _{rms}	△/△		△		
TLP109(IGM)		SO6 (reinforced insulation) IPM drive High CMR	800 ns	25% (min)	10 mA	3750 V _{rms}	○/○		○ ⁽¹⁾		
TLP2409(IGM)*		SO8 IPM drive High CMR	800 ns	20% (min)	10 mA	3750 V _{rms}	△/△		△		
TLP114A(IGM)		Mini-flat MFSOP6 IPM drive High CMR TLP109(IGM) recm'ed	800 ns	25% (min)	10 mA	3750 V _{rms}	○/○	○ ⁽¹⁾	△		
TLP559(IGM)		DIP8 IPM drive High CMR	800 ns	25% (min)	10 mA	2500 V _{rms}	○/○				
TLP759(IGM) TLP759F(IGM)		DIP8 IPM drive High CMR SEMKO-approved	800 ns	25% (min)	10 mA	5000 V _{rms}	○/○	△	○	◎	◎

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EN 60747-5-2-approved with option V4 or D4

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4 Selection Guide

JEDEC-Compliant Photocouplers

Part Number	Pin Configuration	Features	Data Rate (NRZ) (Typ.)	CTR	I _{FH} , I _{FL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
6N135		JEDEC-compliant	1 Mbit/s	7% (min)	16 mA	2500 V _{rms}	○/—				
6N136		JEDEC-compliant	1 Mbit/s	19% (min)	16 mA	2500 V _{rms}	○/—				
6N137		JEDEC-compliant	10 Mbit/s	700% (Typ.)	5 mA	2500 V _{rms}	○/—				
6N138		JEDEC-compliant High CTR	300 kbit/s	300% (min)	1.6 mA	2500 V _{rms}	○/—				
6N139		JEDEC-compliant High CTR	300 kbit/s	400% (min)	0.5 mA	2500 V _{rms}	○/—				

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 TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
 EN 60747-5-2-approved with option V4 or D4
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3 Photocouplers for IGBT/MOSFET Gate Drive

Package	Photocoupler Package Images			
Output Peak Current	SDIP6	DIP8	SO6	SO8
± 0.25 A		TLP557		
± 0.45 A (max)	TLP705 (High speed)			
± 0.6 A (max)	TLP701 TLP701H*	TLP351 TLP351H*	TLP151*	TLP2451*
± 2.0 A (max)	TLP700 TLP700H*			
± 2.5 A (max)		TLP350 TLP350H*		
± 6.0 A (max)		TLP358 TLP358H		

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Photocouplers for IGBT/MOSFET Gate Drive

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output	I _{FHL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP151*		SO6 (reinforced Insulation) Creepage/clearance ≥ 5 mm Isolation thickness ≥ 0.4 mm	0.7 μs	Peak output current (max): ±0.6 A	5 mA	3750 Vrms	○/○		○ ⁽¹⁾		
TLP2451*		SO8 T _{opr} = 125°C (max) Direct drive of a small-power IGBT/MOSFET High CMR SO8 version of the TLP151	0.7 μs	Peak output current (max): ±0.6 A	5 mA	3750 Vrms	△/△		△		
TLP350 TLP350F		DIP8 Direct drive of a medium-power IGBT/MOSFET High CMR Low power dissipation	0.5 μs	Peak output current (max): ±2.5 A	5 mA	3750 Vrms	○/○	○	○		
TLP350H* TLP350HF*		DIP8 T _{opr} = 125°C (max) Direct drive of a medium-power IGBT/MOSFET High CMR	0.5 μs	Peak output current (max): ±2.5 A	5 mA	3750 Vrms	△/△		○		
TLP351 TLP351F		DIP8 Direct drive of a medium-power IGBT/MOSFET Low power dissipation	0.7 μs	Peak output current (max): ±0.6 A	5 mA	3750 Vrms	○/○	○	○		
TLP351H* TLP351HF*		DIP8 T _{opr} = 125°C (max) Direct drive of a small-power IGBT/MOSFET High CMR	0.7 μs	Peak output current (max): ±6.0 A	5 mA	3750 Vrms	△/△		○		
TLP358 TLP358F		DIP8 Direct drive of a medium-power IGBT/MOSFET High CMR Low power dissipation	0.5 μs	Peak output current (max): ±6.0 A	5 mA	3750 Vrms	△/△		△		
TLP358H* TLP358HF*		DIP8 T _{opr} = 125°C (max) Direct drive of a medium-power IGBT/MOSFET High CMR	0.5 μs	Peak output current (max): ±6.0 A	5 mA	3750 Vrms	△/△		△		

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4 Selection Guide

Photocouplers for IGBT/MOSFET Gate Drive (continued)

Part Number	Pin Configuration	Features	Propagation Delay Time (Max)	Output	I _{FHL} (Max)	BV _s	Safety Standards ⁽²⁾				
							UL/cUL	TÜV	VDE	BSI	IEC
TLP557		DIP8 Direct drive of a power transistor	5 μs	Constant current output : 0.25 A	5 mA	2500 Vrms	○/○				
TLP700 TLP700F		SDIP6 Direct drive of a medium-power IGBT/MOSFET Low power dissipation	0.5 μs	Peak output current (max): ±2.0 A	5 mA	5000 Vrms	○/○	○	△		
TLP700H* TLP700HF*		SDIP6 T _{opr} = 125°C (max) Direct drive of a medium-power IGBT/MOSFET High CMR	0.5 μs	Peak output current (max): ±2.0 A	5 mA	5000 Vrms	△/△		△		
TLP701 TLP701F		SDIP6 Direct drive of a medium-power IGBT/MOSFET Low power dissipation	0.7 μs	Peak output current (max): ±0.6 A	5 mA	5000 Vrms	○/○	○	○		
TLP701H* TLP701HF*		SDIP6 T _{opr} = 125°C (max) Direct drive of a small-power IGBT/MOSFET High CMR	0.7 μs	Peak output current (max): ±0.6 A	5 mA	5000 Vrms	△/△		△		
TLP705 TLP705F		SDIP6 Direct drive of a small-power IGBT/MOSFET High speed (250 kHz) Low power dissipation	0.2 μs	Peak output current (max): ±0.45 A	8 mA	5000 Vrms	○/○	○	○		

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





EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

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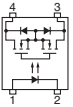
4 Photorelays (1-Form-A and 2-Form-A)

Features			Package							
										
Off-State Voltage (max) (V)	On-State Resistance (max) (Ω)	On-State Current (max) (A)	USOP4	SSOP4	2.54SOP4	2.54SOP6	2.54SOP8	DIP4	DIP6	DIP8
20	8	0.16		TLP3230	TLP3130					
	5	0.2		TLP3250						
	1.2	0.3			TLP3131					
	1.2	0.45		TLP3231						
	0.22	0.9		TLP3203						
40	0.05	2.5				TLP3100				
	35	0.08		TLP3213	TLP3113					
	15	0.12		TLP3216	TLP3116					
	14	0.12		TLP3240						
	10	0.14		TLP3241						
	3	0.25		TLP3214	TLP3114					
	1.5	0.3		TLP3215	TLP3115					
50	0.13	1			TLP3123					
	1.5	0.3	TLP3375	TLP3275						
60	50	0.07			TLP173A**					
	1	0.4	TLP3312							
	1.2	0.35			TLP3110					
	2	0.4			TLP170A TLP172A TLP176A	TLP192A TLP197A	TLP202A* TLP206A*			
	1.5	0.4		TLP3212						
	1.1	0.5					TLP225A			
	2	0.5					TLP222A TLP227A	TLP598AA TLP592A TLP597A	TLP222A-2* TLP227A-2*	
	0.7	1			TLP3122					
80	0.1	2.5							TLP3542	
	25	0.04		TLP3218	TLP3118					
	20	0.1			TLP3111					
	12	0.12		TLP3217						
	8	0.2		TLP3219	TLP3119					
	1.2	0.35			TLP3121					
100	0.15	1.25				TLP3120				
	14	0.08		TLP3220						
200	50	0.05			TLP179D	TLP199D	TLP209D*			
	8	0.2			TLP170D TLP176D	TLP197D	TLP200D*			
350	50	0.1			TLP170G					
	35	0.11			TLP172G	TLP192G	TLP202G*			
	35	0.12			TLP174G TLP176G	TLP197G	TLP206G*	TLP222G TLP224G TLP227G	TLP592G TLP597G	TLP222G-2* TLP224G-2* TLP227G-2*
400	35	0.12			TLP176GA	TLP197GA	TLP206GA*	TLP227GA	TLP597GA TLP797GA	TLP227GA-2*
	12	0.15							TLP598GA TLP798GA	
	35	0.12			TLP174GA			TLP224GA		TLP224GA-2*
	4	0.2					TLP3125			
600	35	0.1							TLP797J	
	60	0.09			TLP170J					

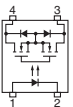
* Dual-channel **: MFSOP6

4 Selection Guide

MOSFET-Output Photorelays, 1-Form-A in a USOP4 Package

Part Number	Pin Configuration	Features	I _{FT} (Max)	R _{ON} (Max)		I _{ON} (Max)	V _{OFF}	BVs	Safety Standards ⁽²⁾				
					@ I _F				UL/cUL	TÜV	VDE	BSI	IEC
TLP3312*		USOP4 COFF: 20 pF (typ.)	3 mA	1 Ω	5 mA	0.4 A	60 V	500 Vrms					
TLP3375*		USOP4 COFF: 12 pF (typ.)	3 mA	1.5 Ω	5 mA	0.3 A	50 V	500 Vrms					

MOSFET-Output Photorelays, 1-Form-A in a SSOP4 Package

Part Number	Pin Configuration	Features	I _{FT} (Max)	R _{ON} (Max)		I _{ON} (Max)	V _{OFF}	BVs	Safety Standards ⁽²⁾				
					@ I _F				UL/cUL	TÜV	VDE	BSI	IEC
TLP3203		SSOP4 COFF: 40 pF (typ.)	3 mA	0.22 Ω	5 mA	0.9 A	20 V	1500 Vrms	○/—				
TLP3212		SSOP4 COFF: 20 pF (typ.)	5 mA	1.5 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/—				
TLP3213		SSOP4 COFF: 0.6 pF (typ.)	4 mA	35 Ω	5 mA	0.08 A	40 V	1500 Vrms	○/—				
TLP3214		SSOP4 COFF: 5 pF (typ.)	4 mA	3 Ω	5 mA	0.25 A	40 V	1500 Vrms	○/—				
TLP3215		SSOP4 COFF: 10 pF (typ.)	4 mA	1.5 Ω	5 mA	0.3 A	40 V	1500 Vrms	○/—				
TLP3216		SSOP4 COFF: 1 pF (typ.)	4 mA	15 Ω	5 mA	0.12 A	40 V	1500 Vrms	○/—				
TLP3217		SSOP4 COFF: 5 pF (typ.)	5 mA	12 Ω	10 mA	0.12 A	80 V	1500 Vrms	○/—				
TLP3218		SSOP4 COFF: 2.5 pF (typ.)	5 mA	25 Ω	5 mA	0.04 A	80 V	1500 Vrms	△/—				
TLP3219		SSOP4 COFF: 6.5 pF (typ.)	3 mA	8 Ω	5 mA	0.2 A	80 V	1500 Vrms	△/—				
TLP3220		SSOP4 COFF: 6 pF (typ.)	5 mA	14 Ω	10 mA	0.08 A	100 V	1500 Vrms	○/—				
TLP3230		SSOP4 COFF: 1 pF (typ.)	4 mA	8 Ω	5 mA	0.16 A	20 V	1500 Vrms	○/—				
TLP3231		SSOP4 COFF: 5 pF (typ.)	4 mA	1.2 Ω	5 mA	0.45 A	20 V	1500 Vrms	○/—				
TLP3240		SSOP4 COFF: 0.45 pF (typ.)	3 mA	14 Ω	5 mA	0.12 A	40 V	1500 Vrms	○/—				
TLP3241		SSOP4 COFF: 0.7 pF (typ.)	3 mA	10 Ω	5 mA	0.14 A	40 V	1500 Vrms	○/—				
TLP3250		SSOP4 COFF: 0.8 pF (typ.)	3 mA	5 Ω	5 mA	0.2 A	20 V	1500 Vrms	○/—				
TLP3275		SSOP4 COFF: 12 pF (typ.)	3 mA	1.5 Ω	5 mA	0.3 A	50 V	1500 Vrms	○/—				IEC

*Under development. Specifications subject to change without notice. For the latest information, please contact your nearest Toshiba sales representative.

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

MOSFET-Output Photorelays, 1-Form-A in a 2.54SOP4 Package

Part Number	Pin Configuration	Features	I _{FT} (Max)	R _{ON} (Max)		I _{ON} (Max)	V _{OFF}	BV _s	Safety Standards ⁽²⁾				
				@ I _F					UL/cUL	TÜV	VDE	BSI	IEC
TLP170A		2.54SOP4 Lead pitch: 2.54 mm Low trigger LED current	1 mA	2 Ω	2 mA	0.4 A	60 V	1500 Vrms	○/○				
TLP170D		2.54SOP4 Lead pitch: 2.54 mm Low trigger LED current	1 mA	8 Ω	2 mA	0.2 A	200 V	1500 Vrms	○/○				
TLP170G		2.54SOP4 Lead pitch: 2.54 mm Low trigger LED current	1 mA	50 Ω	2 mA	0.1 A	350 V	1500 Vrms	○/○				
TLP170J		2.54SOP4 Lead pitch: 2.54 mm Low trigger LED current	1 mA	60 Ω	2 mA	0.09 A	600 V	1500 Vrms	○/○				
TLP172A		2.54SOP4 Lead pitch: 2.54 mm COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/○				
TLP172G		2.54SOP4 Lead pitch: 2.54 mm COFF: 30 pF (typ.)	3 mA	35 Ω	5 mA	0.11 A	350 V	1500 Vrms	○/○				
TLP173A		Mini-flat MFSOP6 Low trigger LED current	2 mA	50 Ω	3 mA	0.07 A	60 V	3750 Vrms	○/○	△	△		
TLP174G		2.54SOP4 Lead pitch: 2.54 mm SEMKO-approved Current-limiting function Limit current: 150 to 300 mA	3 mA	35 Ω	5 mA	0.12 A	350 V	1500 Vrms	○/○				△
TLP174GA		2.54SOP4 Lead pitch: 2.54 mm Current-limiting function Limit current: 150 to 300 mA	3 mA	35 Ω	5 mA	0.12 A	400 V	1500 Vrms	○/○				
TLP176A		2.54SOP4 Lead pitch: 2.54 mm COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/○	△	○ ⁽¹⁾		
TLP176D		2.54SOP4 Lead pitch: 2.54 mm COFF: 100 pF (typ.)	3 mA	8 Ω	5 mA	0.2 A	200 V	1500 Vrms	○/○	△	○ ⁽¹⁾		
TLP176G		2.54SOP4 Lead pitch: 2.54 mm SEMKO-approved COFF: 40 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	350 V	1500 Vrms	○/○	△	○ ⁽¹⁾	○	○
TLP176GA		2.54SOP4 Lead pitch: 2.54 mm COFF: 70 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	400 V	1500 Vrms	○/○			○	○
TLP179D		2.54SOP4 Lead pitch: 2.54 mm COFF: 15 pF (typ.)	3 mA	50 Ω	5 mA	0.05 A	200 V	1500 Vrms	○/○				
TLP3110		2.54SOP4 Lead pitch: 2.54 mm COFF: 100 pF (typ.)	4 mA	1.2 Ω	5 mA	0.35 A	60 V	1500 Vrms	○/—				
TLP3111		2.54SOP4 Lead pitch: 2.54 mm COFF: 11 pF (typ.)	4 mA	20 Ω	5 mA	0.1 A	80 V	1500 Vrms	○/—				
TLP3113		2.54SOP4 Lead pitch: 2.54 mm COFF: 0.6 pF (typ.)	4 mA	35 Ω	5 mA	0.08 A	40 V	1500 Vrms	○/—				
TLP3114		2.54SOP4 Lead pitch: 2.54 mm COFF: 5 pF (typ.)	4 mA	3 Ω	5 mA	0.25 A	40 V	1500 Vrms	○/—				
TLP3115		2.54SOP4 Lead pitch: 2.54 mm COFF: 10 pF (typ.)	4 mA	1.5 Ω	5 mA	0.3 A	40 V	1500 Vrms	○/—				
TLP3116		2.54SOP4 Lead pitch: 2.54 mm COFF: 1 pF (typ.)	4 mA	15 Ω	5 mA	0.12 A	40 V	1500 Vrms	○/—				
TLP3118		2.54SOP4 Lead pitch: 2.54 mm COFF: 2.5 pF (typ.)	3 mA	25 Ω	5 mA	0.04 A	80 V	1500 Vrms	○/—				

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

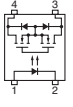
Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
EN 60747-5-2-approved with option V4 or D4

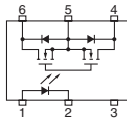
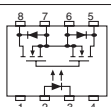
For the latest information, please contact your nearest Toshiba sales representative.

4 Selection Guide

MOSFET-Output Photorelays, 1-Form-A in a 2.54SOP4 Package (continued)

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BV _s	Safety Standards ⁽²⁾				
				@ I _F					UL/cUL	TÜV	VDE	BSI	IEC
TLP3119		2.54SOP4 Lead pitch: 2.54 mm COFF: 6.5 pF (typ.)	3 mA	8 Ω	5 mA	0.2 A	80 V	1500 Vrms	○/–				
TLP3121		2.54SOP4 Lead pitch: 2.54 mm COFF: 30 pF (typ.)	4 mA	1.2 Ω	5 mA	0.35 A	80 V	1500 Vrms	○/○				
TLP3122		2.54SOP4 Lead pitch: 2.54 mm ION: 1 A (max) @ Ta: up to 50°C COFF: 90 pF (typ.)	3 mA	0.7 Ω	5 mA	1.0 A	60 V	1500 Vrms	○/○				
TLP3123		2.54SOP4 Lead pitch: 2.54 mm ION: 1 A (max) @ Ta: up to 50°C COFF: 300 pF (typ.)	3 mA	0.13 Ω	5 mA	1.0 A	40 V	1500 Vrms	○/○				
TLP3130		2.54SOP4 Lead pitch: 2.54 mm COFF: 1 pF (typ.)	4 mA	8 Ω	5 mA	0.16 A	20 V	1500 Vrms	○/–				
TLP3131		2.54SOP4 Lead pitch: 2.54 mm COFF: 5 pF (typ.)	4 mA	1.2 Ω	5 mA	0.3 A	20 V	1500 Vrms	○/–				

MOSFET-Output Photorelays, 1-Form-A in a 2.54SOP6 or 2.54SOP8 Package

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BV _s	Safety Standards ⁽²⁾				
				@ I _F					UL/cUL	TÜV	VDE	BSI	IEC
TLP192A		2.54SOP6 Lead pitch: 2.54 mm COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/○				
TLP192G		2.54SOP6 Lead pitch: 2.54 mm COFF: 30 pF (typ.)	3 mA	35 Ω	5 mA	0.11 A	350 V	1500 Vrms	○/○				
TLP197A		2.54SOP6 Lead pitch: 2.54 mm COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/○				
TLP197D		2.54SOP6 Lead pitch: 2.54 mm COFF: 100 pF (typ.)	3 mA	8 Ω	5 mA	0.2 A	200 V	1500 Vrms	○/○				
TLP197G		2.54SOP6 Lead pitch: 2.54 mm SEMKO-approved	3 mA	35 Ω	5 mA	0.12 A	350 V	1500 Vrms	○/○	△	○ ⁽¹⁾	○	○
TLP197GA		2.54SOP6 Lead pitch: 2.54 mm COFF: 70 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	400 V	1500 Vrms	○/–			○	○
TLP199D		2.54SOP6 Lead pitch: 2.54 mm COFF: 15 pF (typ.)	3 mA	50 Ω	5 mA	0.05 A	200 V	1500 Vrms	○/○				
TLP3100		2.54SOP6 Lead pitch : 2.54mm ION: 2.5 A (max) @ Ta: up to 50°C	3 mA	0.05 Ω	5 mA	2.5 A	20 V	1500 Vrms	○/○				
TLP3120		2.54SOP6 Lead pitch : 2.54mm ION: 1.25 A (max)	5 mA	0.15 Ω	5 mA	1.25 A	80 V	1500 Vrms	○/○				
TLP3125			2.54SOP8 Lead pitch: 2.54 mm COFF: 410 pF (typ.)	3 mA	4 Ω	5 mA	0.2 A	400 V	1500 Vrms	○/○			

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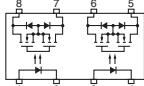
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EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

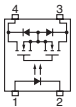
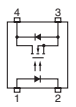
EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

MOSFET-Output Photorelays, 2-Form-A in a 2.54SOP8 Package

Part Number	Pin Configuration	Features	I _{FT} (Max)	R _{ON} (Max)		I _{ON} (Max)	V _{OFF}	BV _s	Safety Standards ⁽²⁾				
				@ I _F					UL/cUL	TÜV	VDE	BSI	IEC
TLP200D		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP176D	3 mA	8 Ω	5 mA	0.2 A	200 V	1500 Vrms	○/–				
TLP202A		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP172A	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/–				
TLP202G		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP172G	3 mA	50 Ω	5 mA	0.11 A	350 V	1500 Vrms	○/–				
TLP206A		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP176A	3 mA	2 Ω	5 mA	0.4 A	60 V	1500 Vrms	○/–				
TLP206G		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP176G	3 mA	35 Ω	5 mA	0.12 A	350 V	1500 Vrms	○/–	△	○ ⁽¹⁾	○	○
TLP206GA		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP176GA	3 mA	35 Ω	5 mA	0.12 A	400 V	1500 Vrms	○/–			○	○
TLP209D		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP179D	3 mA	50 Ω	5 mA	0.05 A	200 V	1500 Vrms	○/–				

MOSFET-Output Photorelays, 1-Form-A in a DIP4 Package

Part Number	Pin Configuration	Features	I _{FT} (Max)	R _{ON} (Max)		I _{ON} (Max)	V _{OFF}	BV _s	Safety Standards ⁽²⁾				
				@ I _F					UL/cUL	TÜV	VDE	BSI	IEC
TLP222A		DIP4 C _{OFF} : 130 pF (typ.)	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/○				
TLP222G		DIP4 C _{OFF} : 30 pF (typ.)	3 mA	50 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○			○	○
TLP224G		DIP4 SEMKO-approved Current-limiting function Limit current: 150 to 300 mA	3 mA	35 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○			◎	◎
TLP224GA		DIP4 For modems Current-limiting function Limit current: 150 to 300 mA	3 mA	35 Ω	5 mA	0.12 A	400 V	2500 Vrms	○/–				△
TLP227A		DIP4 SEMKO-approved C _{OFF} : 130 pF (typ.)	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/○				△
TLP227G		DIP4 SEMKO-approved C _{OFF} : 40 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○	△	○	○	○
TLP227GA		DIP4 SEMKO-approved	3 mA	35 Ω	5 mA	0.12 A	400 V	2500 Vrms	○/–				△
TLP225A		DIP4 Designed for DC output modules	5 mA	1.1 Ω	10 mA	0.5 A	60 V	2500 Vrms	○/○				

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

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Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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4 Selection Guide

MOSFET-Output Photorelays, 1-Form-A in a DIP6 Package

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BV _S	Safety Standards ⁽²⁾				
				@ IF					UL/cUL	TÜV	VDE	BSI	IEC
TLP592A		DIP6 COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/–				
TLP592G		DIP6 COFF: 30 pF (typ.)	3 mA	50 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/–				
TLP597A		DIP6 SEMKO-approved COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/–				△
TLP597G		DIP6 SEMKO-approved COFF: 40 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/–	△	○	○	○
TLP597GA		DIP6 SEMKO-approved COFF: 70 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	400 V	2500 Vrms	○/–				△
TLP598AA		DIP6 COFF: 130 pF (typ.)	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/–				
TLP598GA		DIP6	3 mA	12 Ω	5 mA	0.15 A	400 V	2500 Vrms	○/–				
TLP797GA TLP797GAF		DIP6 COFF: 40 pF (typ.)	3 mA	35 Ω	5 mA	0.12 A	400 V	5000 Vrms	○/–	△	△	△	△
TLP797J TLP797JF		DIP6 COFF: 120 pF (typ.)	3 mA	35 Ω	5 mA	0.1 A	600 V	5000 Vrms	○/○	△	△	△	△
TLP798GA		DIP6	3 mA	12 Ω	5 mA	0.15 A	400 V	5000 Vrms	○/–	△	△	△	△
TLP3542		DIP6 High output current: 2.5 A (max) COFF: 400 pF (typ.)	3 mA	0.1 Ω	10 mA	2.5 A	60 V	2500 Vrms	○/○				

MOSFET-Output Photorelays, 2-Form-A in a DIP8 Package

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BV _S	Safety Standards ⁽²⁾				
				@ IF					UL/cUL	TÜV	VDE	BSI	IEC
TLP222A-2		DIP8 Dual-channel version of the TLP222A	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/○				
TLP222G-2		DIP8 Dual-channel version of the TLP222G SEMKO-approved	3 mA	50 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○			○	○
TLP224G-2		DIP8 Dual-channel version of the TLP224G SEMKO-approved	3 mA	35 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○			○	○
TLP224GA-2		DIP8 Current-limiting function Limit current: 150 to 300 mA	3 mA	35 Ω	5 mA	0.12 A	400 V	2500 Vrms	○/–				
TLP227A-2		DIP8 Dual-channel version of the TLP227A SEMKO-approved	3 mA	2 Ω	5 mA	0.5 A	60 V	2500 Vrms	○/○				△
TLP227G-2		DIP8 Dual-channel version of the TLP227G SEMKO-approved	3 mA	35 Ω	5 mA	0.12 A	350 V	2500 Vrms	○/○	△	○	○	○
TLP227GA-2		DIP8 Dual-channel version of the TLP227GA SEMKO-approved	3 mA	35 Ω	5 mA	0.12 A	400 V	2500 Vrms	○/–				△

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Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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5 Photorelays (1-Form-B, 2-Form-B and 1-Form-A/1-Form-B)

Features		Package								
		Off-State Voltage (max) (V)	On-State Resistance (max) (Ω)	On-State Current (max) (A)	2.54SOP4	2.54SOP6	2.54SOP8	DIP4	DIP6	DIP8
1-Form-B, 1-Form-B, 2-Form-B	350	50	0.09	TLP4172G	TLP4192G	TLP4202G*				
		50	0.10				TLP4222G	TLP4592G	TLP4222G-2*	
		25	0.12	TLP4176G	TLP4197G	TLP4206G*				
		25	0.15				TLP4227G	TLP4597G	TLP4227G-2*	
1-Form-A/ 1-Form-B	350	50	0.09			TLP4027G*				
		50	0.10						TLP4007G*	
		25	0.12			TLP4026G*			TLP4006G*	

* Dual-channel

MOSFET-Output Photorelays, 1-Form-B

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BVs	Safety Standards (2)				
					@ IF				UL/cUL	TÜV	VDE	BSI	IEC
TLP4172G		2.54SOP4 Lead pitch: 2.54 mm 1-Form-B	3 mA	50 Ω	0 mA	0.09 A	350 V	1500 Vrms	○/—				
TLP4192G		2.54SOP6 Lead pitch: 2.54 mm 1-Form-B	3 mA	50 Ω	0 mA	0.09 A	350 V	1500 Vrms	○/—				
TLP4222G		DIP4 1-Form-B	3 mA	50 Ω	0 mA	0.1 A	350 V	2500 Vrms	○/—				
TLP4592G		DIP6 1-Form-B	3 mA	50 Ω	0 mA	0.1 A	350 V	2500 Vrms	○/—				
TLP4176G		2.54SOP4 Lead pitch: 2.54 mm 1-Form-B	3 mA	25 Ω	0 mA	0.12 A	350 V	1500 Vrms	○/—				
TLP4197G		2.54SOP6 Lead pitch: 2.54 mm 1-Form-B	3 mA	25 Ω	0 mA	0.12 A	350 V	1500 Vrms	○/—				
TLP4227G		DIP4 1-Form-B SEMKO-approved	3 mA	25 Ω	0 mA	0.15 A	350 V	2500 Vrms	○/—				△
TLP4597G		DIP6 1-Form-B SEMKO-approved	3 mA	25 Ω	0 mA	0.15 A	350 V	2500 Vrms	○/—				△

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
 EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved
 TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
 EN 60747-5-2-approved with option V4 or D4
 For the latest information, please contact your nearest Toshiba sales representative.

