TOSHIBA

IGBT/Power MOSFET Gate Drive Photo-IC Couplers TLP250(INV)/TLP250F(INV)

NEW PRODUCT GUIDE

IGBT / POWER MOSFET GATE DRIVE PHOTO-IC COUPLERS
TLP250 (INV) / TLP250F (INV)

The Toshiba TLP250 (INV) and TLP250F (INV) are 8-pin photocouplers designed exclusively for use in IGBT (isolated-gate bipolar transistor) drive applications. These photocouplers are capable of driving the gates of IGBTs and power MOSFETs directly (for which the addition of a gate resistor is necessary).
The photo-IC couplers are housed in compact packages. This, combined with their ability to drive IGBTs and power MOSFETs directly, makes system design easier, allows simpler circuit configurations and improves system reliability.

Applications

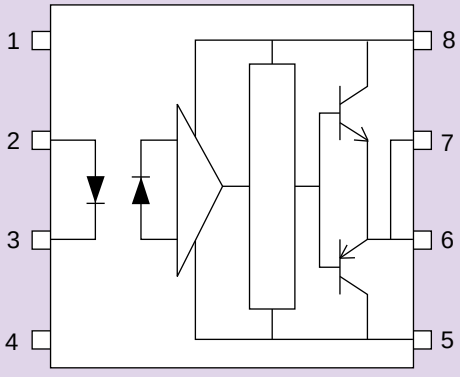
- IGBT gate drive
- Power MOSFET gate drive
- Inverter
- Servo motor control
- UPS
- Induction heater

Features

- Input threshold current: I_F = 5 mA (max)
- Supply voltage: 10 V ~ 35 V
- Output peak current: 2.0 A (max)
- Response speed: 0.5 μs (max)
- $|t_{pHL} - t_{pLH}|$: 0.4 μs (max)
- Isolation voltage: 2500 V_{rms} (min)
- UL-recognized
- D4 option type: VDE-approved

Note:
If a VDE0884-approved device is required, please specity option D4.