4 Selection Guide

MOSFET-Output Photorelays, 2-Form-B





Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BVs	Safety Standards (2)				
					@ IF				UL/cUL	TÜV	VDE	BSI	IEC
TLP4202G		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP4172G 2-Form-B	3 mA	50 Ω	0 mA	0.09 A	350 V	1500 Vrms	○ / -				
TLP4222G-2		DIP8 Dual-channel version of the TLP4222G 2-Form-B	3 mA	50 Ω	0 mA	0.1 A	350 V	2500 Vrms	○ / -				
TLP4206G		2.54SOP8 Lead pitch: 2.54 mm Dual-channel version of the TLP4176G 2-Form-B	3 mA	25 Ω	0 mA	0.12 A	350 V	1500 Vrms	○ / -				
TLP4227G-2		DIP8 Dual-channel version of the TLP4227G 2-Form-B SEMKO-approved	3 mA	25 Ω	0 mA	0.15 A	350 V	2500 Vrms	○ / -				△

MOSFET-Output Photorelays, 1-Form-A/1-Form-B

Part Number	Pin Configuration	Features	IFT (Max)	RON (Max)		ION (Max)	VOFF	BVs	Safety Standards (2)				
					@ IF				UL/cUL	TÜV	VDE	BSI	IEC
TLP4027G		2.54SOP8 Lead pitch: 2.54 1a1b (N.C. + N.O.)	3 mA	50 Ω	(Form-A) 5 mA (Form-B) 0 mA	0.09 A	350 V	1500 Vrms	○ / -				
TLP4007G		DIP8 1a1b (N.C. + N.O.)	3 mA	50 Ω	(Form-A) 5 mA (Form-B) 0 mA	0.1 A	350 V	2500 Vrms	△ / -				
TLP4026G		2.54SOP8 Lead pitch: 2.54 1a1b (N.C. + N.O.)	3 mA	25 Ω	(Form-A) 5 mA (Form-B) 0 mA	0.12 A	350 V	1500 Vrms	○ / -				
TLP4006G		DIP8 1a1b (N.C. + N.O.)	3 mA	25 Ω	(Form-A) 5 mA (Form-B) 0 mA	0.12 A	350 V	2500 Vrms	△ / -				

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
 EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved
 TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
 EN 60747-5-2-approved with option V4 or D4
 For the latest information, please contact your nearest Toshiba sales representative.

6 Triac-Output Photocouplers







Package									
		MFSOP6		DIP6		DIP4/8/16		SO6	
V _{DRM}	Isolation voltage	NZC	ZC	NZC	ZC	NZC	ZC	NZC	ZC
400 V	2500 Vrms	TLP160G	TLP161G	TLP560G	TLP561G	TLP525G/-2/-4			
	5000 Vrms			TLP3022(S) TLP3023(S)	TLP3042(S) TLP3043(S)				
600 V	2500 Vrms	TLP160J TLP165J	TLP161J TLP163J TLP166J	TLP560J	TLP561J				
		TLP260J	TLP261J						
	3750 Vrms		TLP168J					TLP265J*	TLP266J*
	4000 Vrms			TLP762J	TLP763J				
	5000 Vrms			TLP3052(S)	TLP3762(S) TLP3062(S) TLP3063(S) TLP3064(S)	TLP360J	TLP361J TLP363J		
800 V	5000 Vrms				TLP3082(S) TLP3782(S) TLP3783(S)				

*Under development. Specifications subject to change without notice. For the latest information, please contact your nearest Toshiba sales representative.

NZC: Non-zero cross

ZC: Zero cross

Triac-Output Photocouplers for Solid State Relays (SSRs)

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾				
			Rank		@ I _{TM}				UL/c-UL	TÜV	VDE	BSI	IEC
TLP160G		Mini-flat MFSOP6 Non-zero cross	-	10 mA	2.8 V	70 mA	400 V	2500 Vrms	○/○	△	○ ⁽¹⁾		
			IFT7	7 mA									
			IFT5	5 mA									
TLP161G		Mini-flat MFSOP6 Zero cross	-	10 mA	2.8 V	70 mA	400 V	2500 Vrms	○/○	△	○ ⁽¹⁾		
			IFT7	7 mA									
			IFT5	5 mA									
TLP160J TLP165J		Mini-flat MFSOP6 Non-zero cross	-	10 mA	2.8 V	70 mA	600 V	2500 Vrms	○/○	△	○ ⁽¹⁾		
			IFT7	7 mA									
TLP161J TLP166J		Mini-flat MFSOP6 Zero cross	-	10 mA	2.8 V	70 mA	600 V	2500 Vrms	○/○	△	○ ⁽¹⁾		
			IFT7	7 mA									
TLP168J		Mini-flat MFSOP6 Zero cross Low trigger current	-	3 mA	2.8 V	70 mA	600 V	2500 Vrms	○/○				
TLP163J		Mini-flat MFSOP6 Zero cross High impulse noise immunity V _N =2000 V (typ.)	-	10 mA	2.8 V	100 mA	600 V	2500 Vrms	○/○	△	△		

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010

EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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4 Selection Guide

Triac-Output Photocouplers for Solid State Relays (SSRs) (continued)

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾				
			Rank		@ I _{TM}				UL/c-UL	TÜV	VDE	BSI	IEC
TLP260J		Mini-flat MFSOP6 Non-zero cross	-	10 mA	2.8 V	70 mA	600 V	3000 Vrms	○/—	△	○ ⁽¹⁾		
TLP261J		Mini-flat MFSOP6 Zero cross	-	10 mA	2.8 V	70 mA	600 V	3000 Vrms	○/—	△	○ ⁽¹⁾		
TLP265J*		SO6 (reinforced insulation) Non-zero cross SO6 version of TLP165J	-	10 mA	2.8 V	70 mA	600 V	3750 Vrms	○/○	△	○ ⁽¹⁾		
TLP266J*		SO6 (reinforced insulation) Zero cross SO6 version of TLP166J	-	10 mA	2.8 V	70 mA	600 V	3750 Vrms	○/○	△	○ ⁽¹⁾		

Triac-Output Photocouplers for Office Equipment

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾				
			Rank		@ I _{TM}				UL/c-UL	TÜV	VDE	BSI	IEC
TLP360J TLP360JF		DIP4 Non-zero cross	-	10 mA	2.8 V	70 mA	600 V	5000 Vrms	○/○	○	○		
				IFT7									
TLP361J TLP361JF		DIP4 Zero cross	-	10 mA	2.8 V	70 mA	600 V	5000 Vrms	○/○	○	○		
				IFT7									
TLP363J TLP363JF		DIP4 Zero cross High impulse noise immunity V _N = 2000 V (typ.)	-	10 mA	2.8 V	70 mA	600 V	5000 Vrms	○/○	○	○		

Triac-Output Photocouplers for AC 100 to 120 V Lines

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾					
			Rank		@ I _{TM}				UL/c-UL	TÜV	VDE	BSI	IEC	
TLP525G		DIP4	-	10 mA	3 V	100 mA	400 V	2500 Vrms	○/○					
TLP525G-2		DIP8 Dual-channel version of the TLP525G	-	10 mA	3 V	100 mA	400 V	2500 Vrms	○/○					
TLP525G-4		DIP16 4-channel version of the TLP525G	-	10 mA	3 V	100 mA	400 V	2500 Vrms	○/○					
TLP560G		DIP6 General-purpose Non-zero cross	-	10 mA	3 V	100 mA	400 V	2500 Vrms	○/—	△	○			
				IFT7										7 mA
				IFT5										5 mA

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TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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Triac-Output Photocouplers for AC 100 to 120 V Lines (continued)

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _S	Safety Standards ⁽²⁾				
			Rank			@ I _{TM}			UL/c-UL	TÜV	VDE	BSI	IEC
TLP561G		DIP6 General-purpose Zero cross	-	10 mA	3 V	100 mA	400 V	2500 V _{rms}	○/-	△	○		
			IFT7	7 mA									
			IFT5	5 mA									
TLP3022(S) TLP3022F(S)		DIP6 Direct replacement for XXX3020/3021/3022 SEMKO-approved Non-zero cross	-	10 mA	3 V	100 mA	400 V	5000 V _{rms}	○/○	△	○	⊙	⊙
TLP3023(S) TLP3023F(S)		DIP6 Direct replacement for XXX3023 SEMKO-approved Non-zero cross	-	5 mA	3 V	100 mA	400 V	5000 V _{rms}	○/○	△	○	⊙	⊙
TLP3042(S) TLP3042F(S)		DIP6 Direct replacement for XXX3040/3041/3042 SEMKO-approved Zero cross	-	10 mA	3 V	100 mA	400 V	5000 V _{rms}	○/○	△	○	⊙	⊙
TLP3043(S) TLP3043F(S)		DIP6 Direct replacement for XXX3043 SEMKO-approved Zero cross	-	5 mA	3 V	100 mA	400 V	5000 V _{rms}	○/○	△	○	⊙	⊙

Triac-Output Photocouplers for AC 200 to 240 V Line

Part Number	Pin Configuration	Features	I _{FT} (Max)		V _{TM} (Max)		V _{DRM}	BV _S	Safety Standards ⁽²⁾				
			Rank			@ I _{TM}			UL/c-UL	TÜV	VDE	BSI	IEC
TLP560J		DIP6 General-purpose Non-zero cross	-	10 mA	3 V	100 mA	600 V	2500 V _{rms}	○/-	△	○		
			IFT7	7 mA									
TLP561J		DIP6 General-purpose Zero cross	-	10 mA	3 V	100 mA	600 V	2500 V _{rms}	○/-	△	○		
			IFT7	7 mA									
TLP762J TLP762JF		DIP6 Internal creepage: 4 mm (min) SEMKO-approved Non-zero cross-on	-	10 mA	3 V	100 mA	600 V	4000 V _{rms}	○/-	△	○	⊙	⊙
TLP763J TLP763JF		DIP6 Internal creepage: 4 mm (min) SEMKO-approved Zero cross	-	10 mA	3 V	100 mA	600 V	4000 V _{rms}	○/-	△	○	⊙	⊙
TLP3052(S) TLP3052F(S)		DIP6 High V _{DRM} SEMKO-approved Non-zero cross-on	-	10 mA	3 V	100 mA	600 V	5000 V _{rms}	○/○	△	○	⊙	⊙

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TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
EN 60747-5-2-approved with option V4 or D4
For the latest information, please contact your nearest Toshiba sales representative.

4 Selection Guide

Triac-Output Photocouplers for AC 200 to 240 V Line (continued)

Part Number	Pin Configuration	Features	IFT (Max)		V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾				
			Rank		@ I _{TM}				UL/c-UL	TÜV	VDE	BSI	IEC
TLP3062(S) TLP3062F(S)		DIP6 SEMKO-approved High V _{DRM} Zero cross	-	10 mA	3 V	100 mA	600 V	5000 V _{rms}	○/○	△	○	○	○
TLP3063(S) TLP3063F(S)		DIP6 SEMKO-approved High V _{DRM} Zero cross	-	5 mA	3 V	100 mA	600 V	5000 V _{rms}	○/○	△	○	○	○
TLP3064(S) TLP3064F(S)		DIP6 SEMKO-approved Low trigger current Zero cross	-	3 mA	3 V	100 mA	600 V	5000 V _{rms}	○/○	△	○	○	○
TLP3762(S) TLP3762F(S)		DIP6 Zero cross High impulse noise immunity V _N = 2000 V (typ.)	-	10 mA	3 V	100 mA	600 V	5000 V _{rms}	○/○	△	○		
TLP3082(S) TLP3082F(S)		DIP6 Zero cross	-	10 mA	3 V	100 mA	800 V	5000 V _{rms}	○/○	△	○		
TLP3782(S) TLP3782F(S)		DIP6 High impulse noise immunity V _N = 1500 V (typ.) Zero cross	-	10 mA	3 V	100 mA	800 V	5000 V _{rms}	○/○	△	○		
TLP3783(S) TLP3783F(S)			-	5 mA	3 V	100 mA	800 V	5000 V _{rms}	○/○	△	○		

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7 Thyristor-Output Photocouplers

Package				
Features				
V _{DRM}	Isolation voltage	MFSOP6	DIP6	DIP8
400 V	2500 V _{rms}	TLP148G		
600 V	2500 V _{rms}		TLP548J	TLP549J
	4000 V _{rms}		TLP748J	

Replacement Devices




New Device	Discontinued Devices		
TLP148G	TLP141G		
TLP548J	TLP541J	TLP545J	
TLP549J	TLP542G	TLP543J	
TLP748J	TLP641G/J	TLP741G/J	TLP747G/J

The new and discontinued devices are not exactly identical in terms of electrical characteristics. For device replacement, hardware evaluation must be performed in the real-world environment.

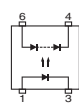
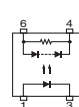
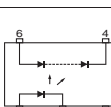
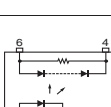
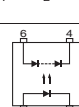
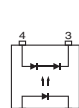
Part Number	Pin Configuration	Features	IFT (Max)	V _{TM} (Max)		V _{DRM}	BV _s	Safety Standards ⁽²⁾				
					@ I _{TM}			UL/cUL	TÜV	VDE	BSI	IEC
TLP148G		Mini-flat MFSOP6	10 mA	1.45 V	100 mA	400 V	2500 V _{rms}	○/—				
TLP548J		DIP6 Low trigger current	7 mA	1.45 V	100 mA	600 V	2500 V _{rms}	○/—				
TLP549J		DIP8 Long anode-cathode distance (SCR)	7 mA	1.45 V	100 mA	600 V	2500 V _{rms}	○/—				
TLP748J TLP748JF		DIP6 SEMKO-approved	10 mA	1.45 V	100 mA	600 V	4000 V _{rms}	○/—		○	○	△

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 TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010
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 For the latest information, please contact your nearest Toshiba sales representative.

8 Photovoltaic-Output photocouplers

Package				
Features				
Short-Circuit Current	Open Voltage	SSOP4	MFSOP6	DIP6
			1500 Vrms	2500 Vrms
5 μ A	7 V	TLP3904	TLP3902	
12 μ A	7 V		TLP190B	TLP590B
20 μ A	7 V	TLP3914		
24 μ A	7 V		TLP191B*	TLP591B*
4 μ A	30 V	TLP3924		

*Built-in shunt resistor

Part Number	Pin Configuration	Features	Short-Circuit Current (Min)			Open-Circuit Voltage (Min)		BVs	Safety Standards ⁽²⁾					
			Rank		@If		@If		UL/cUL	TÜV	VDE	BSI	IEC	
TLP190B		Mini-flat MFSOP6	—	12 μ A	10 mA	7 V	10 mA	2500 Vrms	○/○					
TLP191B		Mini-flat MFSOP6 Built-in shunt resistor	—	24 μ A	20 mA	7 V	20 mA	2500 Vrms	○/○					
TLP590B		DIP6	—	12 μ A	10 mA	7 V	10 mA	2500 Vrms	○/—					
			C20	20 μ A										
TLP591B		DIP6 Built-in shunt resistor	—	24 μ A	20 mA	7 V	20 mA	2500 Vrms	○/—					
			C40	40 μ A										
TLP3902		Mini-flat MFSOP6	—	5 μ A	10 mA	7 V	10 mA	2500 Vrms	△/—					
TLP3904		SSOP4	—	5 μ A	10 mA	7 V	10 mA	1500 Vrms	○/—					
TLP3914		SSOP4	—	20 μ A	10 mA	7 V	10 mA	1500 Vrms	○/—					
TLP3924		SSOP4 High open-circuit voltage	—	4 μ A	10 mA	30 V	10 mA	1500 Vrms	○/—					

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EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

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4 Selection Guide

9 Products Manufactured by Toshiba Semiconductor (Thailand) Co., Ltd. (TST)

Part Number	Pin Configuration	Features	V _{CEO}	BV _s @ 1 Minute	Safety Standards ⁽²⁾					
					UL	c-UL	TÜV	VDE	BSI	IEC
TLP180 (T)		Mini-flat MFSOP6 AC input SEMKO-approved	80 V	3750 Vrms	○	○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
TLP181 (T)		Mini-flat MFSOP6 Transistor output General-purpose	80 V	3750 Vrms	○	○	△	○ ⁽¹⁾	◎	◎
TLP280 (T)		SOP4 Lead pitch = 1.27 mm AC input	80 V	2500 Vrms	○	○	○ ⁽¹⁾	○ ⁽¹⁾	△	△
TLP281 (T)		SOP4 Lead pitch = 1.27 mm General-purpose SEMKO-approved	80 V	2500 Vrms	○	○	△	○ ⁽¹⁾	◎	◎
TLP284 (T)		SOP4 (reinforced insulation) Lead pitch = 1.27 mm Creepage/clearance ≥ 5 mm Isolation thickness ≥ 0.4 mm AC input	80 V	3750 Vrms	○	○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
TLP285 (T)		SOP4 (reinforced insulation) Lead pitch = 1.27 mm Creepage/clearance ≥ 5 mm Isolation thickness ≥ 0.4 mm SEMKO-approved	80 V	3750 Vrms	○	○	○ ⁽¹⁾	○ ⁽¹⁾	◎	◎
TLP521-1 (T)		DIP4 Transistor output General-purpose	55 V	2500 Vrms	○	—				
TLP521-2 (T)		DIP8 Dual-channel version of the TLP521-1(T)	55 V	2500 Vrms	○	—				
TLP620 (T)		DIP4 Transistor output AC input SEMKO-approved	55 V	5000 Vrms	○	—	△	○	◎	◎
TLP620-2 (T)		DIP8 Dual-channel version of the TLP620(T) SEMKO-approved	55 V	5000 Vrms	○	—	△	○	◎	◎
TLP621 (T)		DIP4 Transistor output High isolation voltage SEMKO-approved	55 V	5000 Vrms	○	—	△	○	◎	◎
TLP621-2 (T)		DIP8 Dual-channel version of the TLP621(T) SEMKO-approved	55 V	5000 Vrms	○	—	△	○	◎	◎
TLP627 (T)		DIP4 Darlington transistor output High V _{CEO} SEMKO-approved	300 V	5000 Vrms	○	—	△	○	◎	◎
TLP627-2 (T)		DIP8 Dual-channel version of the TLP627(T) SEMKO-approved	300 V	5000 Vrms	○	—	△	○	◎	◎

Note 1: The EN60747-5-2 safety standard for compact packages is different from that for standard DIP packages.

Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

Note 2: BSI and IEC: ○: Approved (supplementary or basic insulation) ◎: Approved (reinforced insulation) △: Design which meets safety standard/approval pending as of January 2010
EN 60065- and IEC 60065-approved, EN 60950- and IEC 60950-approved

TÜV and VDE: ○: Approved △: Design which meets safety standard/approval pending as of January 2010

EN 60747-5-2-approved with option V4 or D4

For the latest information, please contact your nearest Toshiba sales representative.

Some of the photocouplers with triac output are also manufactured by Toshiba Semiconductor Thailand Co., Ltd. For detailed information, please contact your nearest Toshiba sales representative.

5 Part Naming Conventions

1. Transistor-Output, Darlington-Transistor-Output and IC-Output Photocouplers

TLP □□□□ **F** (□□ - □□□ - □□□, □, **F**)

Part number

Wide-spaced leads
Specify this option, if necessary.

Safety standard option
Specify either "D4" or "V4" for EN60747-5-2-approved devices.

CTR rank
See respective datasheets.

RoHS COMPATIBLE*

Revision code
The revision code may be added to identify a revision of a device. For details, contact your nearest Toshiba sales representative.

Lead form option for DIP packages
Select one of the lead form options shown on page 40.

Carrier tape option
Select one of the carrier tape options shown on pages 51.

Example 1: TLP781(D4-GB-TP6,F)
 [D4] = EN60747-5-2 option
 [GB] = CTR rank
 [TP6] = LF6 lead form
 Tape-and-reel packing
 [,F] = RoHS COMPATIBLE*

Example 2: TLP781F(GR,F)
 [F] = Wide-spaced leads
 [GR] = CTR rank
 [,F] = RoHS COMPATIBLE*

The right parenthesis is omitted due to the limit to the number of characters.

2. Triac-Output and Thyristor-Output Photocouplers

TLP □□□□ □ **F** (□□ - □□□ - □□□, □, **F**)

Part number

V_{DRM}
 G: 400 V
 J: 600 V
 L: 800 V

Wide-spaced leads

Safety standard option

I_{FT} rank
 No character: No I_{FT} rank specified
 IFTx: For example, IFT5 denotes the 5-mA rank.
 The available I_{FT} ranks differ from product to product.
 See datasheets.

RoHS COMPATIBLE*

Revision code

Lead form option for DIP packages
Carrier tape option

Example 3: TLP361J(D4-IFT7-TP1,S,F)
TLP361J(D4T7TP1S,F)
 (Abbreviated due to the limit to the number of characters.)
 [J] = V_{DRM}: 600 V
 [D4] = EN60747-5-2 option

[IFT7] = [T7] = I_{FT} = 7 mA
 [TP1] = LF1 lead form
 Tape-and-reel packing
 [,S] = [S] = Revision code: S
 [,F] = RoHS COMPATIBLE*

3. Photorelays

TLP □□□□ □ **F** (□□ - □□□, □, **F**)

Part number

V_{OFF}
 A: 60 V
 D: 200 V
 G: 350 V
 GA: 400 V
 J: 600 V
 Some photorelays do not have a V_{OFF} code in their names.
 See respective datasheets.

Wide-spaced leads

Safety standard option

RoHS COMPATIBLE*

Revision code

Lead form option for DIP packages
Carrier tape option

Example 4: TLP227A(TP1,F)
 [A] = V_{OFF}: 60 V
 [TP1] = LF1 lead form
 Tape-and-reel packing
 [,F] = RoHS COMPATIBLE*

Example 5: TLP3110(TP,F)
 [TP] = Tape-and-reel packing
 [,F] = RoHS COMPATIBLE*

*: "F" identifies the indication of product Labels with "[[G]]/RoHS COMPATIBLE".



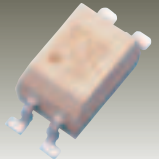
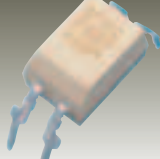
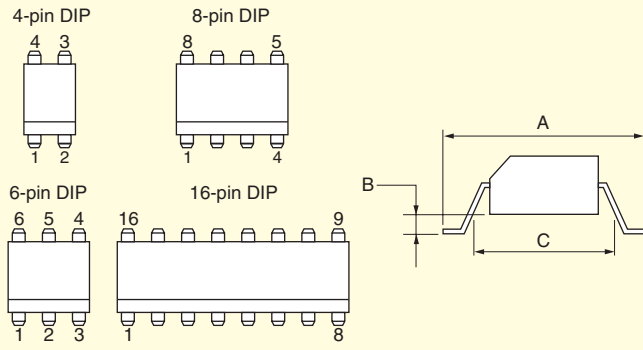
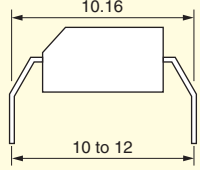
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Note: The length of part names is limited to 18 characters. Longer names are abbreviated by omitting the "-" character and/or using shorthand symbols. However, be sure to give full part names when you have any inquiries. For details, please contact your nearest Toshiba sales representative.

6 Package Information

1 Lead Form Options for DIP Packages

The **DIP4**, **DIP6**, **DIP8** and **DIP16** packages offer three surface-mount lead form options and a wide-spaced lead form option. The electrical characteristics are identical, regardless of these options.

Lead Form	Surface-Mount			Wide-Spaced																																		
Appearance																																						
Lead Form Code	(LF1)	(LF4)	(LF5)	(LF2)																																		
Carrier Tape Code	(TP1)	(TP4)	(TP5)	Not available*																																		
Package Outlines	 <p>Dimensions Unit: mm</p> <table border="1"> <thead> <tr> <th rowspan="2">Dimension</th> <th colspan="2">Version (LF1)</th> <th colspan="2">Version (LF4)</th> <th colspan="2">Version (LF5)</th> </tr> <tr> <th>Min</th> <th>Max</th> <th>Min</th> <th>Max</th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>-</td> <td>10.0</td> <td>-</td> <td>12.0</td> <td>-</td> <td>10.0</td> </tr> <tr> <td>B</td> <td colspan="2">(0.35 typ.)</td> <td colspan="2">(0.25 typ.)</td> <td>-</td> <td>0.2</td> </tr> <tr> <td>C</td> <td>6.4</td> <td>-</td> <td>8.0</td> <td>-</td> <td>6.4</td> <td>-</td> </tr> </tbody> </table> <p>All other package dimensions are the same as for each standard package specification.</p>			Dimension	Version (LF1)		Version (LF4)		Version (LF5)		Min	Max	Min	Max	Min	Max	A	-	10.0	-	12.0	-	10.0	B	(0.35 typ.)		(0.25 typ.)		-	0.2	C	6.4	-	8.0	-	6.4	-	
Dimension	Version (LF1)		Version (LF4)		Version (LF5)																																	
	Min	Max	Min	Max	Min	Max																																
A	-	10.0	-	12.0	-	10.0																																
B	(0.35 typ.)		(0.25 typ.)		-	0.2																																
C	6.4	-	8.0	-	6.4	-																																

* Tape-and-reel packing is not available with (LF2).

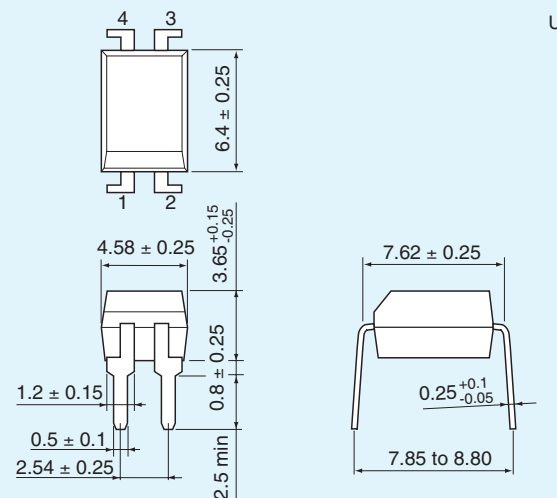
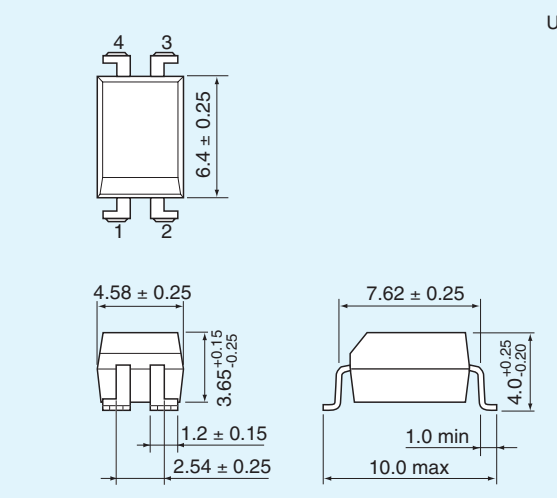
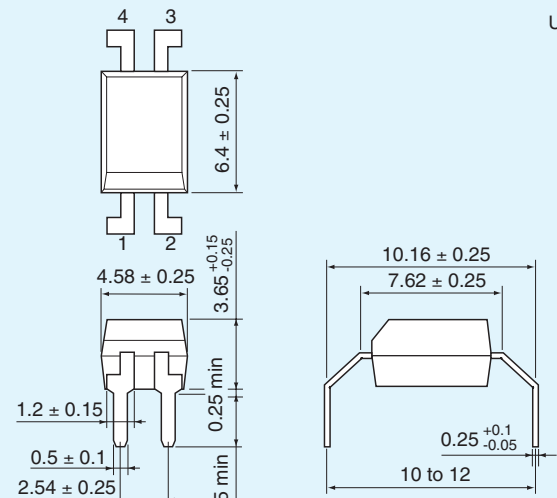
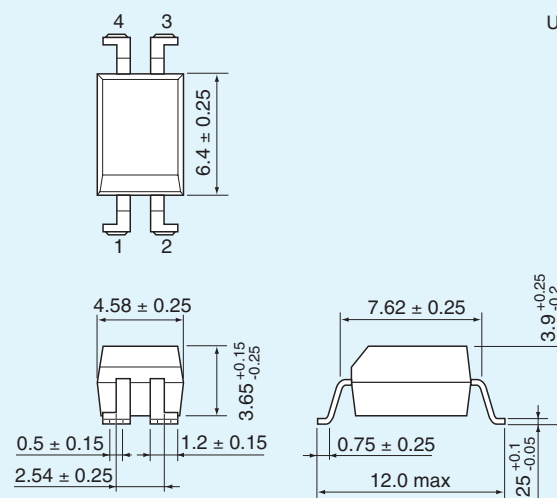
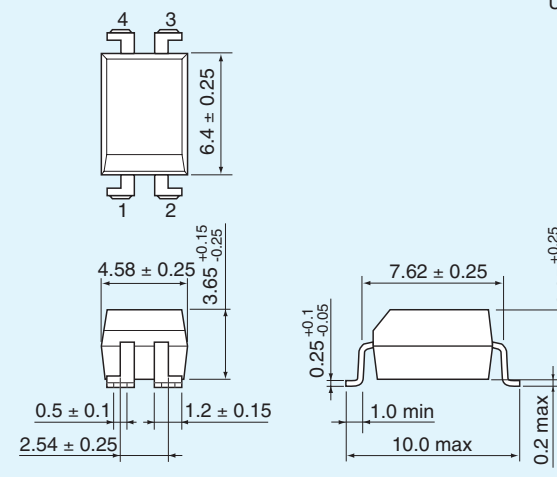
Example 1: Standard part: TLP621(F)

Surface-mount option: TLP621(LF1,F): Packed in stick magazines (see page 49).