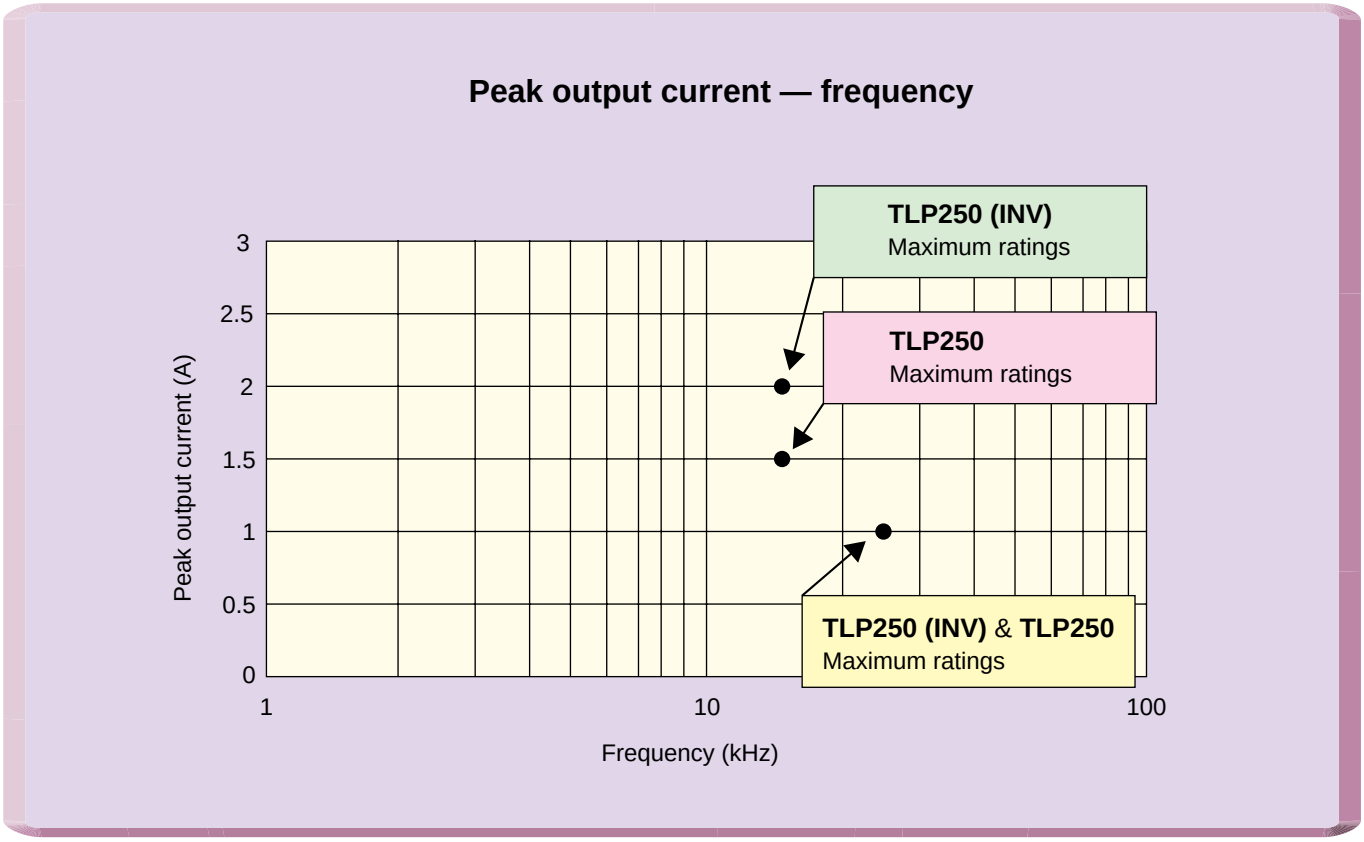
Pin Configuration



1: NC
2: LED ANODE
3: LED CATHODE
4: NC
5: GND
6: V_O (output)
7: V_O
8: V_{CC}

Truth Table

		Tr1	Tr2
LED	ON	ON	OFF
INPUT	OFF	OFF	ON



● TLP250 (INV) vs. TLP250

Parameter	Symbol	Conditions	**TLP250 (INV)**	**TLP250**	Unit
H-level Output Current	I_{OPH}	I_F = 10 mA, $V_{8\text{-}6}$ = 4 V V_{CC} = 30 V	1.0 (min)	0.5 (min)	A
L-Level Output Current	I_{OPL}	I_F = 0, $V_{6\text{-}5}$ = −2.5 V V_{CC} = 30 V	1.0 (min)	0.5 (min)	A
Switching Time Dispersion between ON and OFF	$\lvert t_{pHL} - t_{pLH} \rvert$	R_L = 20 Ω, C_L = 10 nF	0.45 (max)	— (max)	μs
Common Mode Transient Immunity for High-Level Output	CM_H	V_{CM} = 1000 $V_{p\text{-}p}$, I_F = 8 mA, V_{CC} = 30 V, Ta = 25 °C	15,000 (min)	5,000 (min)	V/μs
Common Mode Transient Immunity for Low-Level Output	CM_L	V_{CM} = 1000 $V_{p\text{-}p}$, I_F = 0 mA, V_{CC} = 30 V, Ta = 25 °C	15,000 (min)	5,000 (min)	V/μs

● UL-recognized: UL1577, File No. E67349

● Option (D4) type

VDE-approved: DIN VDE0884/16.92, Certificate No. 76823

	TLP250	**TLP250F***
Maximum Operating Insulation Voltage	630 Vpk	840 Vpk
Highest Permissible Over Voltage	4000 Vpk	6000 Vpk

	TLP250	**TLP250F***
Creepage distance	6.4 mm	8.0 mm
Clearance	6.4 mm	8.0 mm

Note:

When a VDE0884-approved device is required, please specify option D4.

* Making an application

Absolute Maximum ratings (Ta = 2.5°C)

	Parameter			Symbol	Rating	Unit
LED	Forward Current			I_F	20	mA
	Forward Current Derating (Ta ≥ 70°C)			$\Delta I_F / \Delta Ta$	−0.36	mA / °C
	Reverse Voltage			V_R	5	V
Detector	H Peak Output Current	(PW ≤ 2.5 μs, f = 15 kHz)	(Note 2)	I_{OPH}	−1.5	A
		(PW ≤ 1 μs, f = 15 kHz)	(Note 2)		−2.0	
	L Peak Output Current	(PW ≤ 2.5 μs, f = 15 kHz)	(Note 2)	I_{OPL}	+1.5	A
		(PW ≤ 1 μs, f = 15 kHz)	(Note 2)		+2.0	
	Output Voltage			V_O	35	V
	Output Voltage Derating (Ta ≥ 70°C)			$\Delta V_O / \Delta Ta$	−0.73	V / °C
	Supply Voltage			V_{CC}	35	V
	Supply Voltage Derating (Ta ≥ 70°C)			$\Delta V_{CC} / \Delta Ta$	−0.73	V / °C
Operating Frequency			(Note 3)	f	25	kHz
Operating Temperature Range				Topr	−20 ~ 85	°C
Storage Temperature Range				Tstg	−55 ~ 125	°C
Isolation Voltage (AC, 1 minute, R/H ≤ 60%, Ta = 25°C)				BVs	2500	V_{rms}