Surface-mount and tape-and-reel options: TLP621(TP1,F): Packed in tape-and-reel (see page 51).

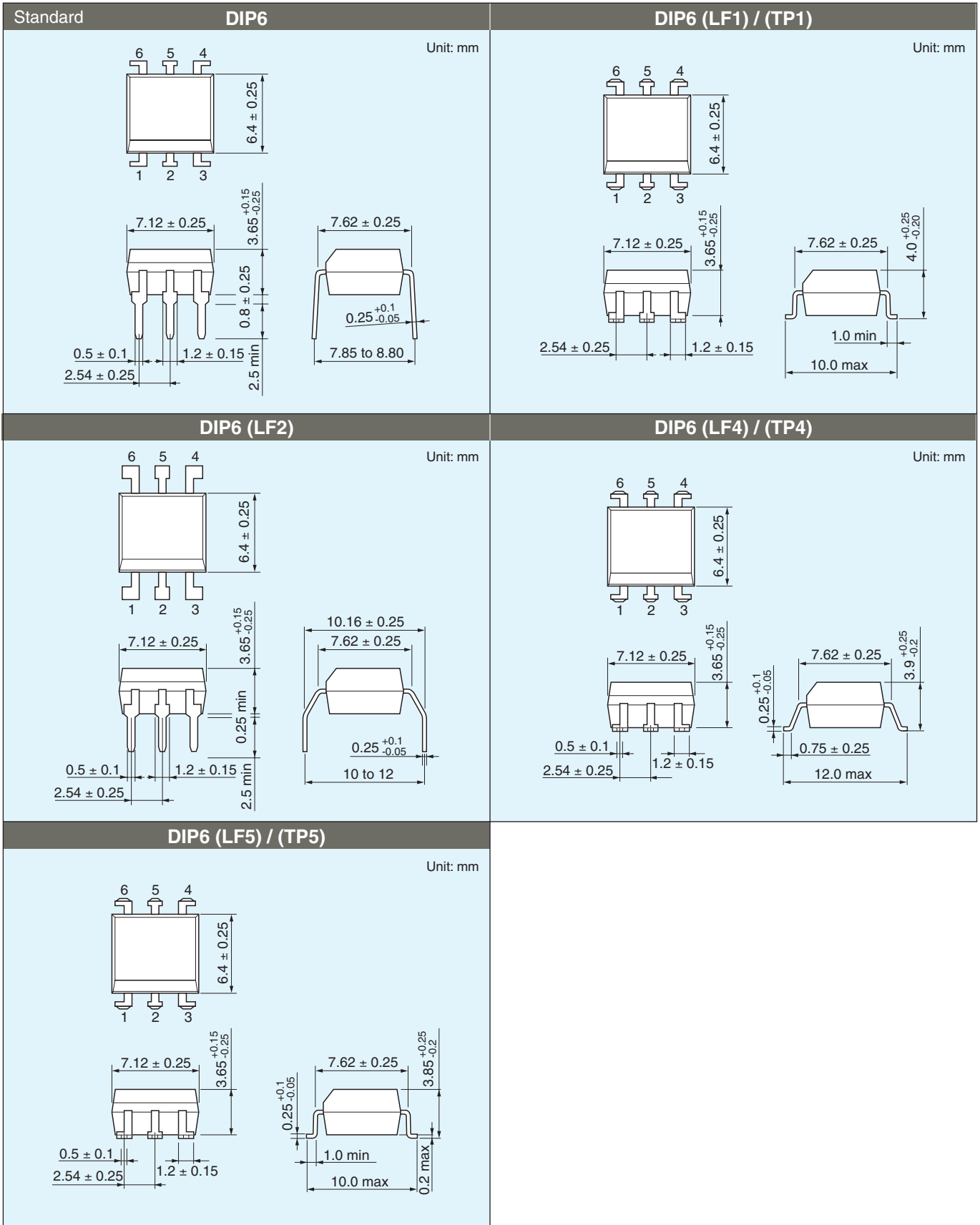
- Standard part names should be used when applying for safety standard approval.
- The package dimensions and lead form options of the TLP781 differ from those shown above. See the TLP781 datasheet.

2 Package Dimensions (4-Pin DIP)

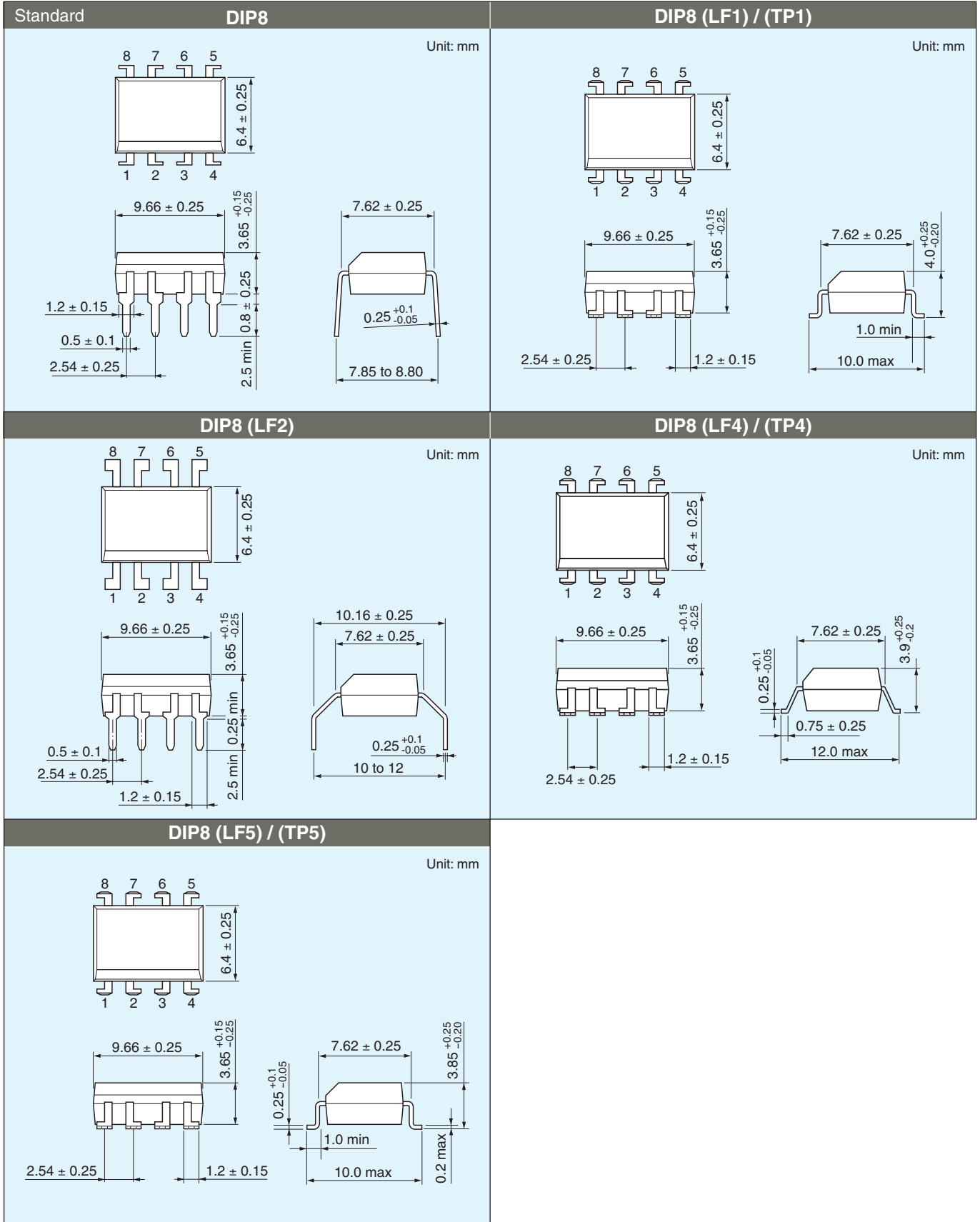
Standard	DIP4	DIP4 (LF1) / (TP1)	DIP4 (LF2) / (TP2)
<p>Unit: mm</p> 	<p>Unit: mm</p> 	<p>Unit: mm</p> 	<p>Unit: mm</p> 
<p>Unit: mm</p> 			

6 Package Information

2 Package Dimensions (6-Pin DIP)

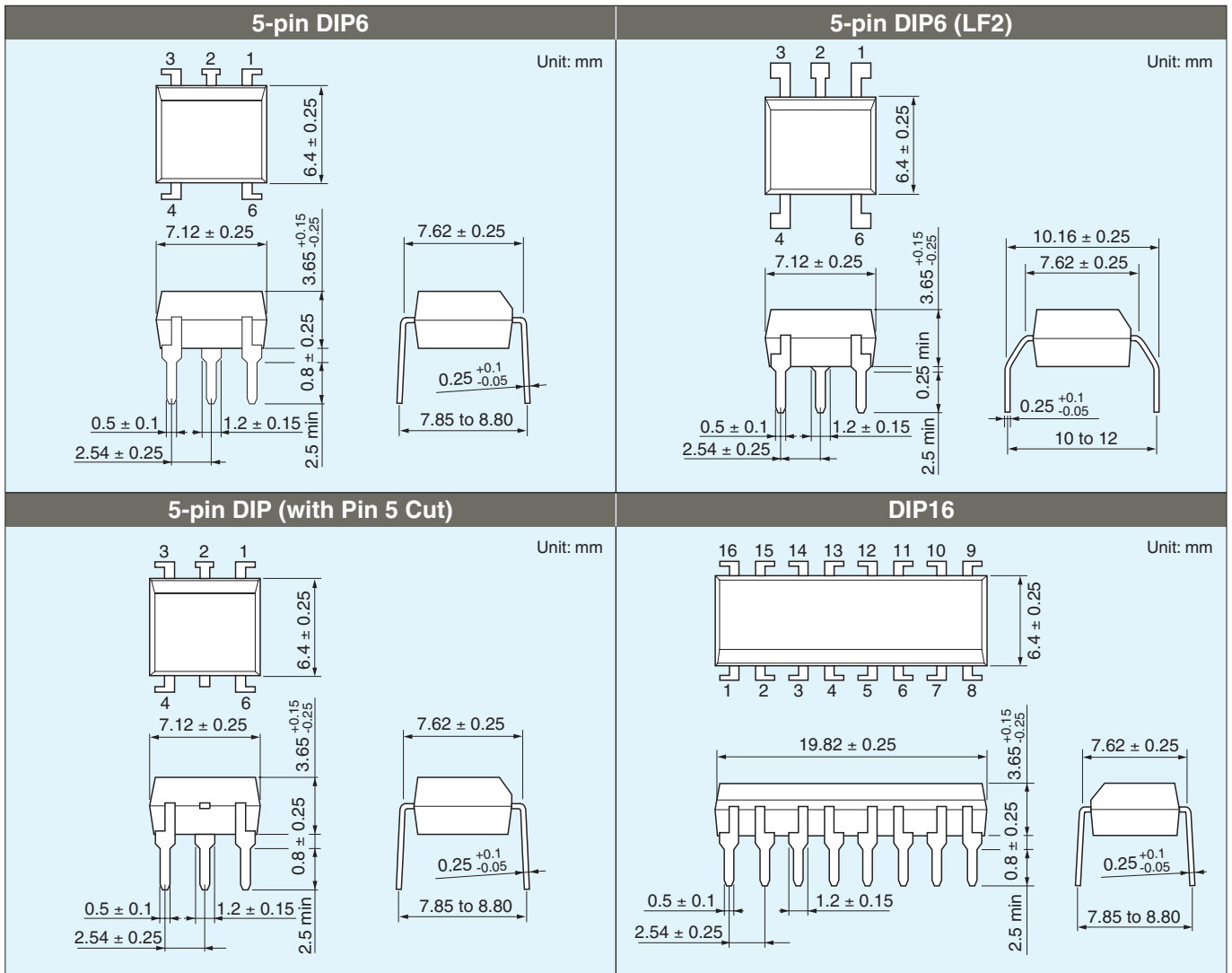


2 Package Dimensions (8-Pin DIP)

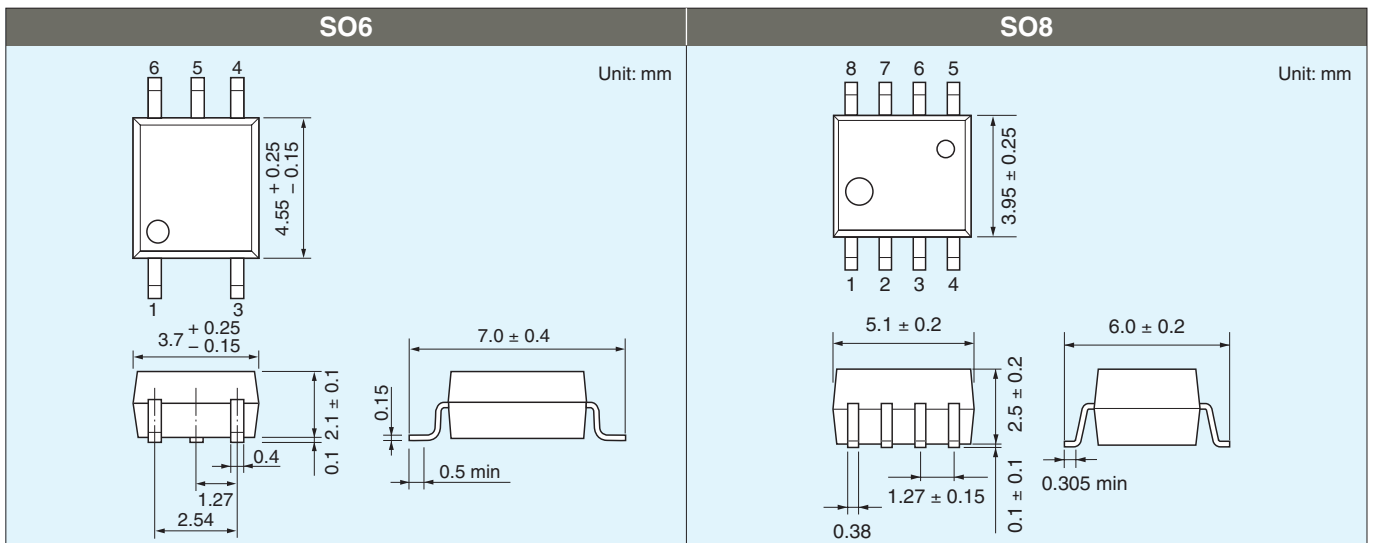


6 Package Information

2 Package Dimensions (Other DIP Packages)

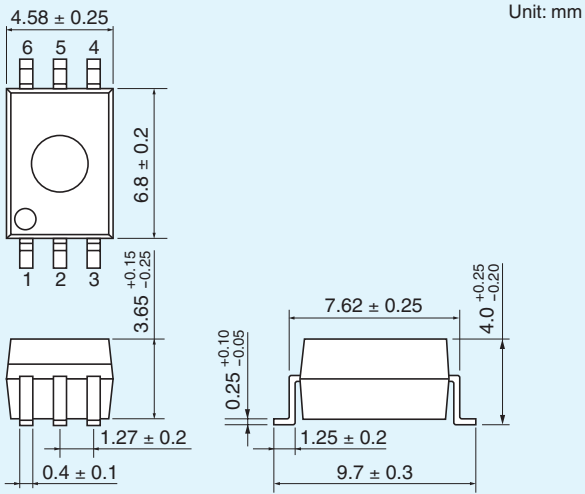


2 Package Dimensions (Surface Mount)

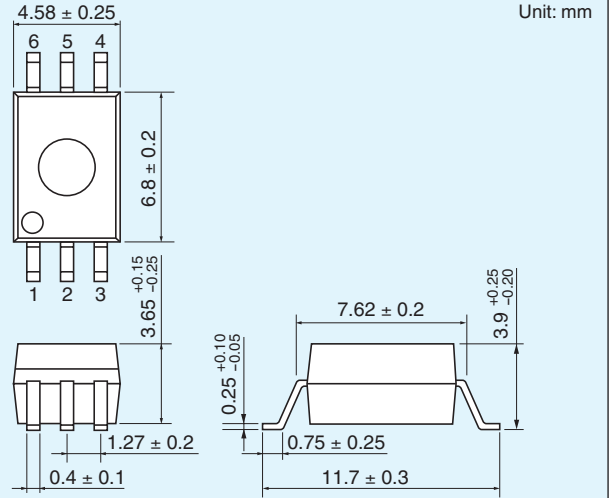


2 Package Dimensions (Surface Mount) (continued)

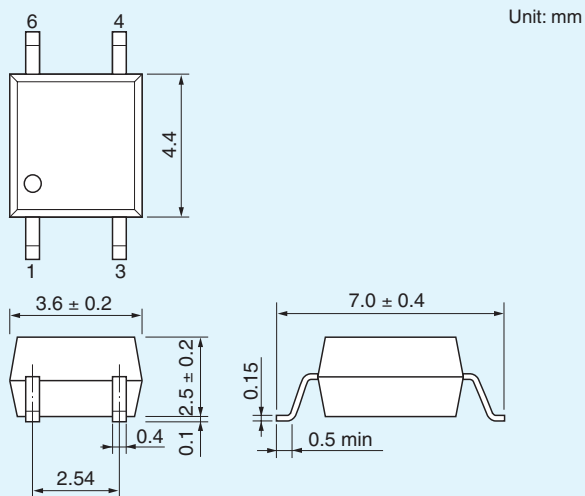
SDIP6



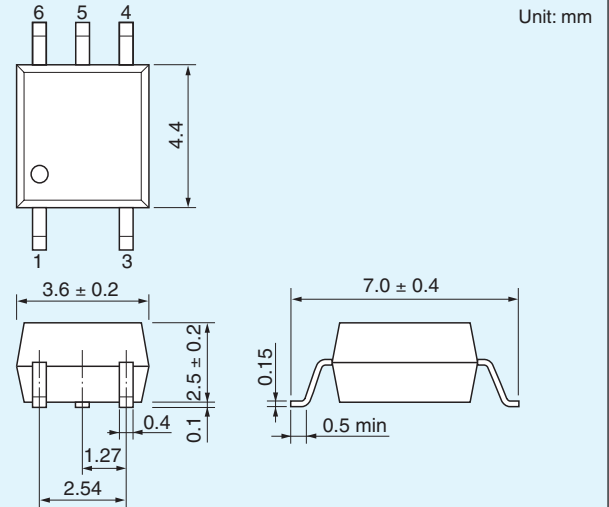
SDIP6 (F type)



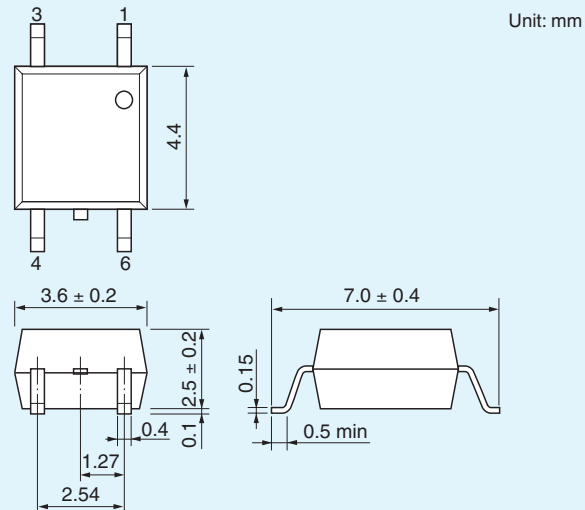
4-pin MFSOP6



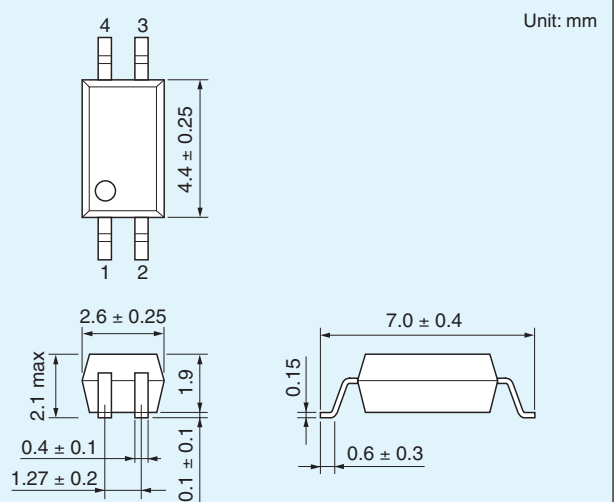
5-pin MFSOP6



4-pin MFSOP6 (with Pin 5 Cut)

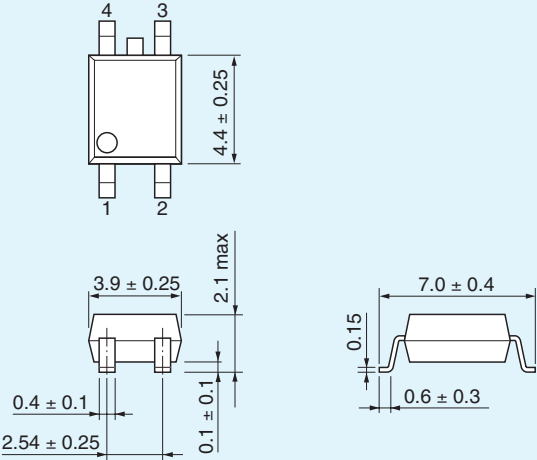
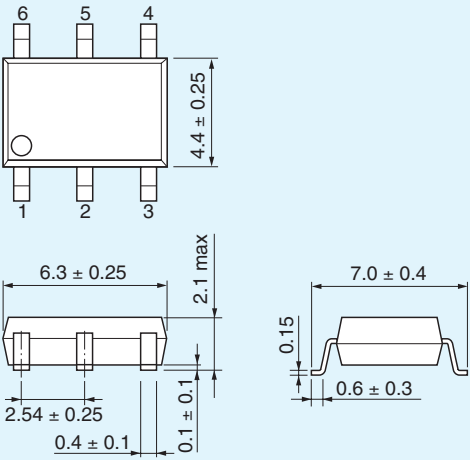
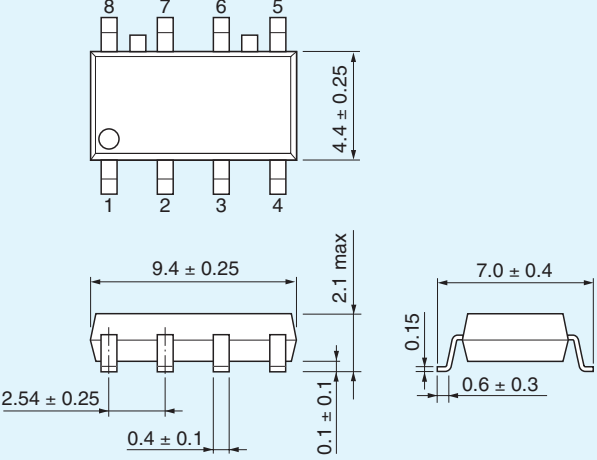
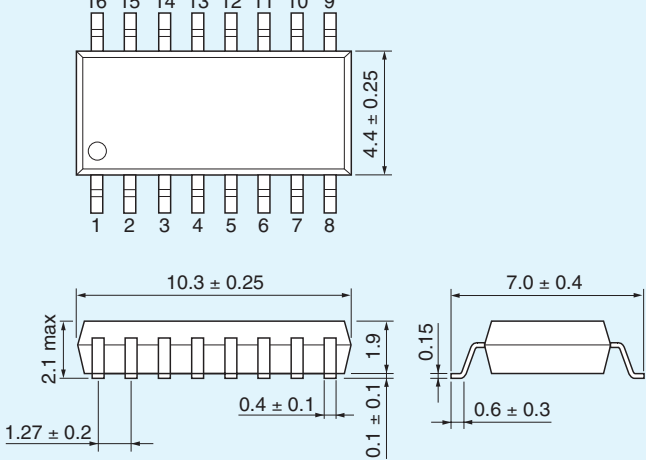
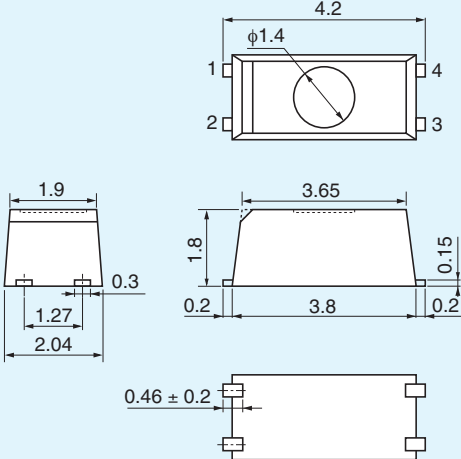
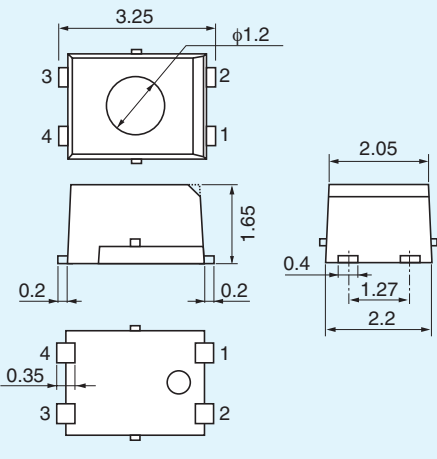


SOP4



6 Package Information

2 Package Dimensions (Surface Mount) (continued)

2.54SOP4	2.54SOP6
<p>Unit: mm</p>  <p>Top view: Pin 1, 2, 3, 4; width 4.4 ± 0.25 mm.</p> <p>Side view: Pin height 2.1 max mm; body width 3.9 ± 0.25 mm; body length 2.54 ± 0.25 mm; pin width 0.4 ± 0.1 mm; pin offset 0.1 ± 0.1 mm.</p> <p>Bottom view: Body width 7.0 ± 0.4 mm; body length 0.6 ± 0.3 mm; lead height 0.15 mm.</p>	<p>Unit: mm</p>  <p>Top view: Pin 1, 2, 3, 4, 5, 6; width 4.4 ± 0.25 mm.</p> <p>Side view: Pin height 2.1 max mm; body width 6.3 ± 0.25 mm; body length 2.54 ± 0.25 mm; pin width 0.4 ± 0.1 mm; pin offset 0.1 ± 0.1 mm.</p> <p>Bottom view: Body width 7.0 ± 0.4 mm; body length 0.6 ± 0.3 mm; lead height 0.15 mm.</p>
2.54SOP8	SOP16
<p>Unit: mm</p>  <p>Top view: Pin 1, 2, 3, 4, 5, 6, 7, 8; width 4.4 ± 0.25 mm.</p> <p>Side view: Pin height 2.1 max mm; body width 9.4 ± 0.25 mm; body length 2.54 ± 0.25 mm; pin width 0.4 ± 0.1 mm; pin offset 0.1 ± 0.1 mm.</p> <p>Bottom view: Body width 7.0 ± 0.4 mm; body length 0.6 ± 0.3 mm; lead height 0.15 mm.</p>	<p>Unit: mm</p>  <p>Top view: Pin 1-16; width 4.4 ± 0.25 mm.</p> <p>Side view: Pin height 2.1 max mm; body width 10.3 ± 0.25 mm; body length 1.27 ± 0.2 mm; pin width 0.4 ± 0.1 mm; pin offset 0.1 ± 0.1 mm.</p> <p>Bottom view: Body width 7.0 ± 0.4 mm; body length 0.6 ± 0.3 mm; lead height 0.15 mm.</p>
SSOP4	USOP4
<p>Unit: mm</p>  <p>Top view: Pin 1, 2, 3, 4; width 4.2 mm; diameter φ1.4 mm.</p> <p>Side view: Pin height 1.9 mm; body width 3.65 mm; body length 3.8 mm; pin width 0.3 mm; pin offset 0.2 mm; lead height 0.15 mm.</p> <p>Bottom view: Body width 0.46 ± 0.2 mm.</p>	<p>Unit: mm</p>  <p>Top view: Pin 1, 2, 3, 4; width 3.25 mm; diameter φ1.2 mm.</p> <p>Side view: Pin height 2.05 mm; body width 1.65 mm; body length 2.2 mm; pin width 0.4 mm; pin offset 0.2 mm; lead height 0.2 mm.</p> <p>Bottom view: Body width 0.35 mm.</p>
<p>Unless Otherwise Specified, Tolerance ±0.2 mm</p>	

3 Rank Marking

Transistor-output photocouplers are ranked according to their CTR ranges, whereas thyristor-output and triac-output photocouplers are ranked according to their maximum I_{FT} value. The following gives the rank classifications and rank marks printed on packages. Note that the rank classifications differ from product to product. For details, please refer to the relevant technical datasheets.

1. CTR Rank Name and Rank Marking

Available CTR Rank Selection (○: Available, △: Contact Toshiba)

Part Number	Rank Name									Rank Marking Group
	None	GB	Y	GR	BL	YH	GRL	GRH	BLL	
TLP180	○	○	△	○	△					①
TLP181	○	○	○	○	○	△	△	△	△	②
TLP280	○	○	△	○	△					①
TLP280-4	○	○								③
TLP281	○	○	○	○	○	△	△	△	△	①
TLP281-4	○	○								③
TLP521-1	○	○	○	○	○	△	△	△	△	②
TLP521-2	○	○	△	○	△					①
TLP521-4	○	○								③
TLP531/532	○	○	△	○	△					①
TLP620	○	○	△	○	△					①
TLP620-2	○	○								③
TLP620-4	○	○								③
TLP621	○	○	○	○	○	△	△	△	△	②
TLP621-2	○	○	△	○	△					①
TLP621-4	○	○								③
TLP630	○	○	△	○	△					①
TLP631/632	○	○	△	○	△					②
TLP731/732	○	○	△	○	△					②
TLP733F/734F	○	○	△	○	△					②

Rank Name	CTR	CTR Rank	
		Other than TLP421	TLP421
None	50 to 600%	*See the right-side tables	Blank, Y, Y+, YE, G, G+, GR, B, B+, BL, GB
Y	50 to 150%	YE	YE
GR	100 to 300%	GR	GR
GB	100 to 600%	GB	GB
BL	200 to 600%	BL	BL
GRL	100 to 200%	G	G
GRH	150 to 300%	G■	G+

* Part Marking when No CTR Rank Is Specified

Part Number	None	Rank Marking Group	Part Number	None	Rank Marking Group
TLP180	Blank, YE, GR, BL, GB	①	TLP280-4	Blank, GB	③
TLP280					
TLP521-2					
TLP531/532					
TLP620					
TLP621-2					
TLP630	Blank, Y, Y■, YE, G, G■, GR, B, B■, BL, GB	②			
TLP181					
TLP281					
TLP521-1					
TLP531					
TLP621					
TLP631					
TLP632					
TLP731					
TLP732					
TLP733F					
TLP734F					


6 Package Information

2. LED Trigger Current (IFT) Ranking and Marking

Rank Name	IFT	IFT Rank Marking
None	IFT max	Blank, T7, T5
IFT7	7 mA max	T7, T5
IFT5	5 mA max	T5
IFT2	2 mA max	T2 (only for photorelays)

3. Marking Examples


(a) 4-pin mini-flat 1-channel type

(Example: **TLP626: P626**
TLP521-1: P521
TLP181: P181  **TLP521-1**)

(b) TLP421, TLP421F

(c) TLP280, TLP281

(d) Others

(Examples: **TLP521-2: TLP521-2**
TLP666GF: TLP666GF  **TLP521-2**)

Note: When ordering a standard photocoupler, add a CTR or IFT rank in parentheses to the standard part number.

Examples: **TLP521-1(GB)** **TLP532(GR)**

Use the standard part number when applying for safety standard approval.

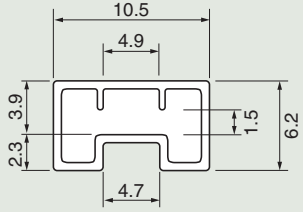
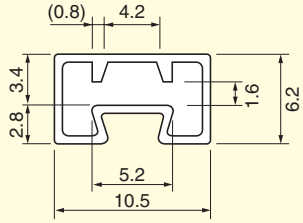
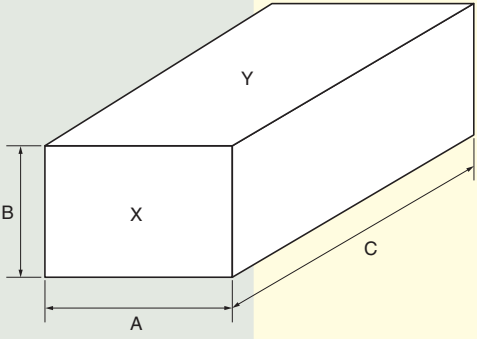
Example $\frac{\text{Part number}}{\text{TLP621(GR)}} \rightarrow \frac{\text{Use this part number}}{\text{TLP621}}$

7 Packing Information

1 Photocoupler Magazine Packing Specifications

	Standard DIP	DIPs with LF1, LF2, LF4 and LF5 Lead Forming																					
Magazine Dimensions	<p>Unit: mm</p> <p>Length = 525 Thickness = 0.5</p>	<p>Unit: mm</p> <p>Length = 525 Thickness = 0.5</p>																					
Device Quantities per Magazine	<table border="1"> <thead> <tr> <th>Package Pin Count</th> <th>4</th> <th>6</th> <th>8</th> <th>12</th> <th>16</th> </tr> </thead> <tbody> <tr> <td>Quantity (pcs)</td> <td>100</td> <td>50</td> <td>50</td> <td>25</td> <td>25</td> </tr> </tbody> </table>						Package Pin Count	4	6	8	12	16	Quantity (pcs)	100	50	50	25	25					
Package Pin Count	4	6	8	12	16																		
Quantity (pcs)	100	50	50	25	25																		
Packing Dimensions	<table border="1"> <thead> <tr> <th>Number of Magazines</th> <th>Dimensions (A x B x C)</th> <th>Label Position</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>50 x 12 x 531</td> <td>Y</td> </tr> <tr> <td>20</td> <td>67 x 51 x 559</td> <td>Y</td> </tr> <tr> <td>60</td> <td>123 x 76 x 568</td> <td>X</td> </tr> </tbody> </table>	Number of Magazines	Dimensions (A x B x C)	Label Position	4	50 x 12 x 531	Y	20	67 x 51 x 559	Y	60	123 x 76 x 568	X	<table border="1"> <thead> <tr> <th>Number of Magazines</th> <th>Dimensions (A x B x C)</th> <th>Label Position</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>60 x 13 x 531</td> <td>Y</td> </tr> <tr> <td>40</td> <td>135 x 58 x 568</td> <td>X</td> </tr> </tbody> </table>	Number of Magazines	Dimensions (A x B x C)	Label Position	4	60 x 13 x 531	Y	40	135 x 58 x 568	X
Number of Magazines	Dimensions (A x B x C)	Label Position																					
4	50 x 12 x 531	Y																					
20	67 x 51 x 559	Y																					
60	123 x 76 x 568	X																					
Number of Magazines	Dimensions (A x B x C)	Label Position																					
4	60 x 13 x 531	Y																					
40	135 x 58 x 568	X																					

7 Packing Information

	Mini-Flat Coupler (MFP)	SOP Photocoupler																		
Magazine Dimensions	<p>Unit: mm</p>  <p>Length = 555 Thickness = 0.5</p>	<p>Unit: mm</p>  <p>Length = 555 Thickness = 0.5</p>																		
Device Quantities per Magazine	<table border="1"> <tr> <td>Package Pin Count</td> <td>4 (MFSOP6)</td> </tr> <tr> <td>Quantity (pcs)</td> <td>150</td> </tr> </table>	Package Pin Count	4 (MFSOP6)	Quantity (pcs)	150	<table border="1"> <tr> <td>Package Pin Count</td> <td>4 (SOP4)</td> <td>16 (SOP16)</td> </tr> <tr> <td>Quantity (pcs)</td> <td>150</td> <td>50</td> </tr> </table> <table border="1"> <tr> <td>Package Pin Count</td> <td>4 (2.54SOP4)</td> <td>6 (2.54SOP6)</td> <td>8 (2.54SOP8)</td> </tr> <tr> <td>Quantity (pcs)</td> <td>100</td> <td>75</td> <td>50</td> </tr> </table>	Package Pin Count	4 (SOP4)	16 (SOP16)	Quantity (pcs)	150	50	Package Pin Count	4 (2.54SOP4)	6 (2.54SOP6)	8 (2.54SOP8)	Quantity (pcs)	100	75	50
Package Pin Count	4 (MFSOP6)																			
Quantity (pcs)	150																			
Package Pin Count	4 (SOP4)	16 (SOP16)																		
Quantity (pcs)	150	50																		
Package Pin Count	4 (2.54SOP4)	6 (2.54SOP6)	8 (2.54SOP8)																	
Quantity (pcs)	100	75	50																	
Packing Dimensions	 <table border="1"> <thead> <tr> <th>Number of Magazines</th> <th>Dimensions (A x B x C)</th> <th>Label Position</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>29 x 13 x 563</td> <td>Y</td> </tr> <tr> <td>24</td> <td>77 x 31 x 586</td> <td>Y</td> </tr> <tr> <td>40</td> <td>67 x 55 x 586</td> <td>X</td> </tr> </tbody> </table>	Number of Magazines	Dimensions (A x B x C)	Label Position	4	29 x 13 x 563	Y	24	77 x 31 x 586	Y	40	67 x 55 x 586	X							
Number of Magazines	Dimensions (A x B x C)	Label Position																		
4	29 x 13 x 563	Y																		
24	77 x 31 x 586	Y																		
40	67 x 55 x 586	X																		

Photocoupler Package Type		Typical Devices
MFC	MFSOP6	TLP114A, TLP160J, TLP180, TLP190B
SOP	SOP4	TLP280, TLP281
	SOP16	TLP280-4, TLP281-4, TLP270D, TLP270G
	2.54SOP4	TLP176G, TLP176A
	2.54SOP6	TLP197G
	2.54SOP8	TLP206G, TLP206A

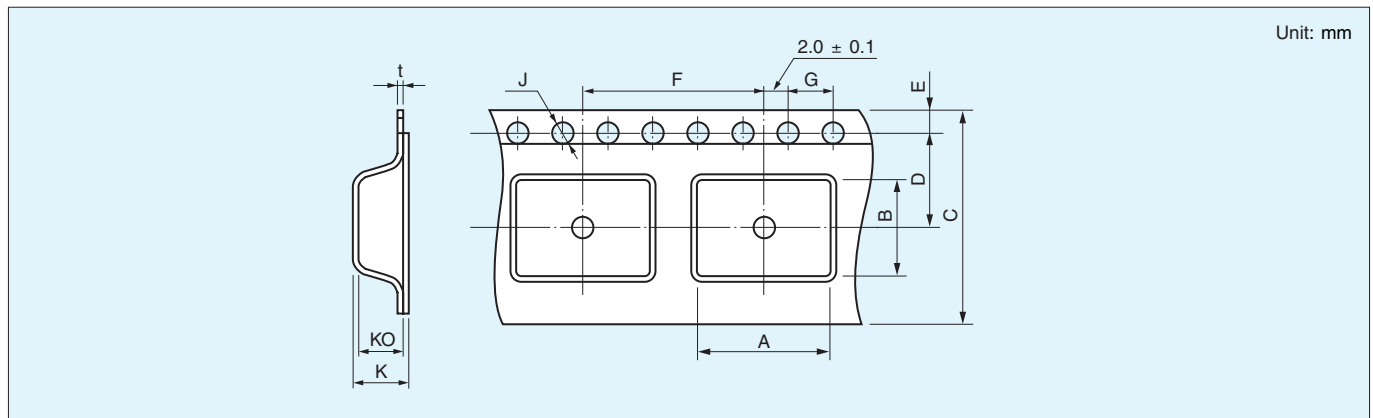
2 Tape-and-Reel Specifications

The tape specifications differ for photocouplers manufactured in Thailand.

1. Embossed Tape Specifications for Surface-Mount Lead Form Options

Photocoupler Package Types	Tape Option Symbol	Typical Devices
MFSOP6, SO6	(TPL) or (TPR)	TLP114A, TLP165J, TLP181, TLP190B
SOP4	(TP)	TLP280, TLP281
SOP16	(TP)	TLP280-4, TLP281-4
2.54SOP4	(TP)	TLP176G, TLP176A, TLP176D
2.54SOP6	(TP)	TLP197G
2.54SOP8	(TP)	TLP200D, TLP206A, TLP206G
SSOP4	(TP15)	TLP3212 to 3217, TLP3230 to TLP3250
SDIP6	(TP)	TLP701, TLP705, TLP719
DIP(LF1, LF5)	(TP1) or (TP5)	TLP550, TLP560G, TLP421
DIP(LF4)	(TP4)	TLP560G

2. Tape Dimensions



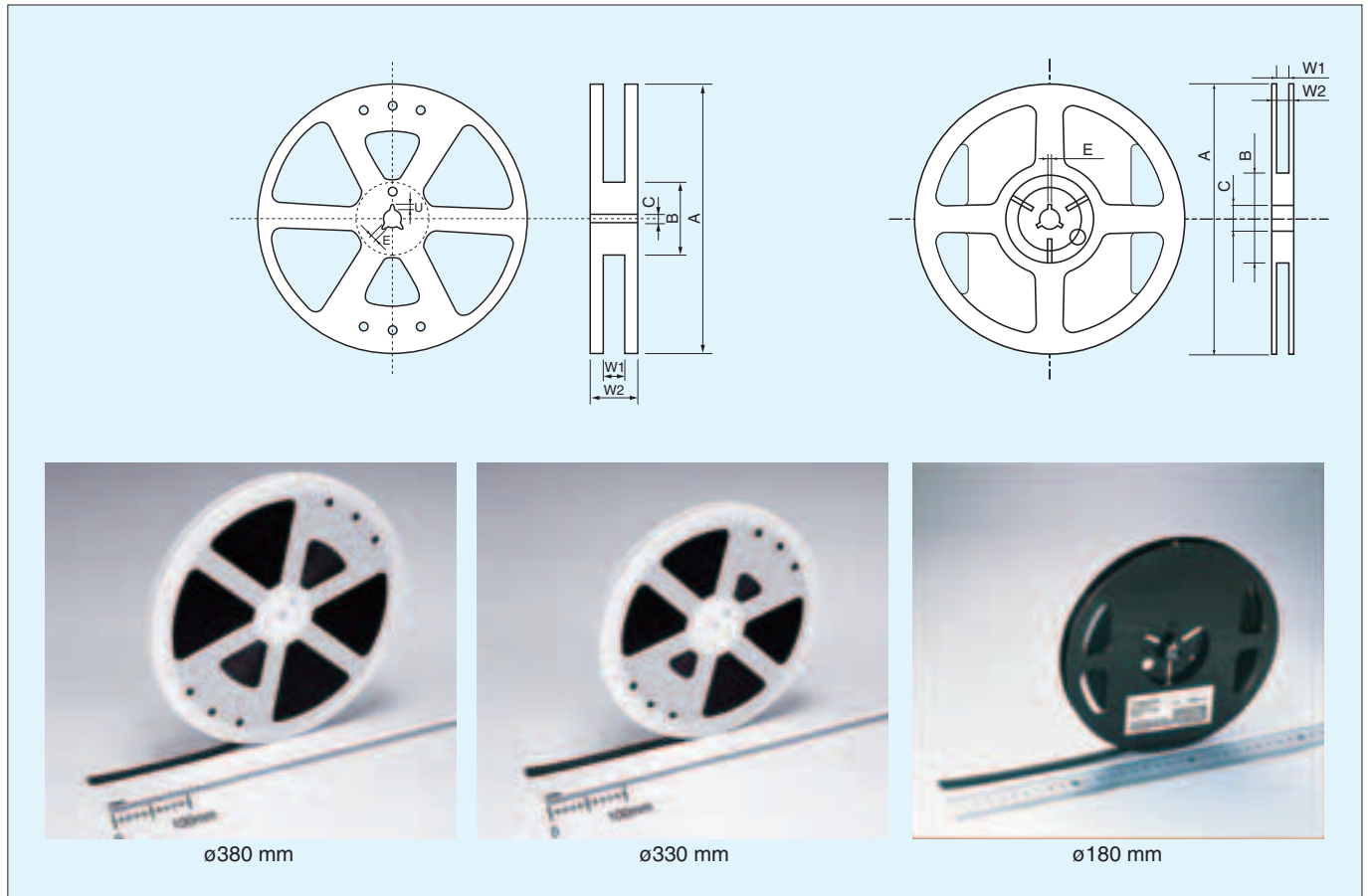
Photocoupler Package Type		MFSOP6	SO6	SO8	SOP4	SOP16	2.54SOP4	2.54SOP6	2.54SOP8	SSOP4	SDIP6	SDIP6 F type	DIP(LF1, LF5)	DIP(LF4)
Tape Option		(TPL), (TPR)	(TPL), (TPR)	(TP)	(TP)	(TP)	(TP)	(TP)	(TP)	(TP15)	(TP)	(TP)	(TP1), (TP5)	(TP4)
Symbol (See figure above)	A	4.2 ± 0.1	4.0 ± 0.1	6.5 ± 0.1	3.1 ± 0.1	7.5 ± 0.1	4.3 ± 0.1	7.5 ± 0.1	2.35 ± 0.2	10.4 ± 0.1	12.3 ± 0.1	10.4 ± 0.1	12.3 ± 0.1	
	B	7.6 ± 0.1		5.6 ± 0.1	7.5 ± 0.1	10.5 ± 0.1	7.5 ± 0.1	6.7 ± 0.1	10.5 ± 0.1	4.5 ± 0.1	5.1 ± 0.1		*1	*1
	C	12.0 ± 0.3				16.0 ± 0.3	12.0 ± 0.3	16.0 ± 0.3	12.0 ± 0.3	16.0 ± 0.3				
	D	5.5 ± 0.1				7.5 ± 0.1	5.5 ± 0.1	7.5 ± 0.1	5.5 ± 0.1	7.5 ± 0.1				
	E	1.75 ± 0.1												
	F	8.0 ± 0.1				12.0 ± 0.1	8.0 ± 0.1	12.0 ± 0.1	4.0 ± 0.1	12.0 ± 0.1	16.0 ± 0.1	12.0 ± 0.1	16.0 ± 0.1	
	G	4.0 ± 0.1												
	J	1.5 ^{+0.1} ₋₀												
	K	3.15 ± 0.2	2.9 ± 0.2	3.4 ± 0.2	2.5 ± 0.2	2.4 ± 0.2	2.6 ± 0.2	2.5 ± 0.2	2.4 ± 0.2	2.4 ± 0.2	4.55 ± 0.2			
	KO	2.8 ± 0.1	2.6 ± 0.1	3.1 ± 0.1	2.3 ± 0.1	2.2 ± 0.1	2.4 ± 0.1	2.3 ± 0.1	2.2 ± 0.1	2.1 ± 0.1	4.1 ± 0.1			
	t	0.3 ± 0.05										0.4 ± 0.05		

*1: Typical devices

DIP4	TLP620	5.1 ± 0.1
DIP6 (short package)	TLP631, TLP734, TLP747G	7.6 ± 0.1
DIP8	TLP555, TLP2601	10.1 ± 0.1 (TP4) is not available

7 Packing Information

3. Reel Dimensions



Unit: mm

Photocoupler Package Type		MFSOP, SO6	SOP4	SOP16	2.54SOP4	2.54SOP6	2.54SOP8	SSOP4	SDIP6	SDIP6 F type	DIP(LF1, LF5)	DIP(LF4)	
Tape Option		(TPL), (TPR)	(TP)	(TP)	(TP)			(TP15)	(TP)	(TP)	(TP1), (TP5)	(TP4)	
Symbol (See figure above)	A	Dimensions	ø380 ± 2		ø330 ± 2			180 ⁺⁰ ₋₄	ø380 ± 2				
	B		ø80 ± 1			ø60			ø80 ± 1				
	C		ø13 ± 0.5			ø13			ø13 ± 0.5				
	E		2.0 ± 0.5			2 ± 0.5			2.0 ± 0.5				
	U		4.0 ± 0.5			4.0 ± 0.5			4.0 ± 0.5				
	W1		13.5 ± 0.5		17.5 ± 0.5	13.5 ± 0.5	17.5 ± 0.5		13 ± 0.3	17.5 ± 0.5			
	W2		17.5 ± 1.0		21.5 ± 1.0	17.5 ± 1.0	21.5 ± 1.0		15.4 ± 1.0	21.5 ± 1.0			

Photocouplers Manufactured in Thailand

Photocoupler Package Type		MFSOP	DIP6(LF1, LF5, LF4)	DIP4(LF1, LF5, LF4)	DIP8(LF1, LF5)		
Tape Option		(TPL), (TPR)	(TP1), (TP5), (TP4)	(TP1), (TP5), (TP4)	(TP1), (TP5)		
Symbol (See figure above)	A	Dimensions	ø380 ± 2		ø330 ± 2		
	B		ø80 ± 1				
	C		ø13 ± 0.5				
	E		2.0 ± 0.5				
	U		4.0 ± 0.5				
	W1		13.5 ± 0.5		17.5 ± 0.5		
	W2		17.5 ± 1.0		21.5 ± 1.0		

4. Other Packing Information

a) Device orientation on tape

Photocouplers are oriented in cavity, as shown below.

Photocoupler Package Type	Tape Option
MFSOP6, SO6	TPR

Photocoupler Package Type	Tape Option
MFSOP6, SO6	TPL
SOP4, 2.54SOP4	TP
SSOP4	TP15

Photocoupler Package Type	Tape Option
SOP16, SO8	TP
2.54SOP6/8	TP
SDIP6	TP
DIP(LF1, LF5)	TP1, TP5
DIP(LF4)	TP4

b) Tape Specifications

Quantities Per Reel

Photocoupler Package Type	MFSOP6, SO6	SOP4, SO8	SOP16	2.54SOP4/6/8	SSOP4	SDIP6	SDIP6 F type	DIP(LF1, LF5)	DIP(LF4)
Quantity (pcs)	3000	2500	2500	2500	1500	1500	1000	1500	1000

Photocouplers Manufactured in Thailand

Photocoupler Package Type	MFSOP	DIP4/6(LF1,LF5)	DIP4/6(LF4)	DIP8(LF1,LF5)
Quantity (pcs)	3000	1500	1000	1000

Empty Cavities

Item	Specification	Note
Consecutive empty cavities	Zero	Any 40-mm portion of tape except leader and trailer.
Non-consecutive empty cavities	0.2% max/reel *2	Except leader and trailer.

*2: 6 pcs max/reel for DIP and SDIP packages

c) Packing boxes

One or five reels per box
Two or five reels per box for photocouplers manufactured in Thailand

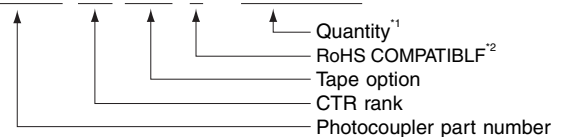
d) Label

The reel label includes the following information:
1. Part number 2. Tape type 3. Quantity 4. Lot number

e) Purchase order

Specify the part number, tape and quantity as follows.

Example TLP181(GB-TPR, F) 3000 units



*1: Must be a multiple of the quantity per-reel.

*2: "F" identifies the indication of product Labels with "[[G]]/RoHS COMPATIBLE".