Note 2: Exponential Waveform
Note 3: Exponential Waveform, IOPH ≤ –1.0 A (≤ 2.5 μs), IOPL ≤ +1.0 A (≤ 2.5 μs)
Note 5: A ceramic capacitor (0.1 μF) should be connected between pin 8 and pin 5 to stabilize the operation of the high-gain linear amplifier. Failure to provide this bypass may impair the switching properties. The total lead length between capacitor and coupler should not exceed 1 cm.

Electrical Characteristics (Ta = –20° ~ 70°C unless otherwise specified)

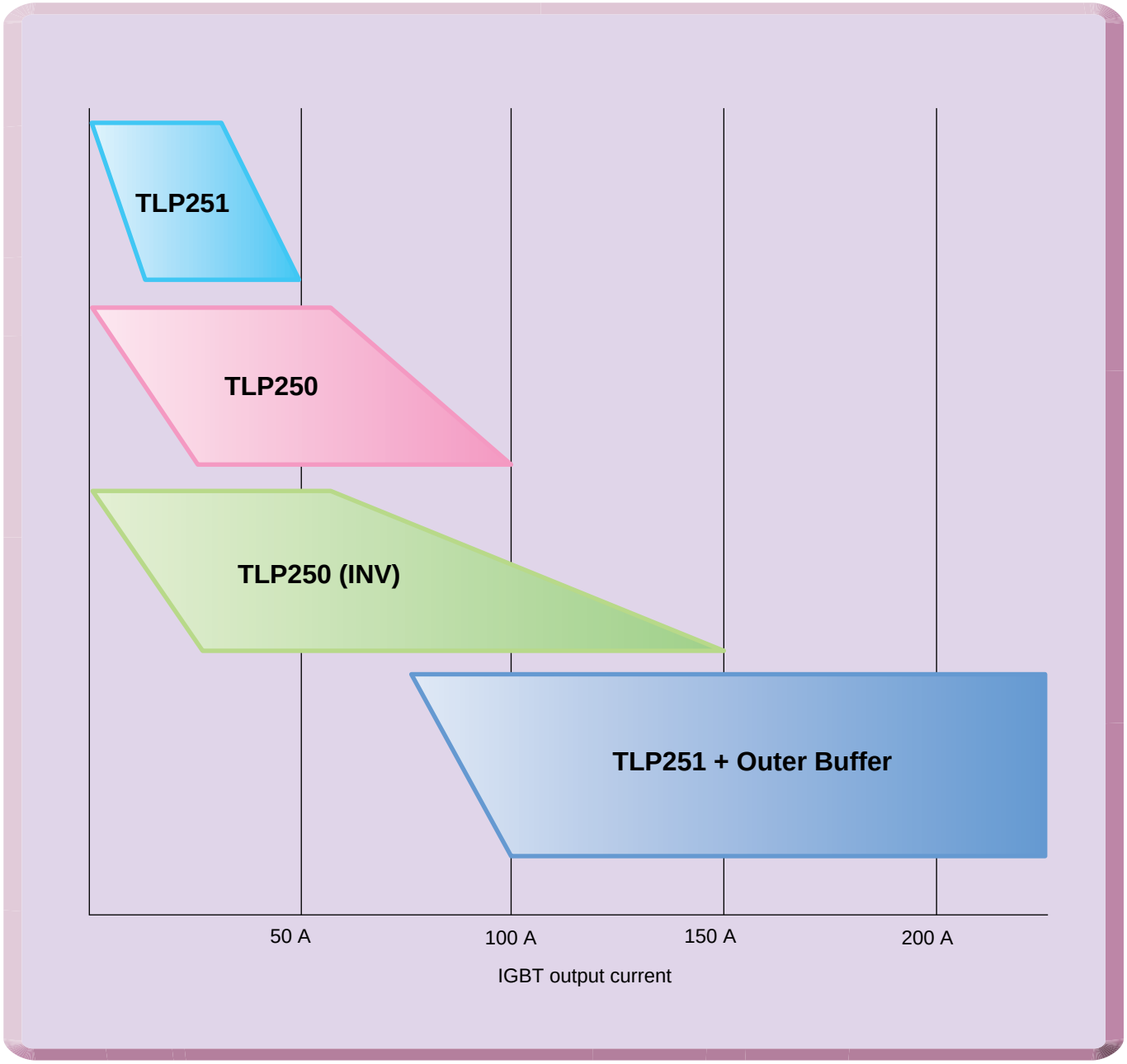
Parameter		Symbol	Conditions		Min	Typ.	Max	Unit
Input Forward Voltage		V_F	I_F = 10 mA, Ta = 25°C		—	1.6	1.8	V
Temperature Coefficient of Forward Voltage		$\Delta V_F / \Delta Ta$	I_F = 10 mA		—	−2.0	—	mV / °C
Input Reverse Voltage		I_R	V_R = 5 V, Ta = 25°C		—	—	10	μA
Output Current	H Level	I_{OPH}	V_{CC} = 30 V (*1)	I_F = 10 mA, V_{8-6} = 4 V	−0.5	−1.5	—	A
				TLP250 (INV)	−1.0	−1.5		
	L Level	I_{OPL}		I_F = 0, V_{6-5} = –2.5 V	0.5	2	—	
				TLP250 (INV)	1.0	2		
Output Voltage	H Level	V_{OH}	V_{CC} = 15 V, V_{EE} = –15 V, R_L = 200 Ω	I_F = 5 mA	11	12.8	—	V
	L Level	V_{OL}		V_F = 0.8 V	—	−14.2	−12.5	
Supply Current	H Level	I_{CCH}	V_{CC} = 30 V	I_F = 10 mA	—	7	11	mA
	L Level	I_{CCL}		V_F = 0.8 V	—	7.5	11	
Threshold Input Current	Output L → H	I_{FLH}	V_{CC1} = +15 V, V_{EE1} = –15 V, R_L = 200 Ω, V_O > 0 V		—	1.2	5	mA
Threshold Input Voltage	Output H → L	V_{FHL}	V_{CC1} = +15 V, V_{EE1} = –15 V, R_L = 200 Ω, V_O < 0 V		0.8	—	—	V
Supply Voltage		V_{CC}			10	—	35	V

* All typical values are at Ta = 25 °C (*1): Duration of I/O time ≦ 50 μs

Switching Characteristics

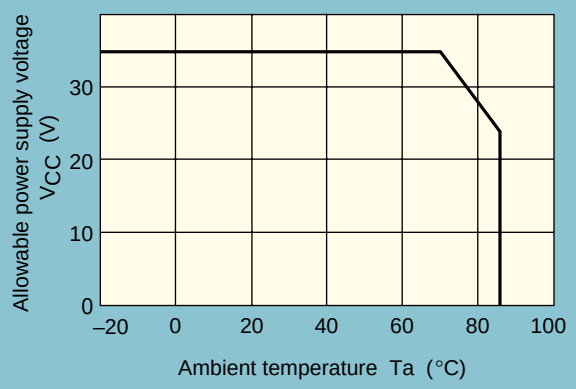
(Ta = –20° ~ 70°C unless otherwise specified)

Parameter		Symbol	Conditions	Min	Typ.	Max	Unit
Propagation Delay Time	L → H	t_{pLH}	I_F = 8 mA V_{CC} = 15 V, V_{EE} = –15 V, R_L = 20 Ω, C_L = 10 nF	0.05	0.15	0.5	µs
	H → L	t_{pHL}		0.05	0.15	0.5	
Switching Time Dispersion between ON and OFF		$\lvert t_{pHL} - t_{pLH} \rvert$		—	—	0.45	
Common Mode Transient Immunity for High-Level Output		CM_H	V_{CM} = 1000 V_{p-p}, I_F = 8 mA, V_{CC} = 30 V, Ta = 25 °C	15,000	—	—	V/µs
Common Mode Transient Immunity for Low-Level Output		CM_L	V_{CM} = 1000 V_{p-p}, I_F = 0 mA, V_{CC} = 30 V, Ta = 25 °C	15,000	—	—	V/µs