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

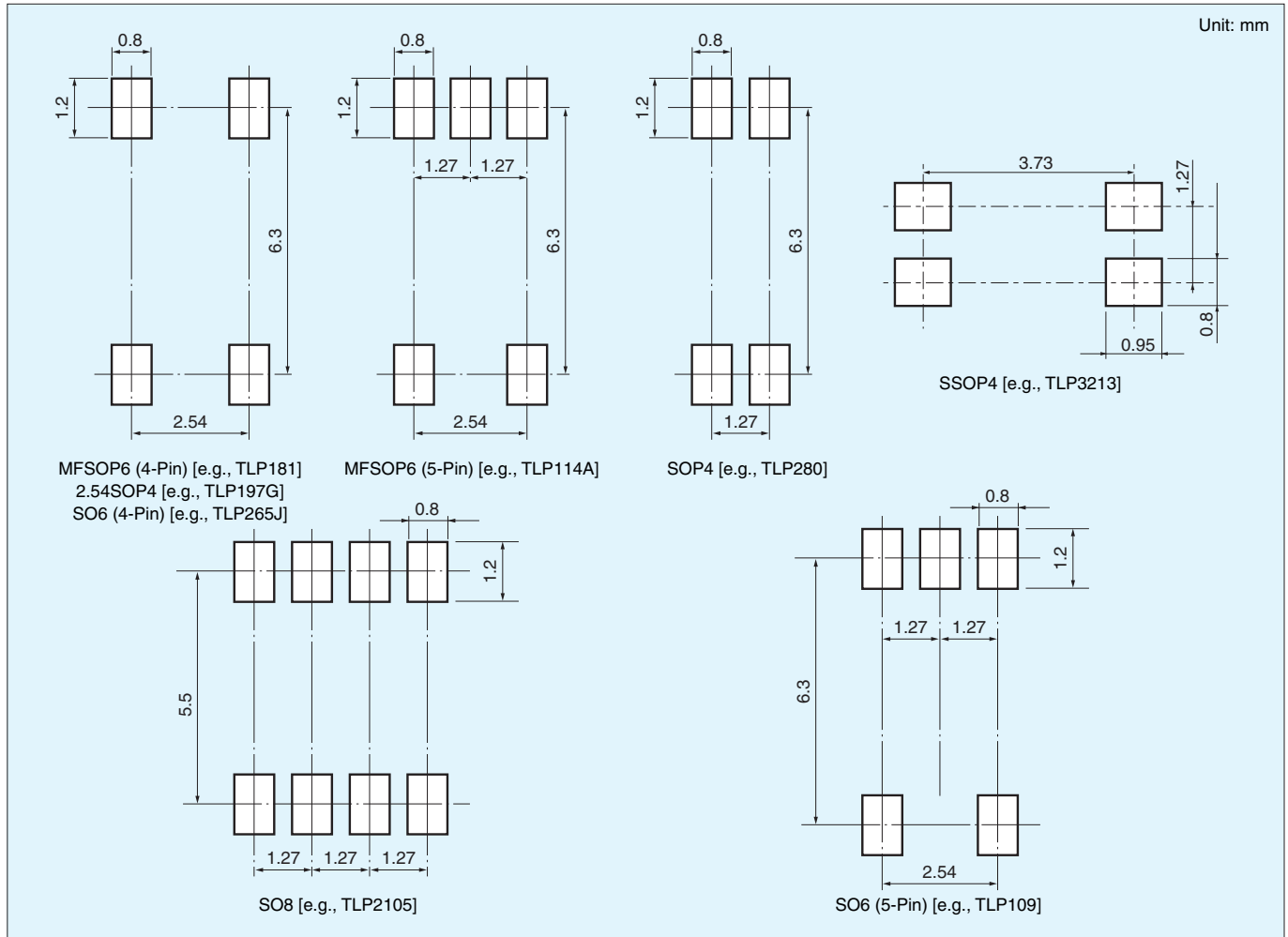
The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

8 Board Assembly

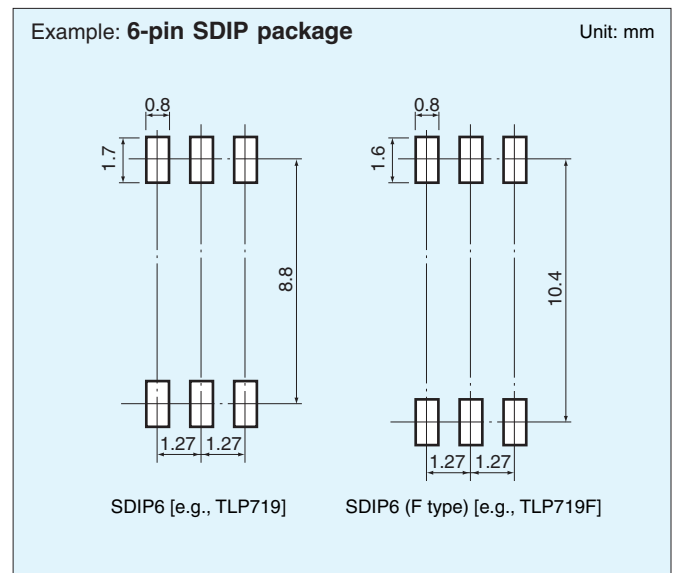
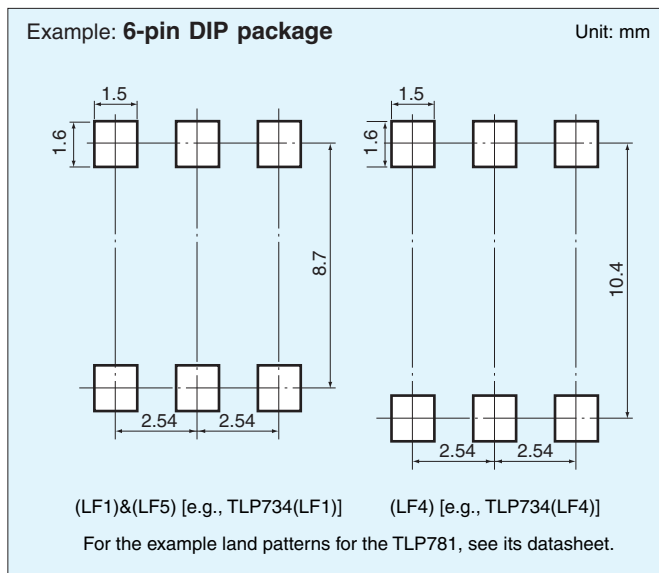
1 Example Land Patterns

Below are the example land patterns for surface-mount packages.

Mini-flat and SOP couplers



Surface-Mount Lead-Formed Photocouplers



2 Board Assembly Considerations

1. Soldering

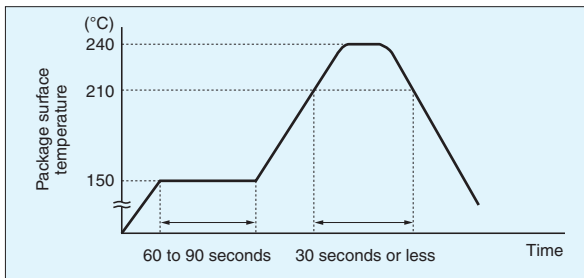
When using a soldering iron or medium infrared ray/hot air reflow, avoid a rise in device temperature as much as possible by observing the following conditions.

1.1) Using a soldering iron

- Solder once within 10 seconds for a lead temperature of up to 260°C.
- Solder once within 3 seconds for a lead temperature of up to 350°C.

1.2) Using medium infrared ray/hot air reflow

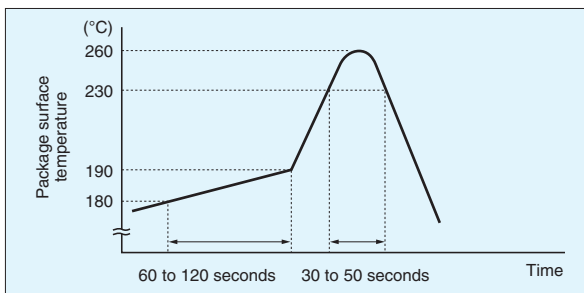
- Complete the infrared ray/hot air reflow process at once within 30 seconds at a package surface temperature between 210°C and 240°C.
- Example of temperature profile of lead (Pb) solder



Example of temperature profile of lead (Pb) solder

- Example of temperature profile of lead (Pb)-free solder

The profile below shows only the typical temperature profile and conditions, which might not apply to all Toshiba photocouplers. Temperature profiles and conditions may differ from product to product. Refer to the relevant technical datasheets and databooks when mounting a device.



Example of temperature profile of lead (Pb)-free solder

- Precautions for heating

Keeping packages at high temperature for a long period of time can degrade the quality and reliability of devices. Soldering time has to be kept as short as possible to avoid a rise in package temperature.

When using a halogen lamp or infrared heater, avoid direct irradiation of packages, since this may cause a rise in package temperature.

1.3) Dip soldering (flow soldering)

The thermal shock of dip soldering increases thermal stress on devices. To avoid stress, the use of a soldering iron or medium infrared ray/hot air reflow is recommended. If you want to use dip soldering, contact your nearest Toshiba sales representative.

2. Flux Cleaning

- When cleaning circuit boards to remove flux, make sure that no residual reactive ions such as sodium(Na^+) or chloride(Cl^-) ions remain. Note that organic solvents react with water to generate hydrogen chloride and other corrosive gases, which can degrade device performance.
- Washing devices with water will not cause any problems. However, make sure that no reactive ions such as sodium(Na^+) or chloride(Cl^-) ions are left as residue. Also, be sure to dry devices sufficiently after washing.
- Do not rub device markings with a brush or with your hand during cleaning or while the devices are still wet from the cleaning agent. Doing so can rub off the markings.
- Dip cleaning, shower cleaning and steam cleaning processes all involve the chemical action of a solvent. Use only recommended solvents for these cleaning methods. When immersing devices in a solvent or steam bath, make sure that the temperature of the liquid is 50°C or below and that the circuit board is removed from the bath within one minute.
- If a device package allows ultrasonic cleaning, keep the duration of ultrasonic cleaning as short as possible, since long hours of ultrasonic cleaning degrade the adhesion between the mold resin and the frame material.

The following ultrasonic cleaning conditions are recommended.

Frequency: 27 kHz to 29 kHz

Ultrasonic output power: 300 W or less (0.25 W/cm² or less)

Cleaning time: 30 seconds or less

Suspend the circuit board in the solvent bath during ultrasonic cleaning in such a way that the ultrasonic vibrator does not come into direct contact with the circuit board or the device.

Conventional cleaning solvents that contain freon are not recommended due to its adverse effect on the earth's ozone layer. Alternative freon-free products are available on the market. Some of these alternative cleaning agents are listed in the table below. Contact Toshiba or a Toshiba distributor regarding cleaning conditions and other relevant information for each product type.

Examples of Alternative Cleaning Agents

Technocare	FRW-1, FRW-17, FRV-100	GE Toshiba Silicon
Asahi Clean	AK-225AES	Asahi Glass Co., Ltd
Clean Through	750H	Kao Co., Ltd.
Pine Alpha	ST-100S, ST-100SX	Arakawa Chemical Co., Ltd.

9 Device Degradation

1 Projected Operating Life Based on LED Light Output Degradation

Toshiba photocouplers use one of three types of LEDs and a projection of the operating life has been made for each LED. The table on page 57 shows the types of LED used in photocouplers and the figures on pages 58 to 60 show projections of long-term light output performance and operating life. Note that these operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only.

	Projected Operating Life ($T_a = 40^\circ\text{C}$, $I_F = 20\text{ mA}$, failure criteria: degradation rate $\Delta P_o < -50\%$)		Photocouplers
	F50% operating life	F0.1% operating life	
① GaAs LED	1,300,000 h	260,000 h	Mainly for phototransistor output devices and phototriac output devices
② GaAlAs(SH) LED	540,000 h	100,000 h	Mainly for photo-IC couplers
③ GaAlAs(DH) LED	1,000,000 h	200,000 h	Mainly for photorelays (MOSFET output), photovoltaic couplers and photo-IC couplers

F50% (cumulative failure rate 50%) operating life: Time period until the projected long-term light output degradation curve of the average light output change (\bar{X}) shown on pages 58 to 60 reaches the failure criteria.

F0.1% (cumulative failure rate 0.1%) operating life: Time period until the projected long-term light output degradation curve of $\bar{X} - 3\sigma$ shown on pages 58 to 60 reaches the failure criteria.

The relationship between LED light output degradation and optical coupling characteristics is shown below.

- (1) The relationship between LED light output degradation and current transfer ratio (CTR)/short circuit current (I_{sc}) is 1:1.

$$\frac{\text{CTR}(t)}{\text{CTR}(o)} = \frac{P_o(t)}{P_o(o)}$$

- (2) The relationship between a reciprocal value of LED light output degradation and $I_{FT}/I_{FLH}/I_{FHL}/I_{FH}$ change is 1:1.

$$\frac{I_{FT}(t)}{I_{FT}(o)} = \left(\frac{P_o(t)}{P_o(o)} \right)^{-1}$$

■ How to estimate an operating life from the graph

Example: Estimate an operating life from GaAs LED projected operating life data (failure criteria $\Delta P_o < -50\%$) on page 58.

At ambient temperature of 25°C

1. Calculate absolute temperature. $25^\circ\text{C} + 273 = 298\text{ (K)}$
2. Calculate the reciprocal value of the calculated value. $1/298 = 3.36 \times 10^{-3}$
3. Read data from the graph.

Projected operating life at $T_a = 25^\circ\text{C}$, $I_F = 50\text{ mA}$ (failure criteria: light output degradation $\Delta P_o < -50\%$)

F50% (cumulative failure rate 50%) operating life: Approximately 200,000 h (reference value)

F0.1% (cumulative failure rate 0.1%) operating life: Approximately 40,000 h (reference value)

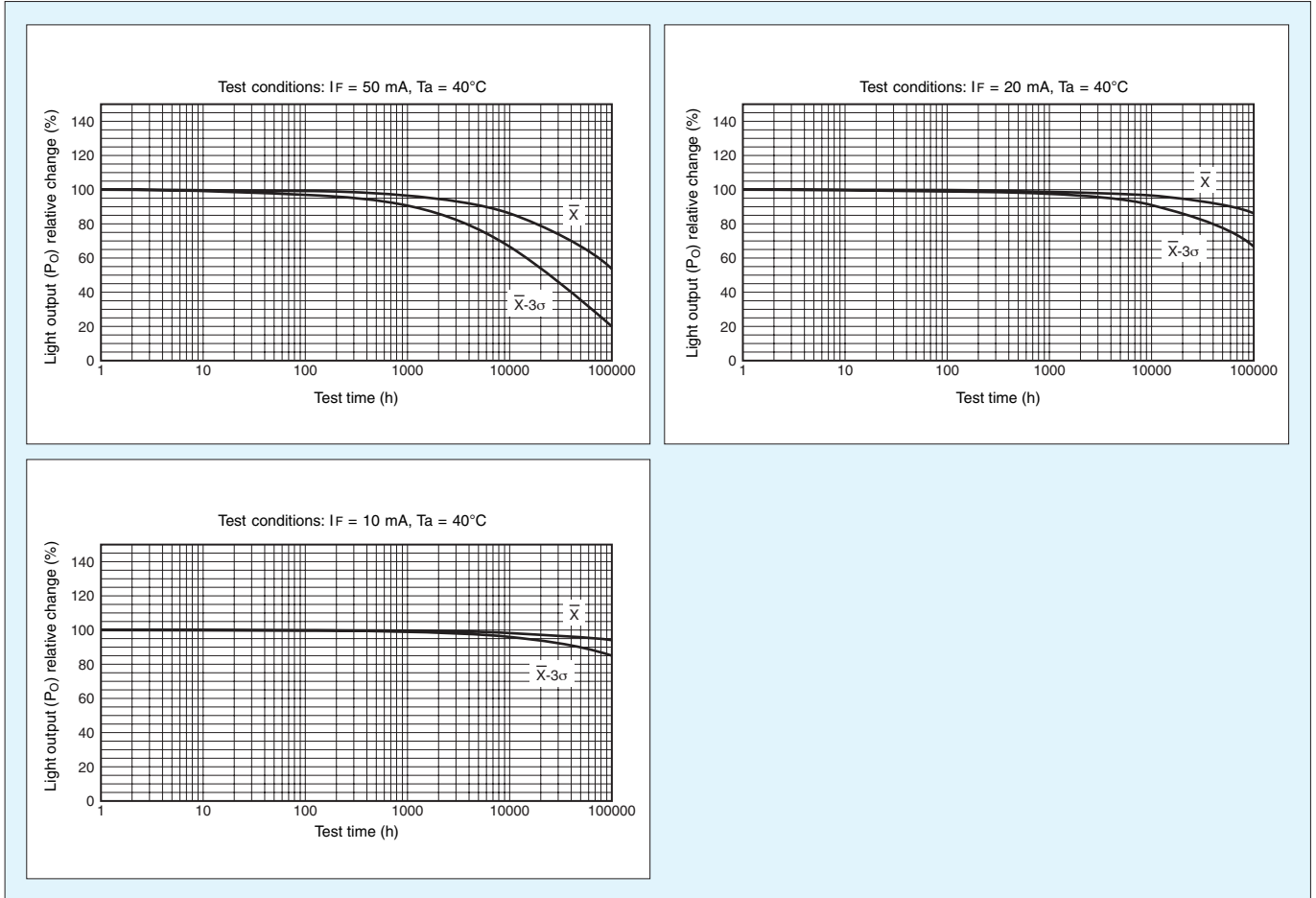
LEDs Used in Photocouplers

LED: ① GaAs LED ② GaAlAs (SH) LED ③ GaAlAs (DH) LED

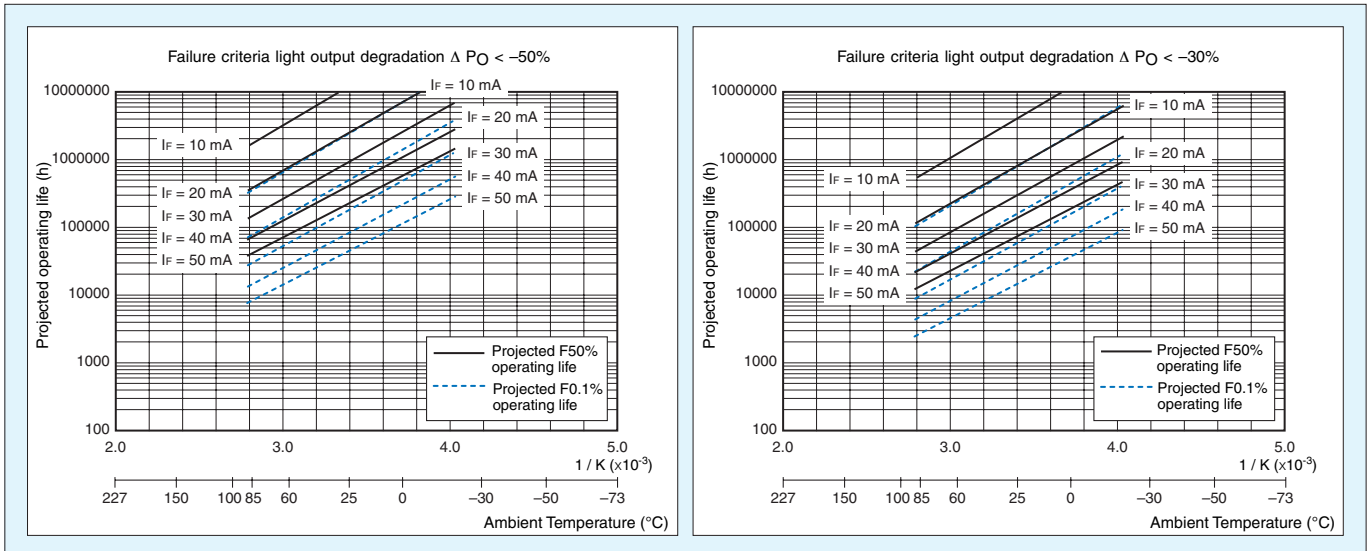
Photocouplers	LED	Photocouplers	LED	Photocouplers	LED	Photocouplers	LED	Photocouplers	LED
4N25 (SHORT)	①	TLP148G	①	TLP371	①	TLP627 Series	①	TLP3231	①
4N25A (SHORT)	①	TLP160 Series	①	TLP372	①	TLP628 Series	①	TLP3240	③
4N26 (SHORT)	①	TLP161 Series	①	TLP373	①	TLP629 Series	①	TLP3241	③
4N27 (SHORT)	①	TLP163	①	TLP504A	①	TLP630	①	TLP3250	③
4N28 (SHORT)	①	TLP165J	①	TLP512	②	TLP631	①	TLP3762(S) Series	①
4N29 (SHORT)	①	TLP166J	①	TLP513	②	TLP632	①	TLP3904	①
4N29A (SHORT)	①	TLP168J	③	TLP521-1	①	TLP641 Series	①	TLP3914	③
4N30 (SHORT)	①	TLP172 Series	①	TLP521-2	①	TLP651	②	TLP3924	③
4N31 (SHORT)	①	TLP174G	①	TLP521-4	①	TLP700	③	TLP4xxx Series	①
4N32 (SHORT)	①	TLP176 Series	①	TLP523 Series	①	TLP701	②		
4N32A (SHORT)	①	TLP180	①	TLP525G Series	①	TLP705	②		
4N33 (SHORT)	①	TLP181	①	TLP531	①	TLP716	②		
4N35 (SHORT)	①	TLP190B	③	TLP532	①	TLP719	②		
4N36 (SHORT)	①	TLP191B	③	TLP550	②	TLP731	①		
4N37 (SHORT)	①	TLP192 Series	①	TLP551	②	TLP732	①		
4N38 (SHORT)	①	TLP197 Series	①	TLP552	②	TLP733 Series	①		
4N38A (SHORT)	①	TLP200D	①	TLP553	②	TLP734 Series	①		
6N135	②	TLP202 Series	①	TLP554	②	TLP747 Series	①		
6N136	②	TLP206 Series	①	TLP555	②	TLP750 Series	②		
6N137	②	TLP222 Series	①	TLP557	②	TLP751 Series	②		
6N138	②	TLP224G Series	①	TLP558	②	TLP759 Series	②		
6N139	②	TLP225A	①	TLP559	②	TLP762J Series	①		
TLP102	②	TLP227 Series	①	TLP560 Series	①	TLP763J Series	①		
TLP106	②	TLP260J	①	TLP561 Series	①	TLP797 Series	①		
TLP112	②	TLP270 Series	①	TLP570	①	TLP798GA	③		
TLP112A	③	TLP280 Series	①	TLP571	①	TLP2066	③		
TLP113	②	TLP281 Series	①	TLP572	①	TLP2200	②		
TLP114A	③	TLP296G	①	TLP590B	③	TLP2530	②		
TLP115	②	TLP320 Series	①	TLP591B	③	TLP2531	②		
TLP115A	③	TLP330	①	TLP592 Series	①	TLP2601	②		
TLP116	③	TLP331	①	TLP594 Series	①	TLP2630	②		
TLP117	③	TLP332	①	TLP597 Series	①	TLP2631	②		
TLP124	①	TLP350	②	TLP598 Series	③	TLP3022(S) Series	①		
TLP126	①	TLP351	②	TLP599 Series	①	TLP3042(S) Series	①		
TLP127	①	TLP351A	②	TLP620 Series	①	TLP3063(S) Series	③		
TLP130	①	TLP360 Series	①	TLP621 Series	①	TLP31xx Series	①		
TLP131	①	TLP361 Series	①	TLP624 Series	①	TLP32xx Series	①		
TLP137	①	TLP363 Series	①	TLP626 Series	①	TLP3230	①		

9 Device Degradation

① GaAs LED Projected Light Output Degradation Data

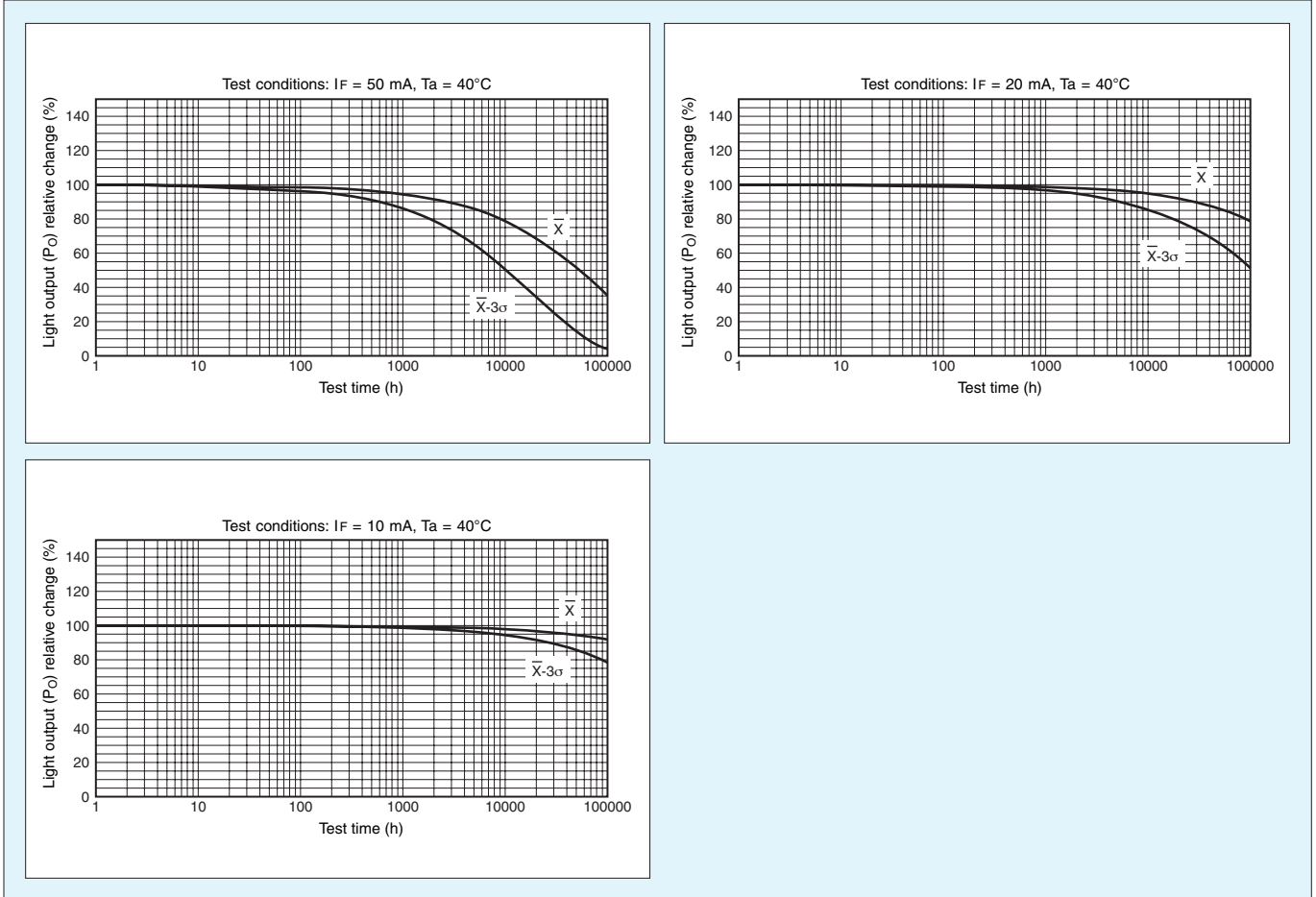


① GaAs LED Projected Operating Life Data

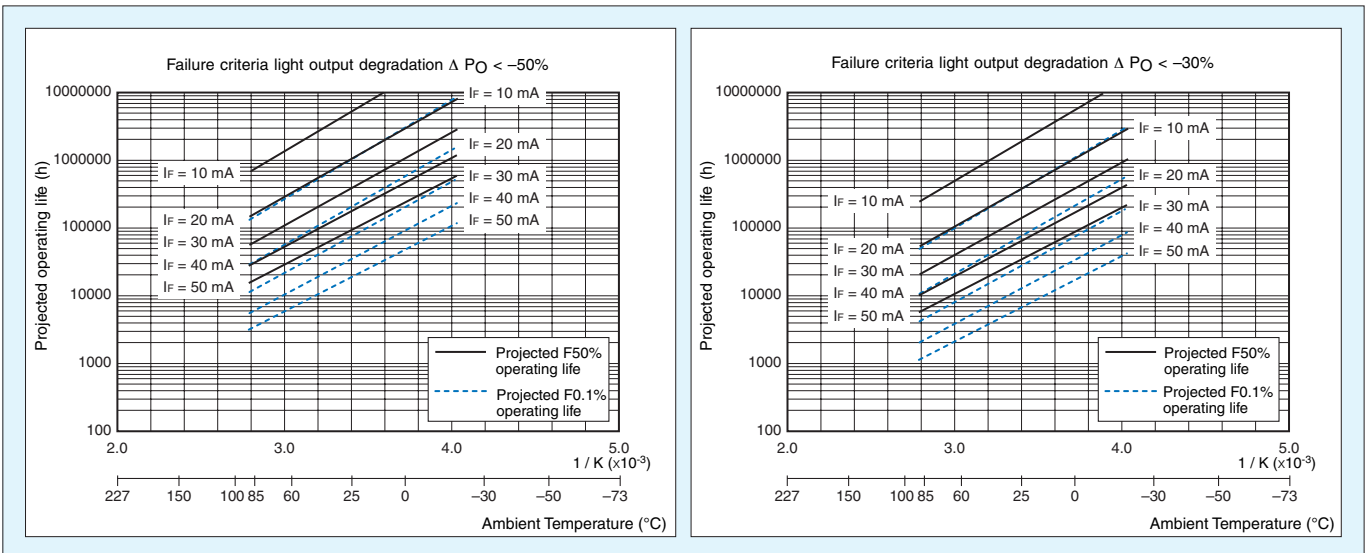


The above operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only. Operating conditions exceeding the maximum ratings are not guaranteed.

② GaAs (SH) LED Projected Light Output Degradation Data



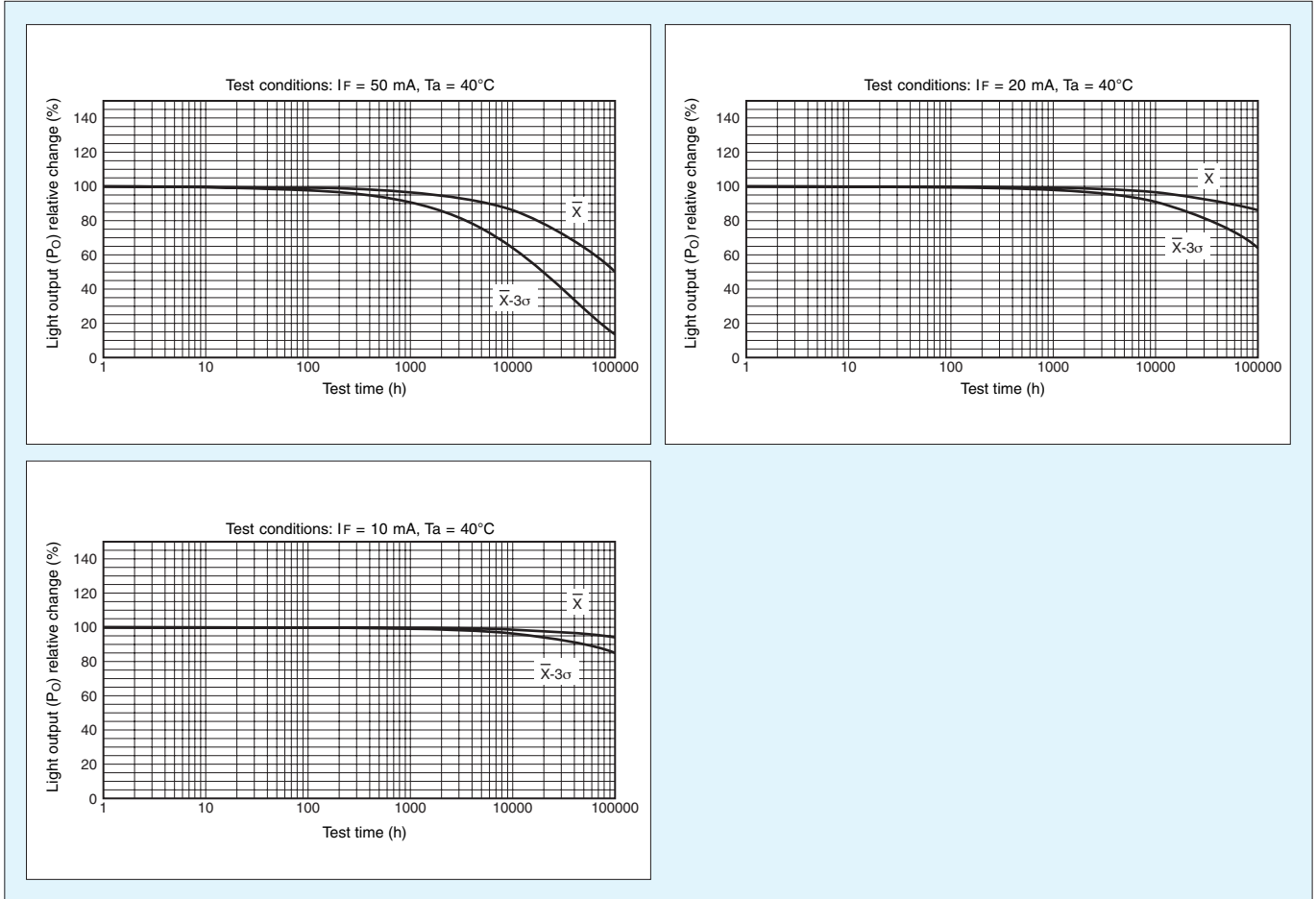
② GaAs (SH) LED Projected Operating Life Data



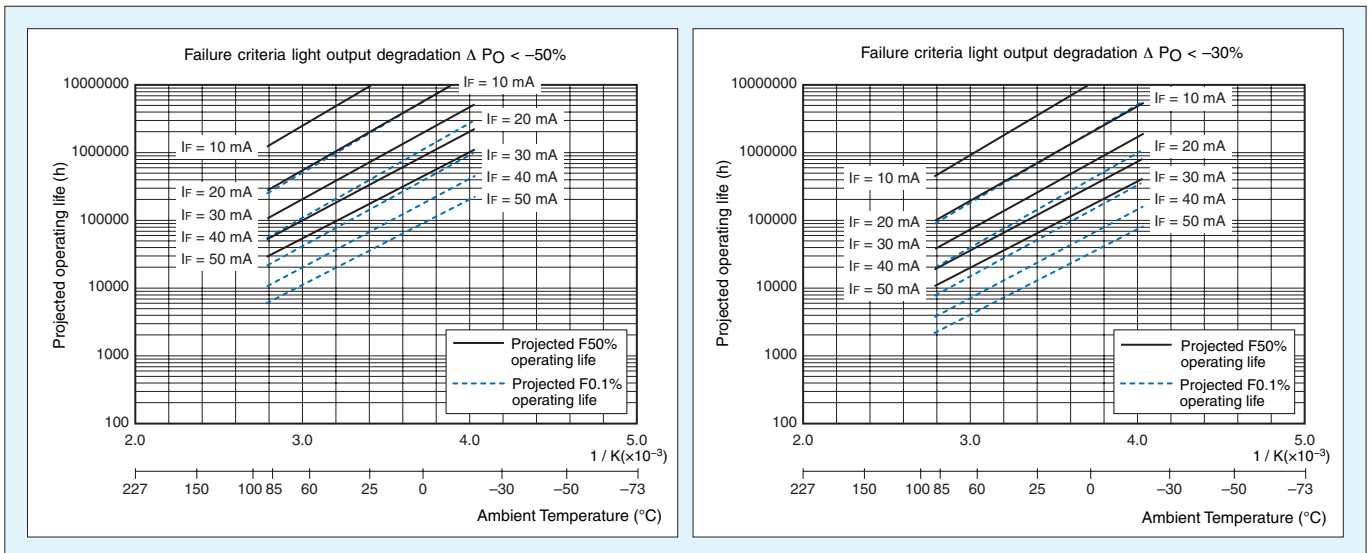
The above operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only. Operating conditions exceeding the maximum ratings are not guaranteed.

9 Device Degradation

③ GaAs (DH) LED Projected Light Output Degradation Data



③ GaAs (DH) LED Projected Operating Life Data



The above operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only. Operating conditions exceeding the maximum ratings are not guaranteed.

10 Safety Standard Approvals

Toshiba offers a wide selection of photocouplers with a transistor output, IC output, thyristor output and triac output, as well as photorelays certified to UL (USA), cUL (Canada), VDE (Germany), BSI (Britain) and SEMKO (Sweden).

Safety Standard Approvals for Photocouplers (DIN EN60747-5-2)

Mechanical Construction		Reflective Photocouplers in Single-Molded Packages			Transmissive Photocouplers in Single-Molded Packages				
Internal Construction									
Package		SOP4/SOP16		MFSOP6	MFSOP6	SO8 (2 ch)	2.54SOP 4/6/8	DIP	DIP (F type)
Construction Mechanical Ratings (min)	Isolation Creepage Path (mm)	4.0	5.0	4.0	4.0	4.2	4.0	6.4/7.0	8.0
	Isolation Clearance (mm)	4.0	5.0	4.0	4.0	4.2	4.0	6.4/7.0	8.0
	Isolation Thickness (mm)	0.4	0.4	0.4	–	–	–	(0.4)	(0.4)
	Internal Creepage Path (mm)	–	–	–	–	–	–	–	–
VDE/TUV DIN EN 60747-5-2	Max. Working Insulation Voltage (V _{orm})	565 Vpk	707 Vpk	565 Vpk	565 Vpk	565 Vpk	565 Vpk	630 Vpk /890 Vpk	1140 Vpk
	Highest Allowable Overvoltage (V _{iotm})	4000 Vpk	6000 Vpk	6000 Vpk	4000 Vpk	4000 Vpk	2500 Vpk	4000 Vpk	6000 Vpk
Certified Devices	IC Output					TLP2105 TLP2108 TLP2166A TLP2116		TLP350 TLP351	TLP350F TLP351F
	Transistor Output	TLP280 TLP280-4 TLP281 TLP281-4	TLP284 TLP284-4 TLP285 TLP285-4	TLP180 TLP181	TLP127				
	Triac/Thyristor Output			TLP260J TLP261J	TLP160G TLP160J TLP161G TLP161J			TLP560G TLP560J TLP561G TLP561J	
	Photorelay						TLP176A TLP176D TLP176G TLP197G TLP206G	TLP227G TLP227G-2 TLP597G	

The table above lists photocouplers and photorelays that have already been approved as of January 2010. The information herein is subject to change. For the latest information, please contact your nearest Toshiba sales representative.

10 Safety Standard Approvals

Safety Standard Approvals for Photocouplers (DIN EN60747-5-2) (Continued)

Mechanical Construction		Transmissive Photocouplers with an Insulating Film in Single-Molded Packages					Transmissive Photocouplers in Double-Molded Packages			
Internal Construction										
Package		SO8 (1 ch)	SDIP6	SDIP6 (F type)	DIP	DIP (F type)	MFSOP6	SO6	DIP	DIP (F type)
Construction Mechanical Ratings (min)	Isolation Creepage Path (mm)	4.2	7.0	8.0	6.4/7.0	8.0	4.0	5.0	6.5/7.0	8.0
	Isolation Clearance (mm)	4.2	7.0	8.0	6.4/7.0	8.0	4.0	5.0	6.5/7.0	8.0
	Isolation Thickness (mm)	0.4	0.4	0.4	0.4/0.5	0.4/0.5	–	0.4	0.4/0.5	0.4/0.5
	Internal Creepage Path (mm)	–	–	–	–	–	–	–	4.0	4.0
VDE/TUV DIN EN 60747-5-2	Max. Working Insulation Voltage (Viorm)	565 Vpk	890 Vpk	1140 Vpk	890 Vpk	1140 Vpk	565 Vpk	707 Vpk	890 Vpk /1130 Vpk	890 Vpk /1130 Vpk
	Highest Allowable Overvoltage (Viotm)	6000 Vpk	8000 Vpk	8000 Vpk	6000 Vpk /8000 Vpk	6000 Vpk /8000 Vpk	4000 Vpk /6000 Vpk	6000 Vpk	6000 Vpk /8000 Vpk	6000 Vpk /8000 Vpk

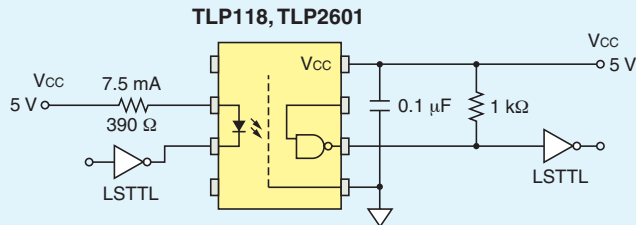
Certified Devices	IC Output		TLP701 TLP705 TLP715 TLP716 TLP718 TLP719	TLP701F TLP705F TLP715F TLP716F TLP718F TLP719F	TLP350H TLP351H TLP750 TLP751 TLP759	TLP350HF TLP351HF TLP750F TLP751F TLP759F	TLP105 TLP108 TLP114A TLP116 TLP117 TLP2066	TLP109 TLP116A TLP104 TLP151		
	Transistor Output				TLP620 TLP620-2 TLP620-4 TLP621 TLP621-2 TLP621-4 TLP627 TLP627-2 TLP627-4 TLP731 TLP732	TLP620F TLP620F-2 TLP621F TLP621F-2			TLP733 TLP734 TLP781	TLP733F TLP734F TLP781F
	Triac/Thyristor Output				TLP360J TLP361J TLP363J TLP3022(S) TLP3023(S) TLP3042(S) TLP3043(S) TLP3052(S) TLP3062(S) TLP3063(S) TLP3064(S) TLP3082(S) TLP3762(S) TLP3782(S) TLP3783(S)	TLP360JF TLP361JF TLP363JF TLP3022F(S) TLP3023F(S) TLP3042F(S) TLP3043F(S) TLP3052F(S) TLP3062F(S) TLP3063F(S) TLP3064F(S) TLP3082F(S) TLP3762F(S) TLP3782F(S) TLP3783F(S)	TLP165J TLP166J	TLP265J TLP266J	TLP762J TLP763J TLP748J	TLP762JF TLP763JF TLP748JF

The table above lists photocouplers and photorelays that have already been approved as of January 2010. The information herein is subject to change. For the latest information, please contact your nearest Toshiba sales representative.

11 Photocoupler Application Circuit Examples

1 Digital Interface Applications

High Speed

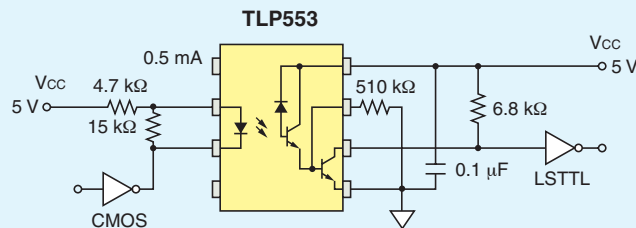


The **TLP2061** (or the **TLP118** in the mini-flat package) allows high-speed data transmission at up to approximately 5 MHz.

Data rate of left-side circuit

f (typ.): 5 Mbit/s (duty cycle \approx 1/2)

Low Input Current Drive

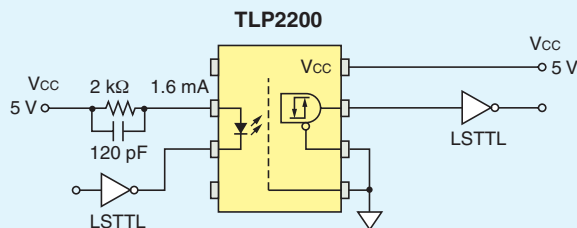


The high-CTR (current transfer ratio) **TLP553** allows operation with low input current (0.5 mA) and direct driving with a CMOS signal.

Data rate of left-side circuit

f (typ.): 50 kbit/s (duty cycle \approx 1/2)

No Pull-up Resistor Required

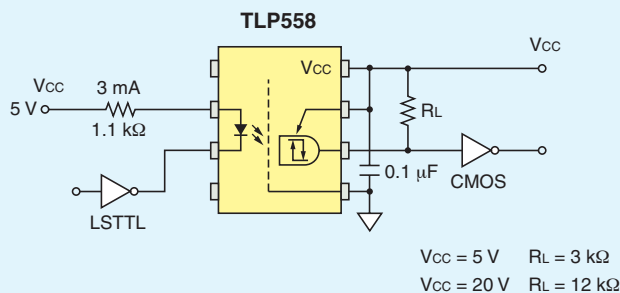


When the **TLP2200** with a 3-state output is used, the next-stage logic gate can be actuated without using a pull-up resistor.

Data rate of left-side circuit

f (typ.): 1 Mbit/s (duty cycle \approx 1/2)

High Vcc Tolerance



By using the **TLP558** which tolerates V_{cc} up to 20 V, CMOS logic gates and other components can be driven without design restrictions on V_{cc} .

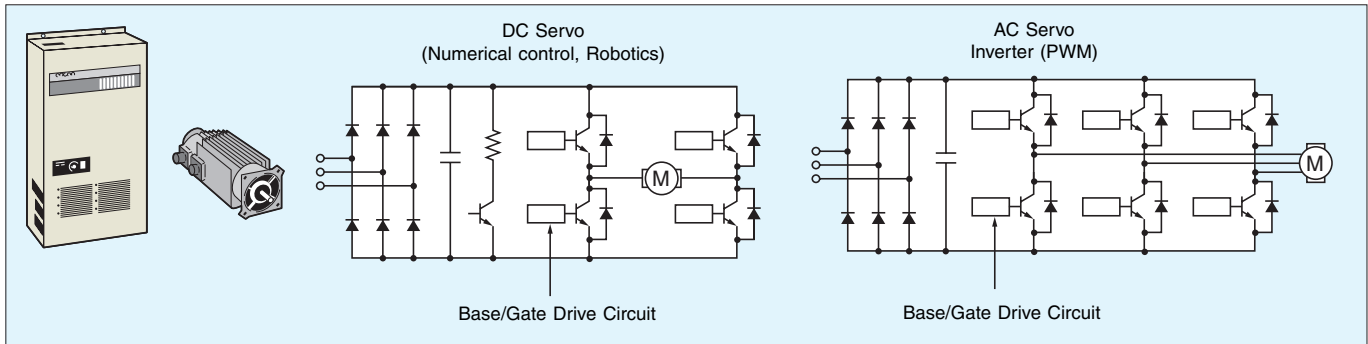
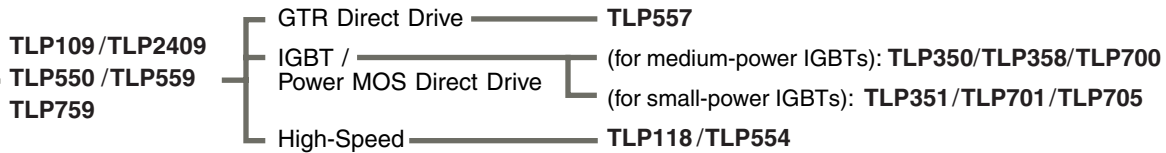
Data rate of left-side circuit

f (typ.): 1 Mbit/s (duty cycle \approx 1/2)

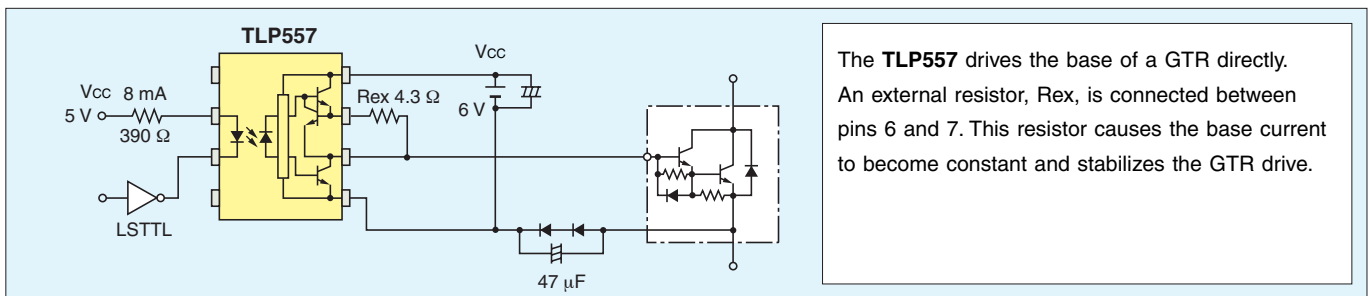
11 Photocoupler Application Circuit Examples

2 Inverter and AC-DC Servo Applications

[Photo-IC couplers: high-speed base/gate drive applications]

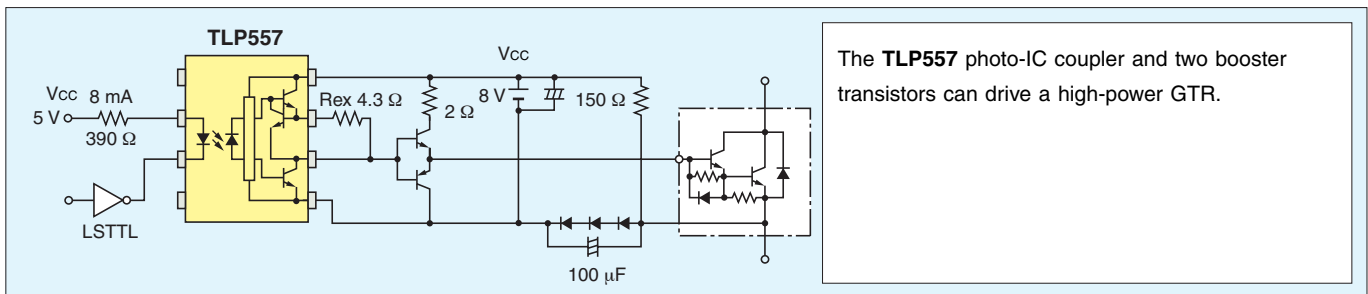


Driving the Base of a 15-A-Class GTR (Giant Transistor) Module



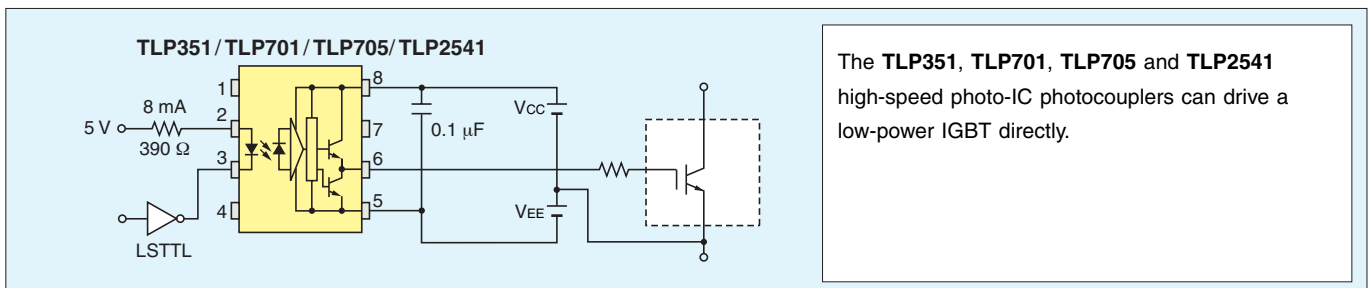
The **TLP557** drives the base of a GTR directly. An external resistor, R_{ex} , is connected between pins 6 and 7. This resistor causes the base current to become constant and stabilizes the GTR drive.

Driving the Base of a 100-A-Class GTR Module



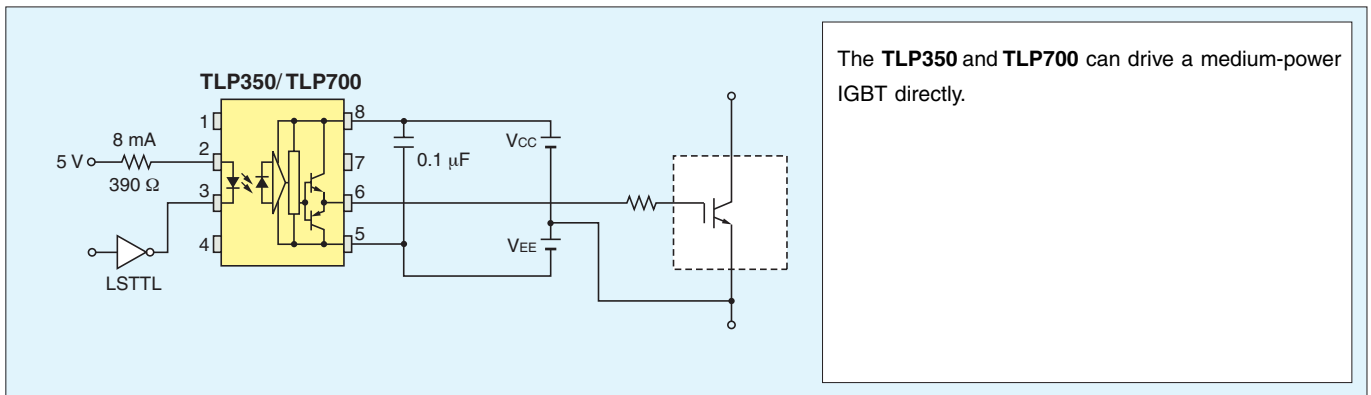
The **TLP557** photo-IC coupler and two booster transistors can drive a high-power GTR.

Driving the Gate of a 15-A-Class IGBT (Insulated Gate Bipolar Transistor) Module

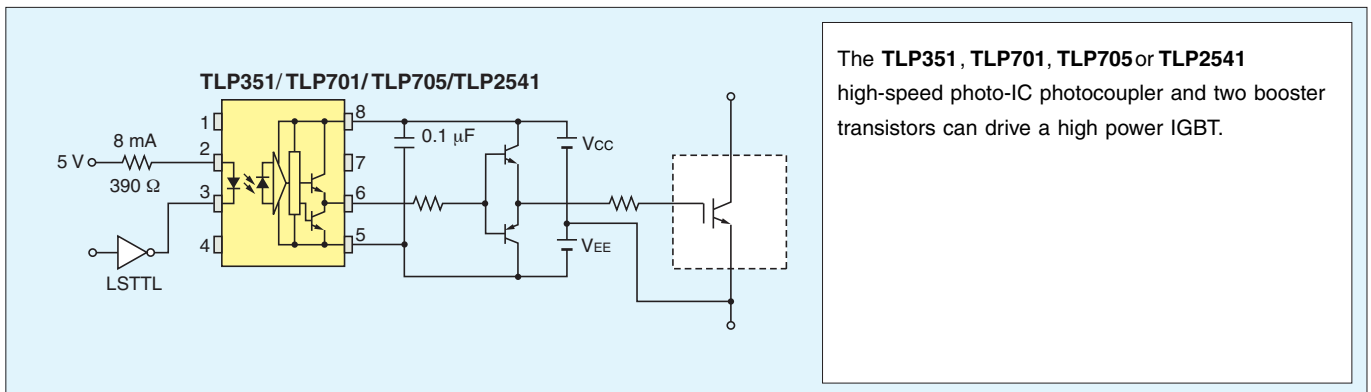


The **TLP351**, **TLP701**, **TLP705** and **TLP2541** high-speed photo-IC photocouplers can drive a low-power IGBT directly.