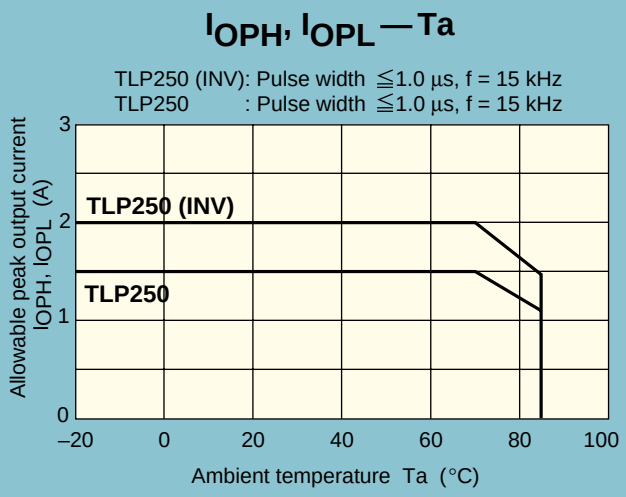
TLP250

V_{CC} — Ta



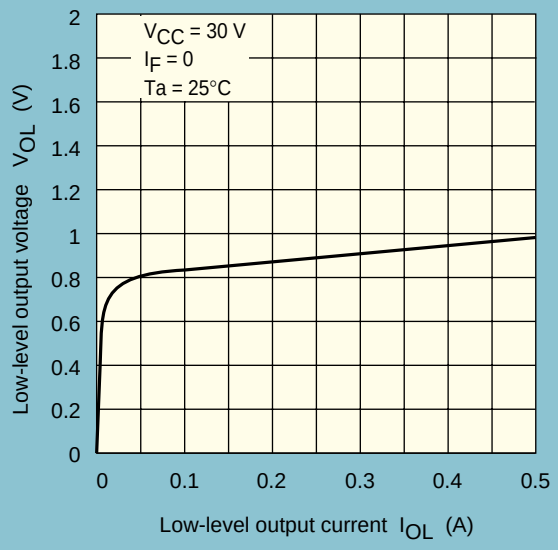
TLP250, TLP250 (INV)

I_{OPH}, I_{OPL} — Ta



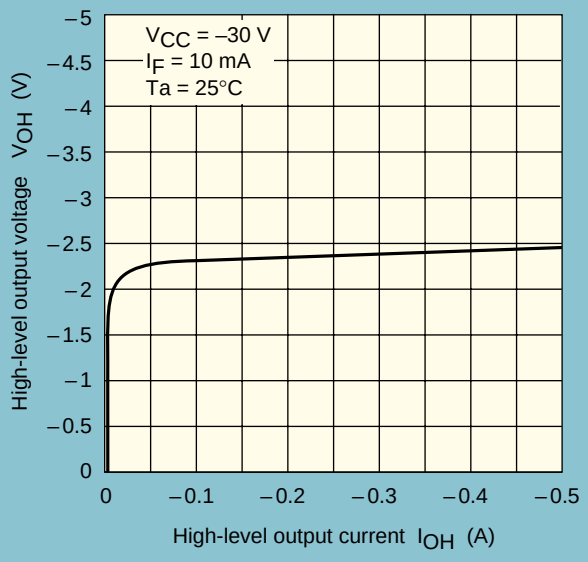
TLP250, TLP250 (INV)

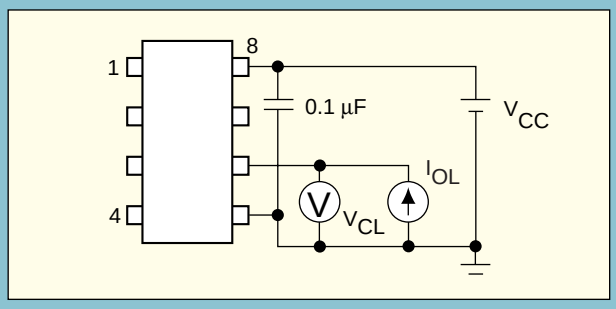
V_{OL} — I_{OL}

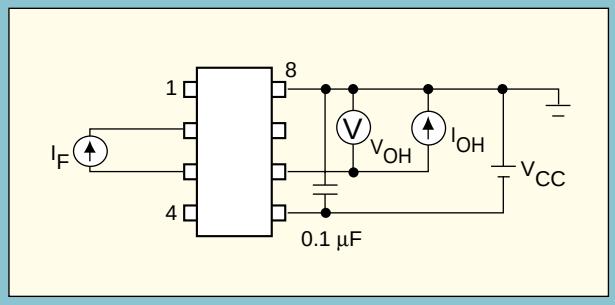


TLP250, TLP250 (INV)