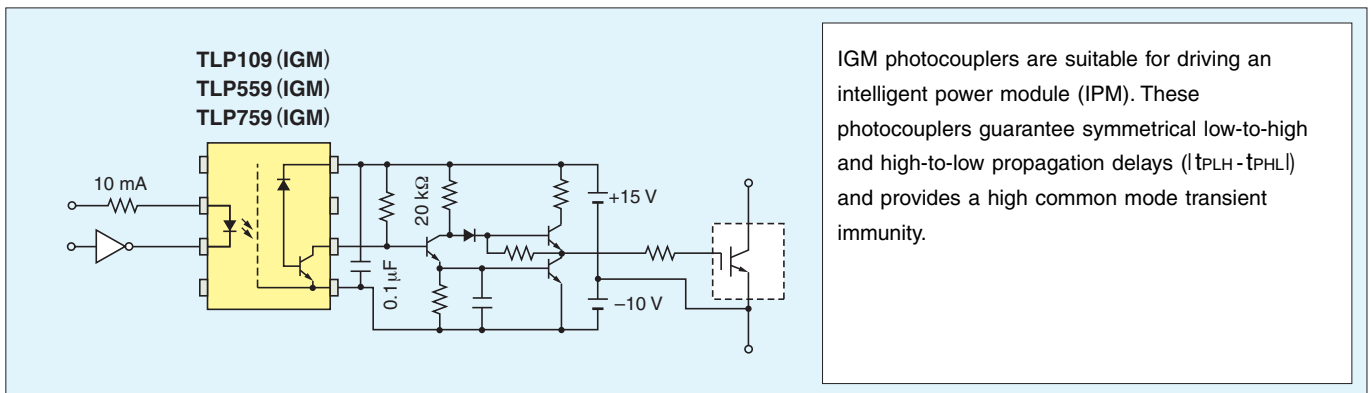
Driving the Gate of a 50-A-Class IGBT Module



Driving the Gate of a 400-A-Class IGBT Module



Driving the Gate of an IGBT Module Using an IGM Photocoupler



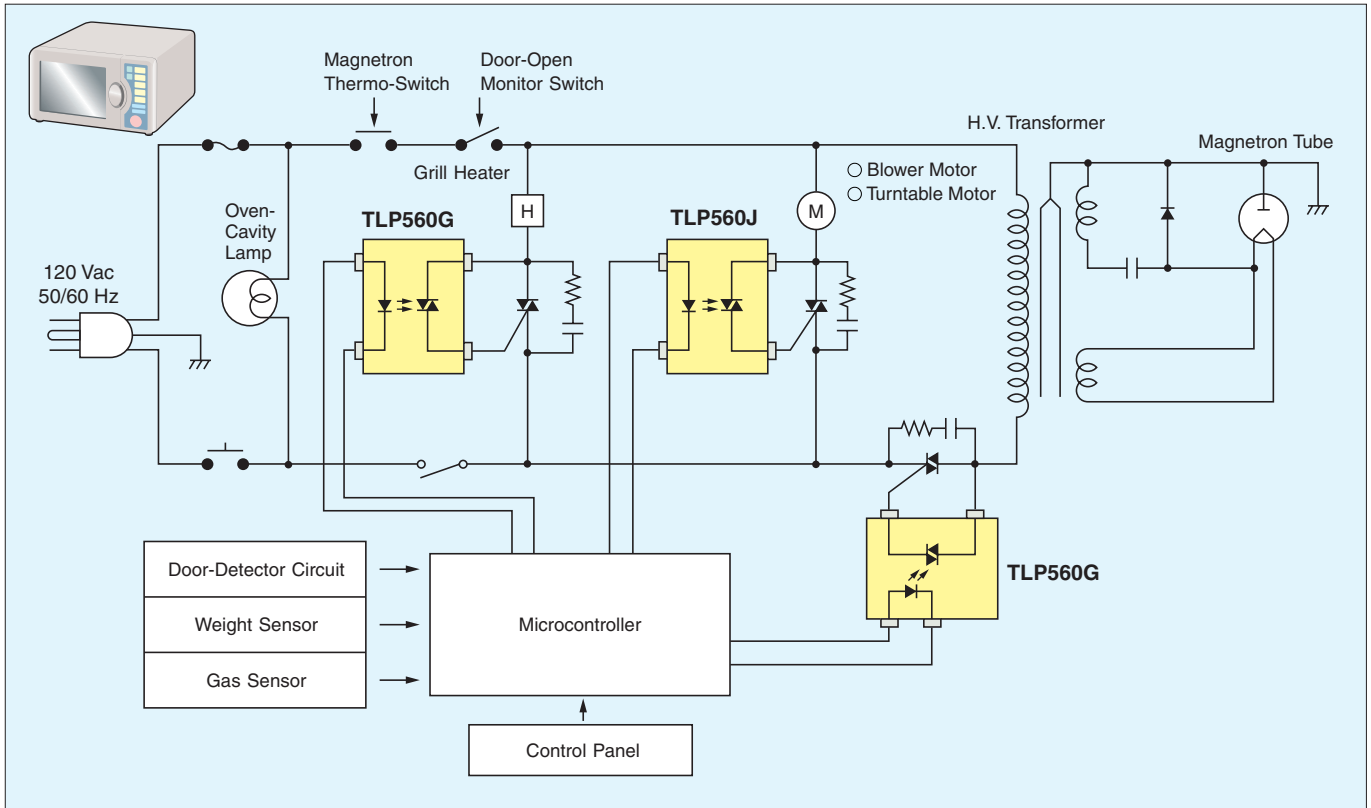
IGM Selection

Part Number	Package	BVs (Vrms)	Vo/Vcc	CTR	$ t_{PLH} - t_{PHL} $	CMH	CML
TLP109 (IGM)	SO6	3750	20 V / 30 V max	25% min 75% max @ $I_F = 10$ mA $V_{CC} = 4.5$ V $V_O = 0.4$ V	0.7 μ s max @ $I_F = 10$ mA $R_L = 20$ k Ω	10000 V / μ s min @ $I_F = 0$ mA $R_L = 20$ k Ω $V_{CM} = 1500$ Vp-p	– 10000 V / μ s min @ $I_F = 10$ mA $R_L = 20$ k Ω $V_{CM} = 1500$ Vp-p
TLP559 (IGM)	DIP8	2500					
TLP759 (IGM)	DIP8	5000					

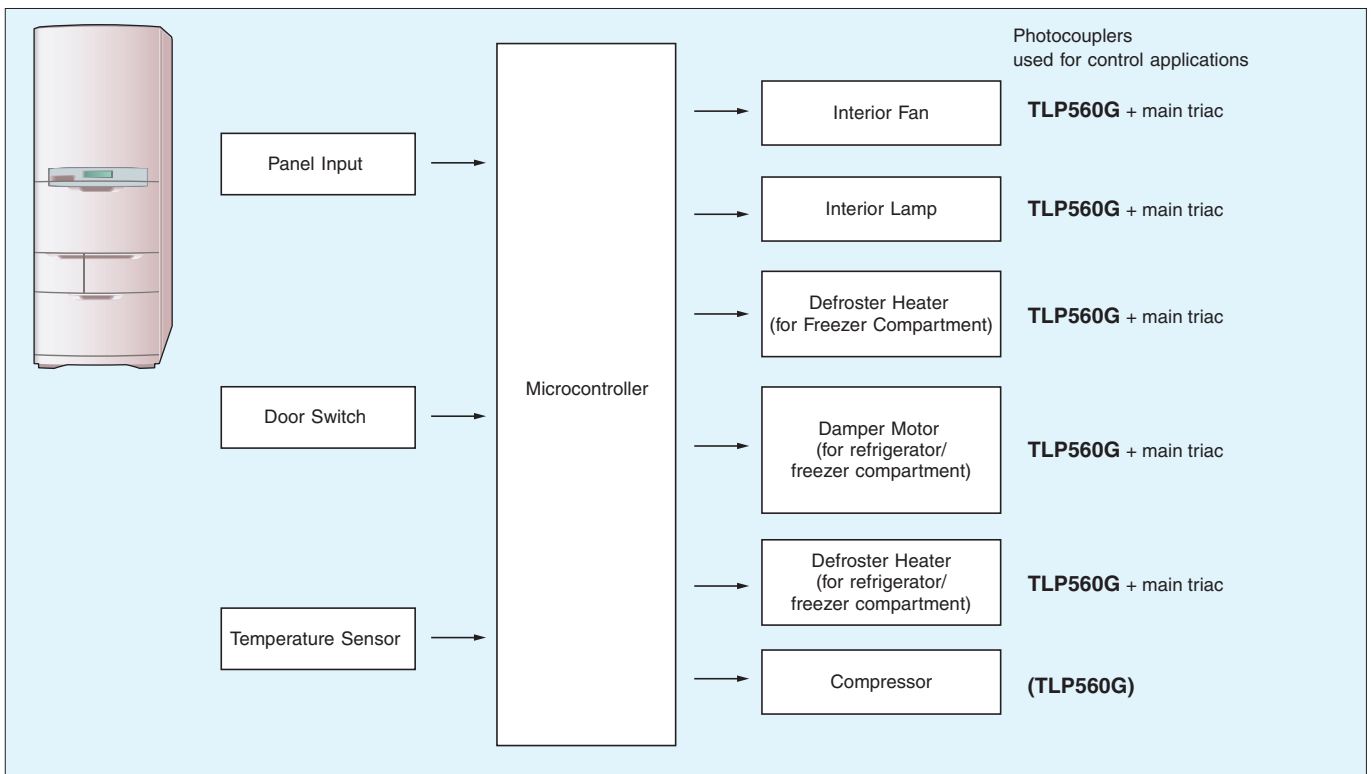
11 Photocoupler Application Circuit Examples

3 Home Appliance Applications

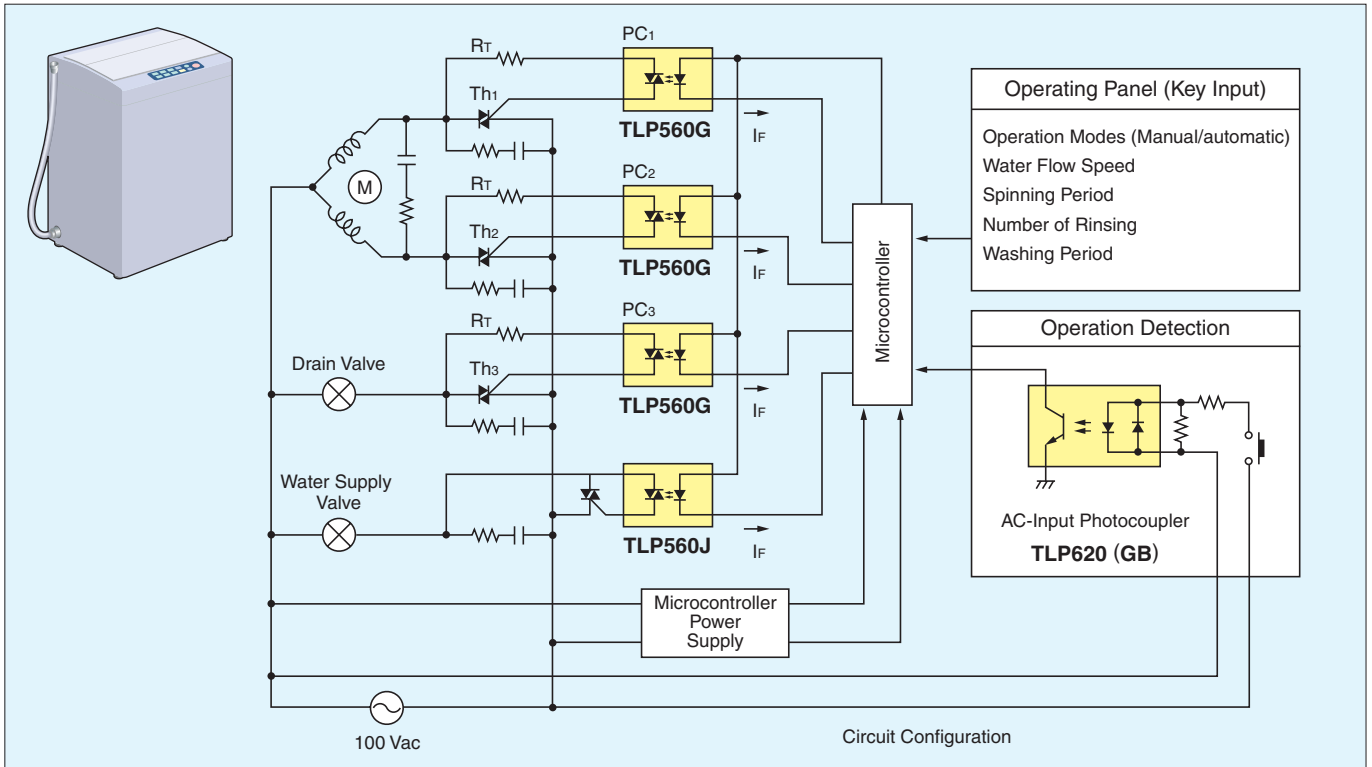
Electric Oven/Grills



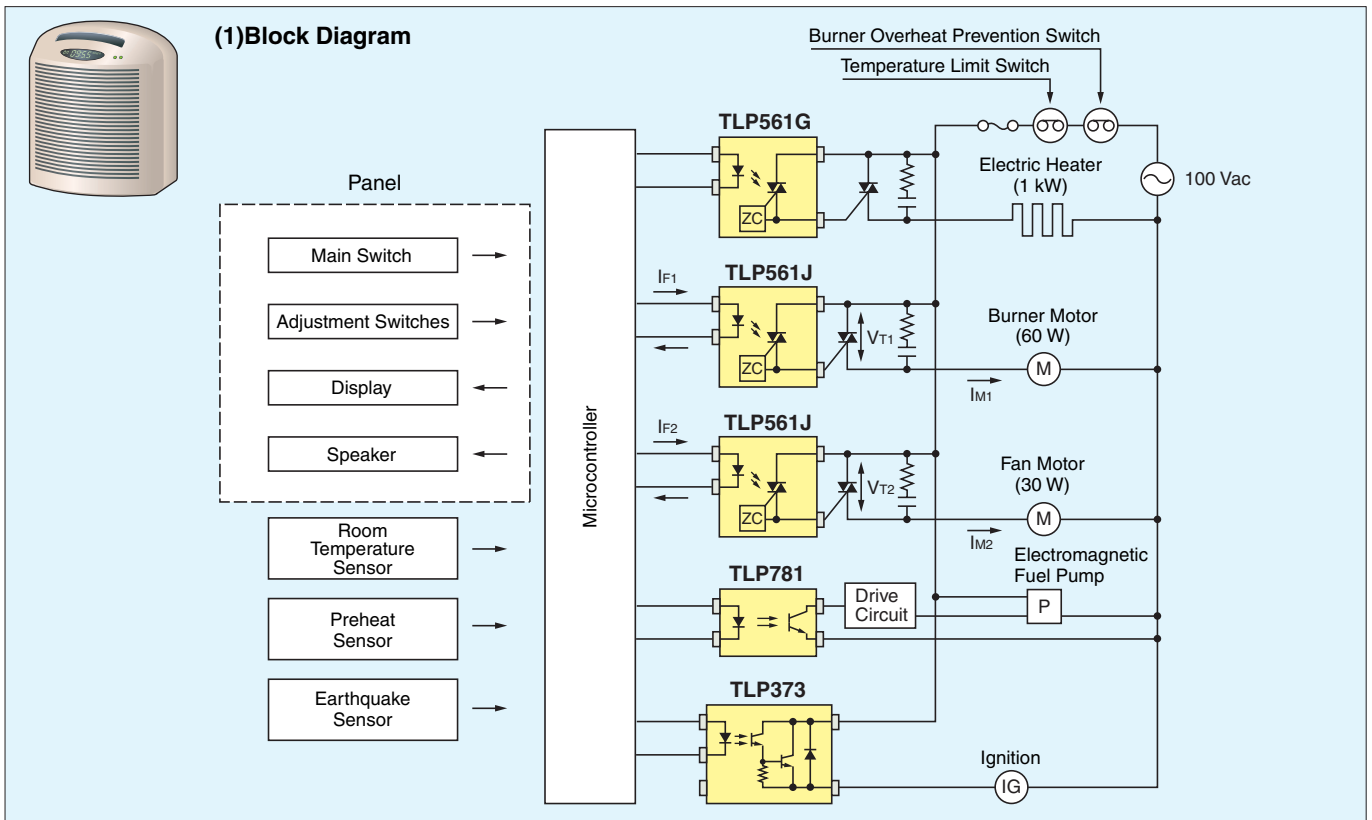
Refrigerator Block Diagram



Automatic Washing Machines



Fan Heaters

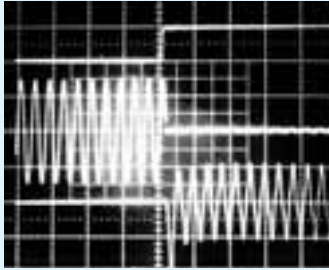


11 Photocoupler Application Circuit Examples

3 Home Appliance Applications (continued)

(2) Waveform Examples

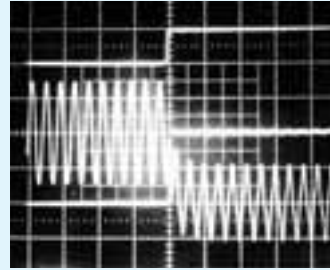
1. Example of Operating Waveform for Burner Motor



Trigger Point

waveforms {
 Top: IF1 20 mA/div
 Medium: VT1 100 V/div
 Bottom: IM1 1 A/div
 Horizontal: time 50 ms/div

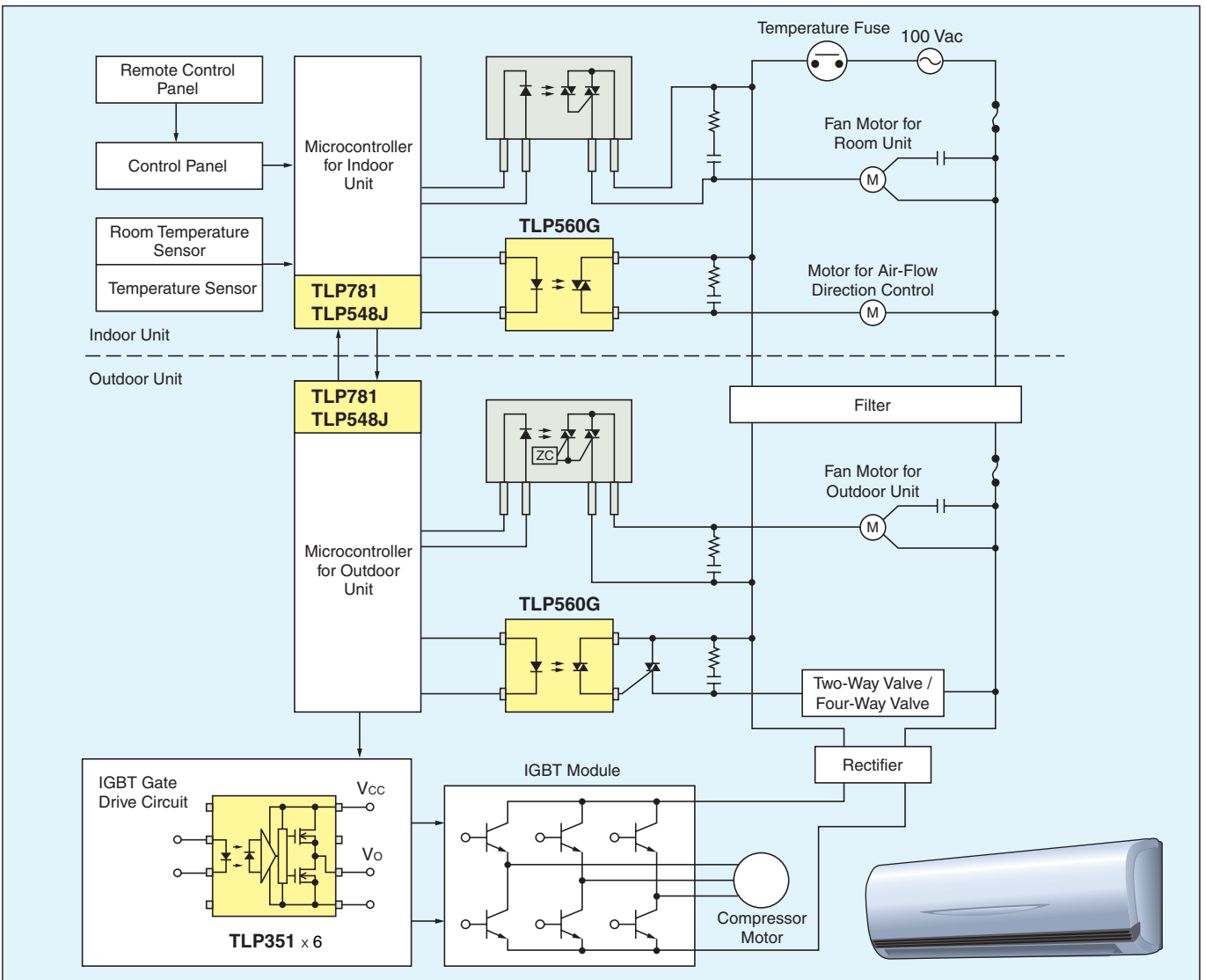
2. Example of Operating Waveform for Fan Motor



Trigger Point

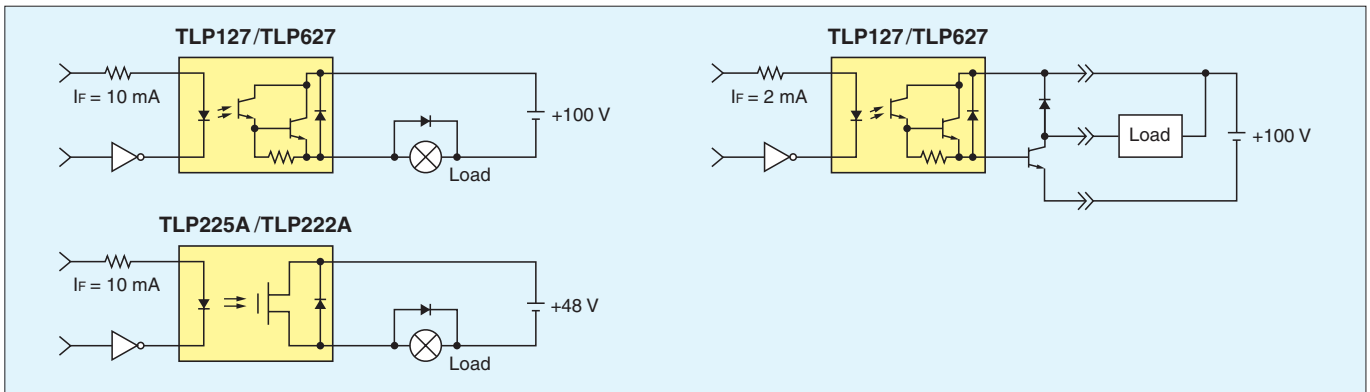
waveforms {
 Top: IF2 20 mA/div
 Medium: VT2 100 V/div
 Bottom: IM2 0.5 A/div
 Horizontal: time 50 ms/div

Inverter Air Conditioners

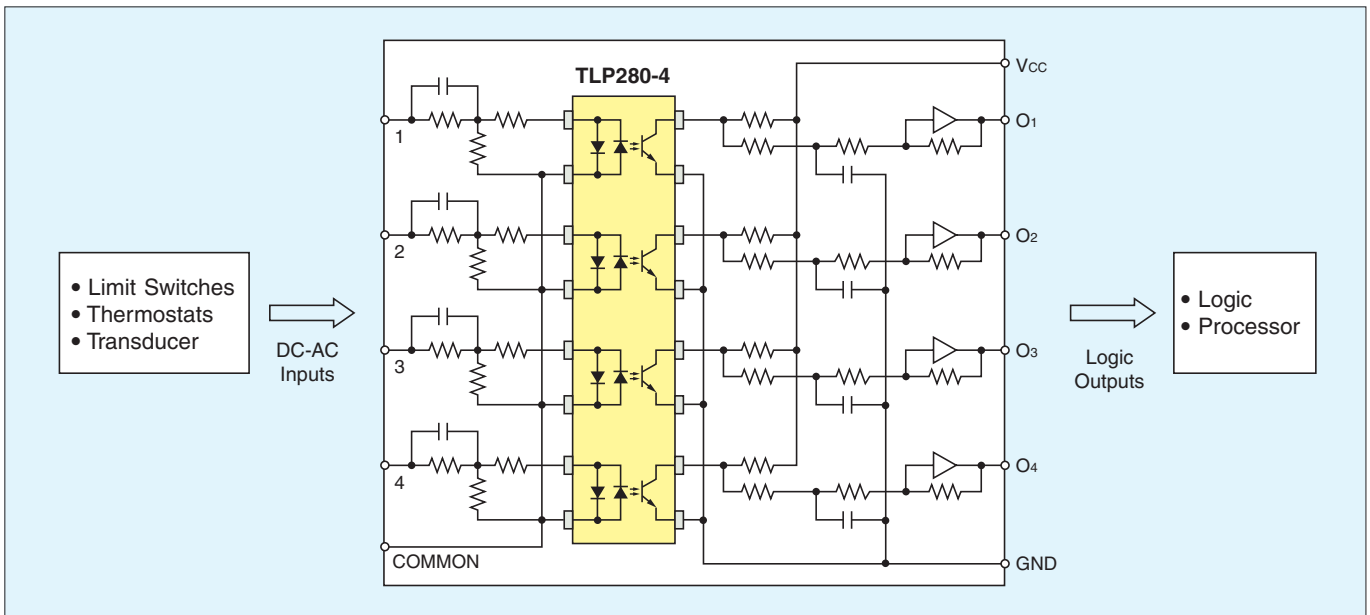


4 Programmable Controller Applications

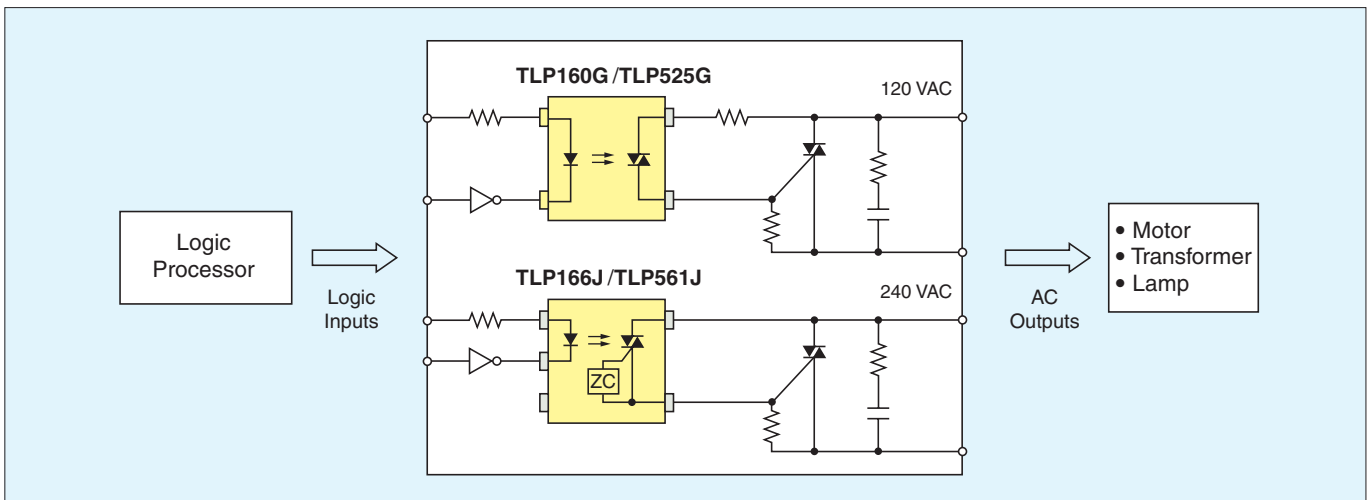
DC Output for Sequencers



AC Input for Sequencers



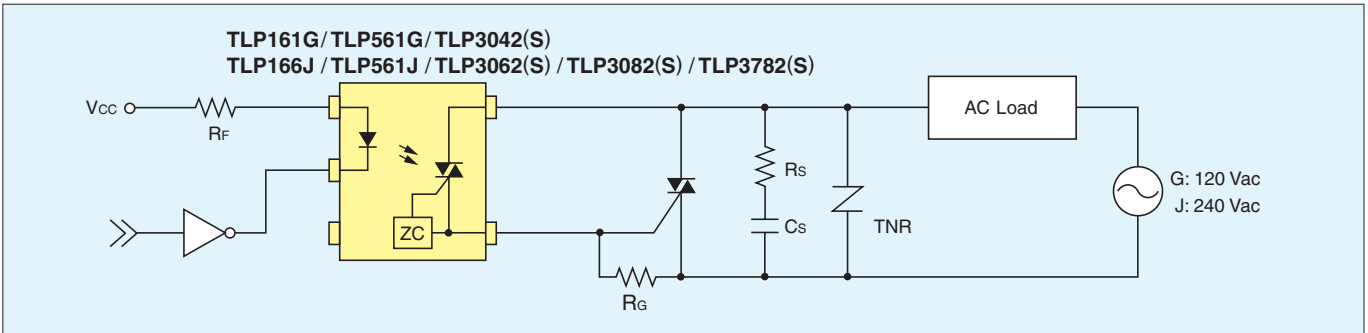
120-/240-Vac Output for Sequencers and Solid State Relays (SSRs)



11 Photocoupler Application Circuit Examples

5 SSR and Power Control Circuit Applications

Zero-Crossing Phototriac Output: TLP161G/TLP561G and Mini-Flat TLP161G/TLP166J



Lamp Load (1-A tungsten lamp)



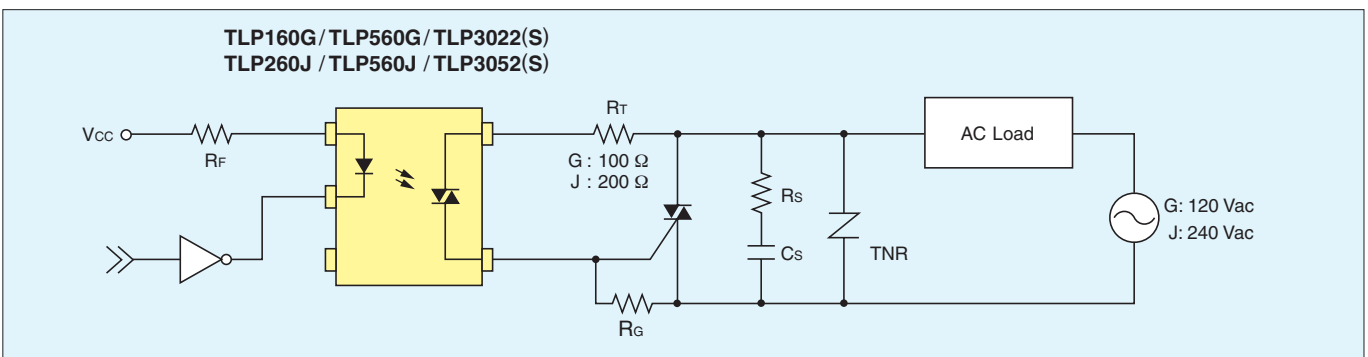
Waveforms { Top: I_F 20 mA/div
Medium: V_T 100 V/div
Bottom: I_T 5 A/div

L load (2.5-A pure inductive load)

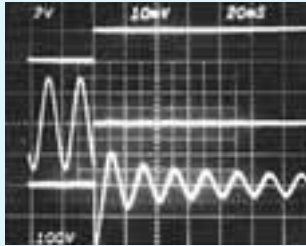


Recommended conditions { I_F = 20 mA
 R_G = 47 Ω
 R_S = 47 Ω , C_S = 0.033 μ F

Non-Zero Crossing Phototriac Output: TLP560G/TLP560J and Mini-Flat TLP160G/TLP260J

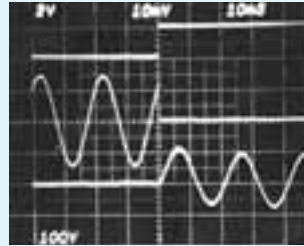


Lamp Load (1-A tungsten lamp)



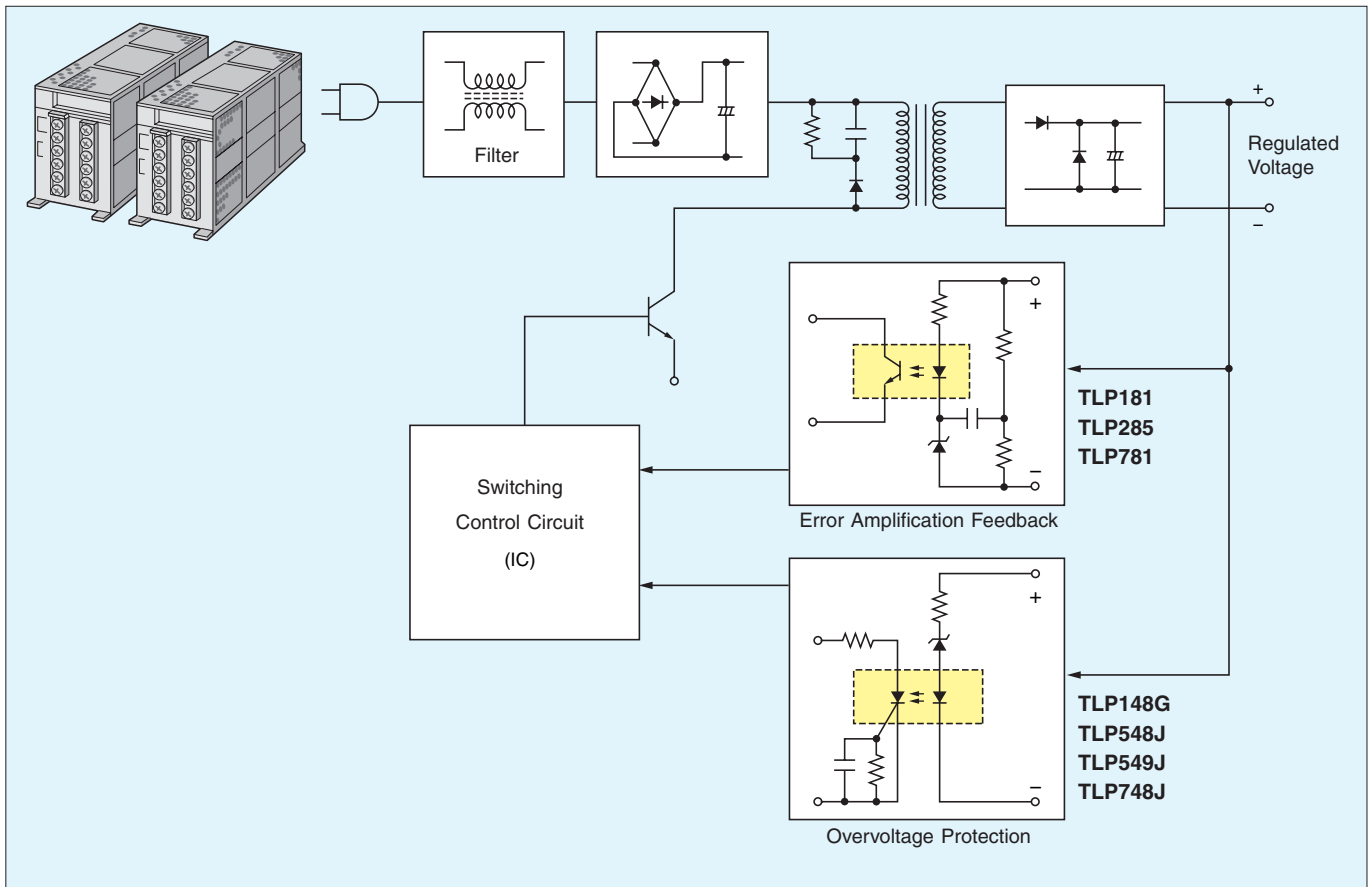
Waveforms { Top: I_F 20 mA/div
Medium: V_T 100 V/div
Bottom: I_T 5 A/div

L load (2.5-A pure inductive load)



Recommended conditions { I_F = 20 mA
 R_T = 100 Ω /200 Ω
 R_G = 47 Ω
 R_S = 47 Ω , C_S = 0.033 μ F

6 Switching Power Supply Circuit Application



■ Transistor Output (○: Approved, as of January 2010)

Part Number	Package Type	Isolation Voltage	Safety Standard Approvals				CTR (Ic / If) Rank (%)		
			UL 1577	BSI 7002(EN60950)	EN60747 (Note 1)	Nordic SEMKO	Min	Max	
TLP181/TLP285	MFSOP6/SOP4	3750 Vrms	○	○	○(Note 2)	○	No Rank (GB) Rank (Y) Rank (GR) Rank (BL) Rank (GRL) Rank (GRH) Rank	50	600
TLP781	DIP4	5000 Vrms	○*	○	○	○		100	600
								50	150
								100	300
								200	600
								100	200
TLP750 (high-speed)	DIP8	5000 Vrms	○	○	○	○	(O) Rank	19	—
							No Rank	10	—

■ Thyristor Output (○: Approved, as of January 2010)

Part Number	Package Type	Isolation Voltage	Safety Standard Approvals		IFT (mA)	VDRM (V)
			UL 1577	EN60747 (Note 1)		
TLP148G	MFSOP6	2500 Vrms	○		10	400
TLP548J	DIP6		○		7	600
TLP748J		4000 Vrms	○	○	10	600

Note 1: EN60747-approved with option (D4)

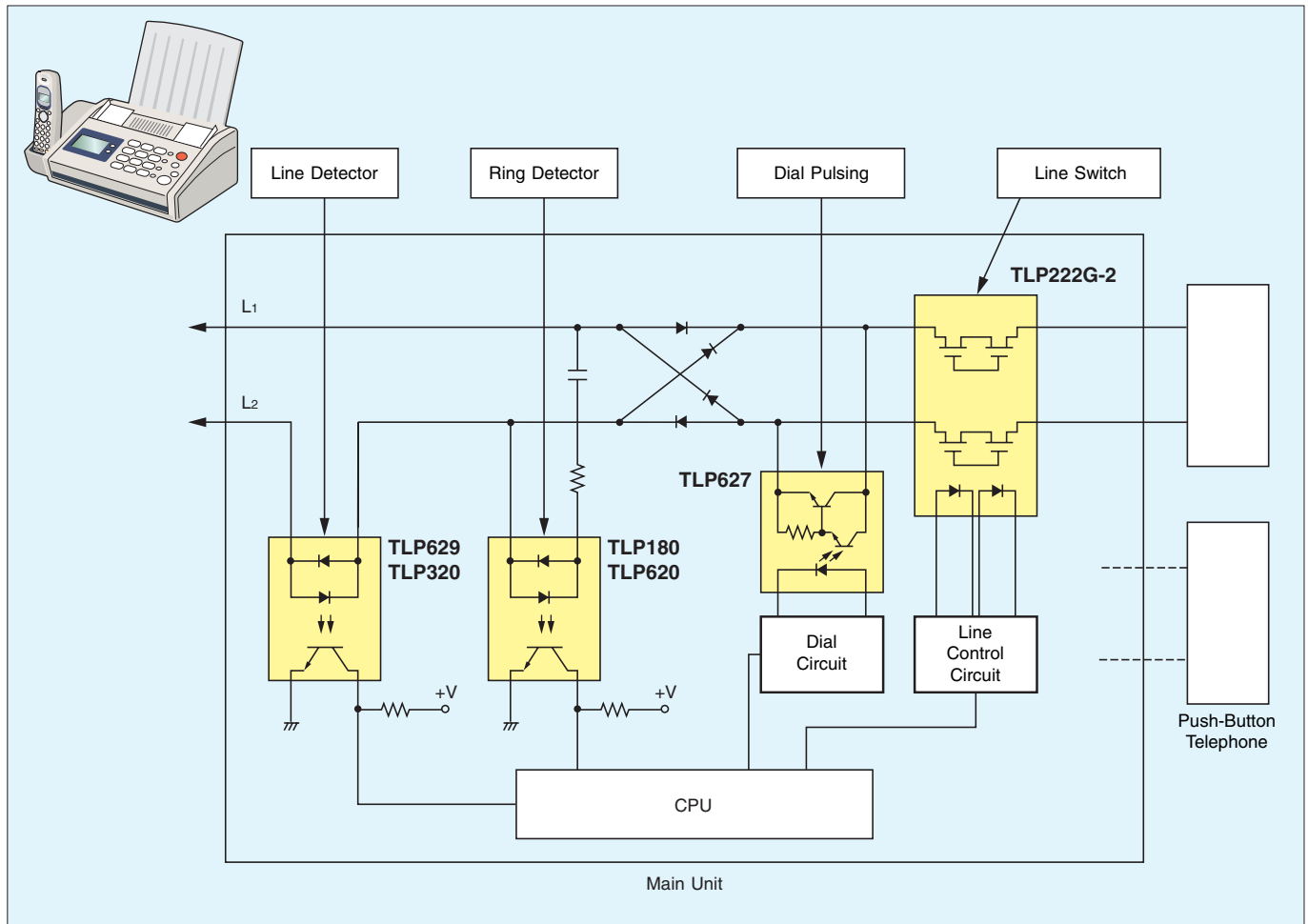
Note 2: The EN60747-5-2 safety standard for compact packages is different from those for standard DIP packages. Since the mini-flat package is a compact package, please contact your nearest Toshiba sales representative for more details.

*: Double protection

11 Photocoupler Application Circuit Examples

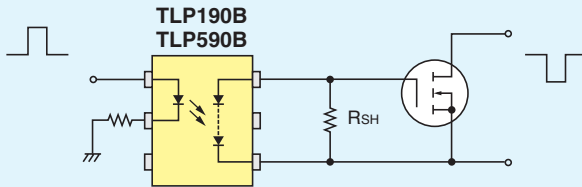
7 Push-Button Telephone Application

A variety of photocouplers are used to isolate between telephone lines (L1 and L2) and a CPU.

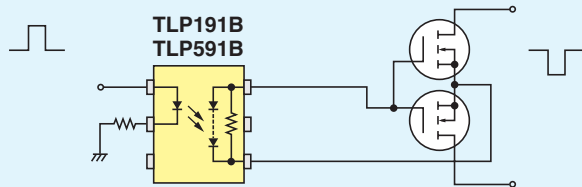


Application	Package Type	Part Number			Features	
		DC Input		AC Input		
Ring Detector	DIP4	TLP781			General single transistor output in compact packages Good cost performance	
	MFSOP6 SOP4	TLP181	TLP281	TLP285		TLP180 TLP280
Dial Pulsing	DIP4	TLP627			High-V _{CEO} (300 V) Darlington transistor output in compact packages Suitable to generate a pulse dial signal	
	MFSOP6	TLP127				
	DIP4	TLP628			High-V _{CEO} (350 V) single transistor output	
Line Detector	DIP4	TLP629		TLP320	High LED current rating = 150 mA Directly connectable to telephone lines	
Line Switch	DIP4	TLP222G*	TLP227G*		MOSFET-output photorelay with V _{OFF} = 400 V Crosspoint relay replacement (*: V _{OFF} = 350 V, **: V _{OFF} = 200 V)	
	DIP6	TLP592G*	TLP597G*			
	DIP8 (Dual)	TLP222G-2*	TLP227G-2*			
	2.54SOP4	TLP170G*	TLP176D**	TLP176G*		
	2.54SOP6	TLP192G*	TLP197G*			
	2.54SOP8 (Dual)	TLP200D**	TLP202G*	TLP206G*		

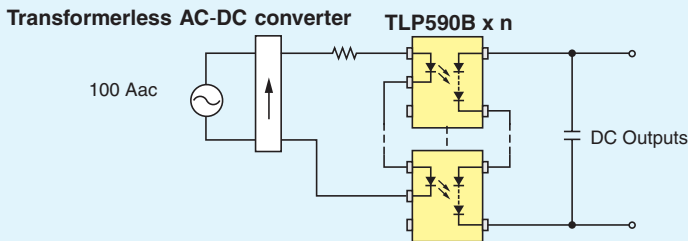
8 Photovoltaic Coupler Applications



This is the simplest power MOSFET drive circuit. The resistor R_{SH} for discharging the gate capacitor reduces turn-off time. R_{SH} is not required for the TLP591B, which has a built-in resistor. (T_{ON} , T_{OFF} \approx several ms)

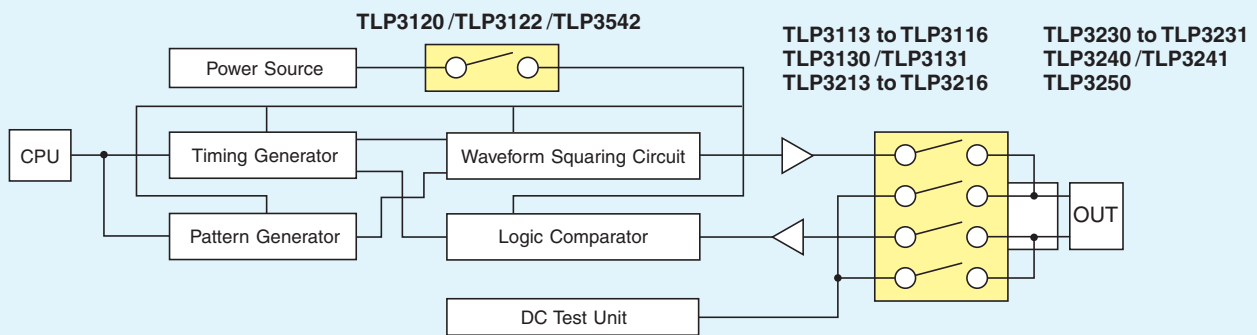


Both AC and DC drivers become possible by connecting power MOSFETs in a common-source configuration.

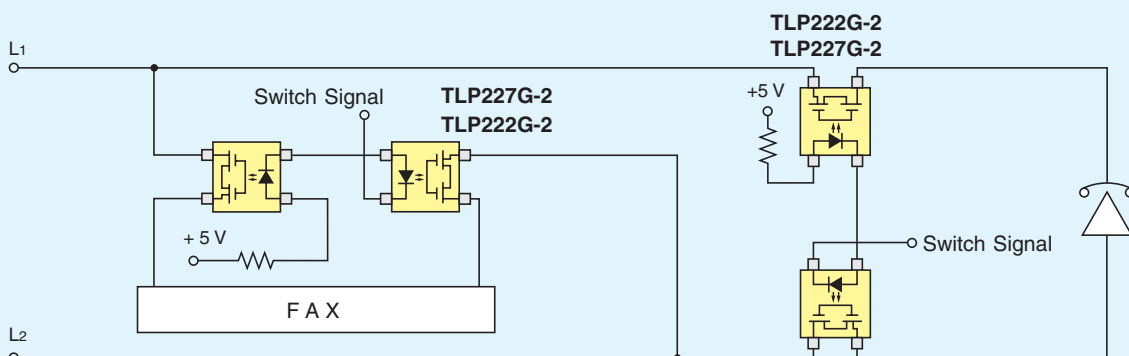


Photovoltaic couplers in a parallel-serial configuration convert AC power to DC without a transformer. This type of configuration requires tens to hundreds of photovoltaic couplers.

9 Photorelays for Tester Application



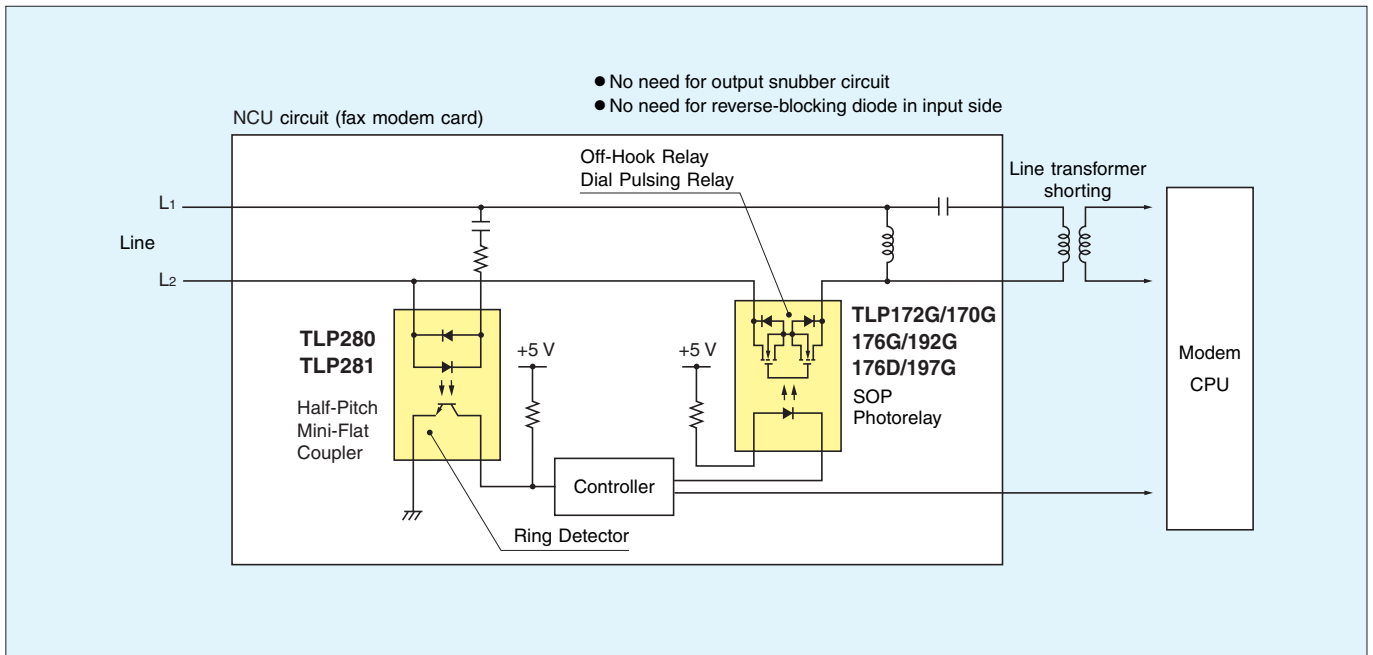
10 Photorelay (MOSFET Output) Application



Example of Terminal Switching Application

11 Photocoupler Application Circuit Examples

12 NCU Circuit (Fax Modem Card) Application



13 Competitor Part Number Cross Reference Search

The Toshiba Semiconductor webpage at <http://www.semicon.toshiba.co.jp/eng/product/opto/selection/coupler/xref/index.html> offers a cross reference search tool for photocouplers and photorelays.

TOSHIBA
Leading Innovation

Semiconductor Company

Product Introduction > Photocouplers/Photorelays > Cross Reference Search

Photocouplers/Photorelays Cross Reference Search

By entering a competitor's Photocoupler or Photorelay part number, you can find an equivalent part from Toshiba.

Cross Reference Search

Manufacturer: All Manufacturers Part Number: [Search]

Search

The information presented in this cross reference is based on TOSHIBA's selection criteria and should be treated as a suggestion only. Please carefully review the latest version of all relevant information on the TOSHIBA products including without limitation data sheets and validate all operating parameters of the TOSHIBA products to ensure that the suggested TOSHIBA products are truly compatible with your design and application.

Please note that this cross reference is based on TOSHIBA's estimate of compatibility with other manufacturer's products based on other manufacturer's published data, at the time the data was collected.

TOSHIBA is not responsible for any incorrect or incomplete information. Information is subject to change at any time without notice.

Top of this page

12 Competitor Cross Reference

NEC

Part Number	Toshiba Part Number
PS2501-1	TLP781
PS2561-1	TLP781
PS2571-1	TLP781
PS2581L1	TLP781F
PS2505-1	TLP620
PS2565-1	TLP620
PS2502-1	TLP627
PS2562-1	TLP627
PS2532-1	TLP627
PS2533-1	TLP627
PS2521-1	TLP629
PS2525-1	TLP320
PS2701-1	TLP181
PS2761-1	TLP181
PS2705-1	TLP180
PS2765-1	TLP180
PS2702-1	TLP127
PS2801-1	TLP281
PS2801-4	TLP281-4
PS2861-1	TLP281
PS2805-1	TLP280
PS2805-4	TLP280-4
PS2865-1	TLP280
PS8601	TLP759
PS8602	TLP759
PS9613	TLP759 (IGM)
PS8701	TLP109
PS8101	TLP109
PS9713	TLP109 (IGM)
PS9113	TLP109 (IGM)
PS9601	TLP554
PS9614	TLP554
PS9714	TLP118
PS9114	TLP118
PS9715	TLP118
PS9115	TLP118
PS9701	TLP118
PS7141-1A	TLP597GA
PS7141-2A	TLP227GA-2
PS7141-1B	TLP4597G
PS7141-2B	TLP4227G-2
PS7141-1C	TLP4006G
PS7341C-1A	TLP594G
PS7141C-2A	TLP224G-2
PS7241-1A	TLP176GA
PS7241-2A	TLP206GA
PS7241-1B	TLP4176G
PS7241-2B	TLP4206G
PS7241-1C	TLP4026G

Panasonic

Part Number	Toshiba Part Number
AQV210	TLP592G
AQV210E	TLP597G
AQV210EH	TLP797GA
AQV210S	TLP192G
AQV212	TLP592A
AQV212S	TLP197A
AQV214	TLP597GA
AQV214E	TLP597G
AQV214EH	TLP797GA
AQV214H	TLP797GA
AQV214S	TLP197GA
AQV215	TLP597A
AQV216	TLP797J
AQV217S	TLP197D
AQV410EH	TLP4592G
AQV414	TLP4592G
AQV414E	TLP4597G
AQV414S	TLP4197G
AQW210	TLP222G-2
AQW210S	TLP202G
AQW212	TLP222A-2
AQW214	TLP227GA-2
AQW214S	TLP206GA
AQW215	TLP222A-2
AQW217	TLP222G-2
AQW414	TLP4222G-2
AQW610S	TLP4026G
AQW614	TLP4007G
AQY210EH	TLP227G
AQY210LS	TLP174G
AQY210S	TLP174G
AQY214EH	TLP227G
AQY214S	TLP176GA
AQY410EH	TLP4227G
AQY414EH	TLP4227G
AQY414S	TLP4176G
AQY221N1S	TLP3113/TLP3116
AQY221N2S	TLP3113/TLP3116
AQY221R2V	TLP3215
AQY221N2V	TLP3216

Vishay

Part Number	Toshiba Part Number
SFH614A	TLP628
SFH615A	TLP781
SFH617A	TLP781
SFH618A	TLP624
TCET1100	TLP781
SFH690xT	TLP181
TCMT1100	TLP281
TCMT4100	TLP281-4
SFH628A	TLP620
K815P	TLP627
SFH612A	TLP627
SFH619A	TLP627
SFH655A	TLP627
SFH692AT	TLP127
TCED1100	TLP627
IL66	TLP371
IL66B	TLP372
IL255	TLP330

SHARP

Part Number	Toshiba Part Number
PC123	TLP781
PC817	TLP781
PC813	TLP620
PC815	TLP627
PC357NT	TLP181
PC354NT	TLP180
PC355NT	TLP127
PC3H7	TLP281
PC3H3	TLP280
PC3H21	TLP525G
PC410	TLP118
PC942	TLP351
PC923	TLP351
S2S3	TLP260J
S2S4	TLP161J
PR36MF11NSZ	TLP3506
PR36MF12NSZ	TLP3506
S21MD3V	TLP3051 (S)
S201D01	TLP3526
S201D02	TLP3527

Fairchild

Part Number	Toshiba Part Number
FOD617	TLP781
FOD814	TLP620
FOD815	TLP627
FOD817	TLP781
FOD852	TLP627
FODM3021	TLP160G
FODM3022	TLP160G
FODM3051	TLP160J
FODM3052	TLP160J
H11A617	TLP781
H11A817	TLP781
H11AA814	TLP620
H11B815	TLP627
HMA121	TLP181
HMA124	TLP124
HMA2701	TLP181
HMHA2801	TLP281
HMHA281	TLP281
HMAA2705	TLP180
HMHAA280	TLP280
H11A1	TLP631
H11AA1	TLP630
H11AG1	TLP331
H11B1	TLP571
H11C1	TLP541G
H11D1	TLP371
H11G1	TLP371
MOC3021-M	TLP3021 (S)
MOC3022-M	TLP3022 (S)
MOC3023-M	TLP3023 (S)
MOC3041-M	TLP3041 (S)
MOC3042-M	TLP3042 (S)
MOC3043-M	TLP3043 (S)
MOC3051-M	TLP3051 (S)
MOC3052-M	TLP3052 (S)
MOC3061-M	TLP3061 (S)
MOC3062-M	TLP3062 (S)
MOC3063-M	TLP3063 (S)

Avago

Part Number	Toshiba Part Number
HCPL-M600	TLP118
HCPL-M601	TLP118
HCPL-M611	TLP118
HCPL-M452	TLP109
HCPL-M453	TLP109
HCPL-M456	TLP109
HCPL-2601	TLP2601
HCPL-2611	TLP2601
HCPL-2201	TLP555
HCPL-2530	TLP2530
HCPL-2531	TLP2531
HCPL-2630	TLP2631
HCPL-2631	TLP2631
HCPL-3120	TLP350
HCPL-3140	TLP351
HCPL-3150	TLP351
HCPL-3180	TLP350
HCPL-314J	TLP701 x2
HCPL-4504	TLP559
HCPL-0708	TLP116A
HCPL-181	TLP181
HCPL-354	TLP180
HCPL-814	TLP620

LITEON

Part Number	Toshiba Part Number
LTV-123	TLP781
LTV-816	TLP781
LTV-817	TLP781
LTV-851	TLP628
LTV-356T	TLP181
LTV-357T	TLP181
LTV-814	TLP620
LTV-814H	TLP320
LTV-354T	TLP180
LTV-815	TLP627
LTV-852	TLP627
LTV-352T	TLP127
LTV-355T	TLP127
MOC3020	TLP3020 (S)
MOC3021	TLP3021 (S)
MOC3022	TLP3022 (S)
MOC3023	TLP3023 (S)
MOC3051	TLP3051 (S)
MOC3052	TLP3052 (S)
MOC3061	TLP3061 (S)
MOC3062	TLP3062 (S)
MOC3063	TLP3063 (S)

COSMO

Part Number	Toshiba Part Number
K1010	TLP781
K1020	TLP621-2
K2010	TLP631
K3010	TLP620
KP3020	TLP620-2
KP4010	TLP627
KP4020	TLP627-2
K5010	TLP371
K6010	TLP630
KPS2801	TLP281
KPC354NT	TLP180
KPC355NT	TLP127
KPC357NT	TLP181
KPC452	TLP127

Note: For details of equivalent devices such as electrical performance and package dimensions, please refer to the latest datasheets.

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