V_{OH} — I_{OH}

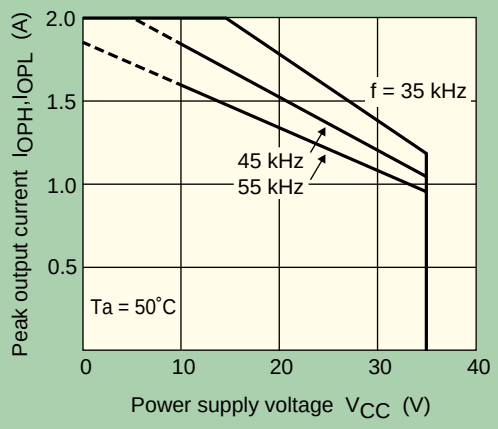




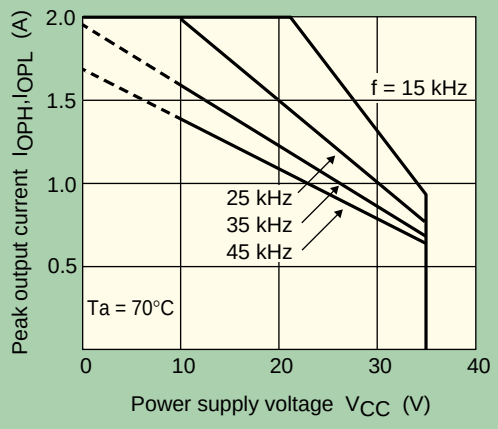


TLP250 (INV)

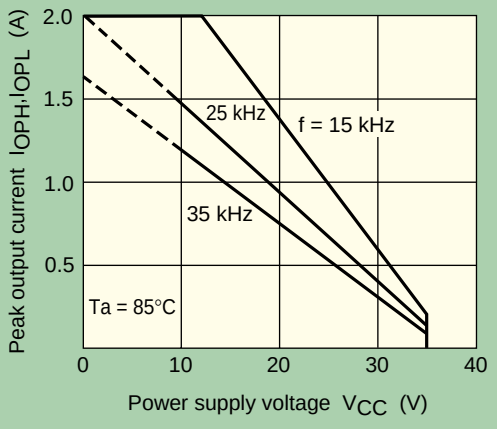
I_{OPH}, I_{OPL} — V_{CC}



I_{OPH}, I_{OPL} — V_{CC}

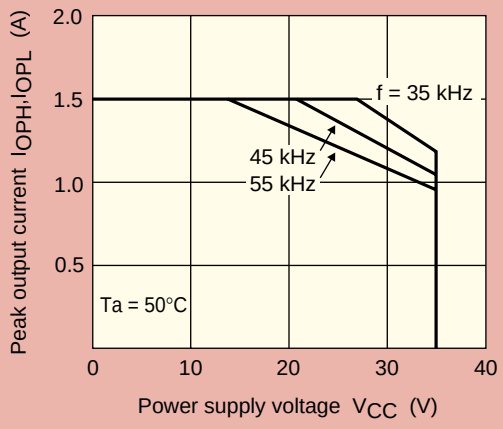


I_{OPH}, I_{OPL} — V_{CC}

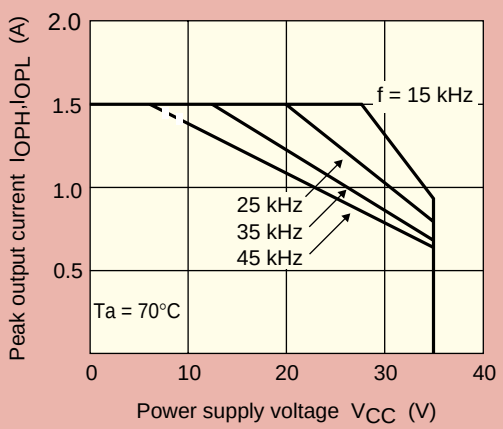


TLP250

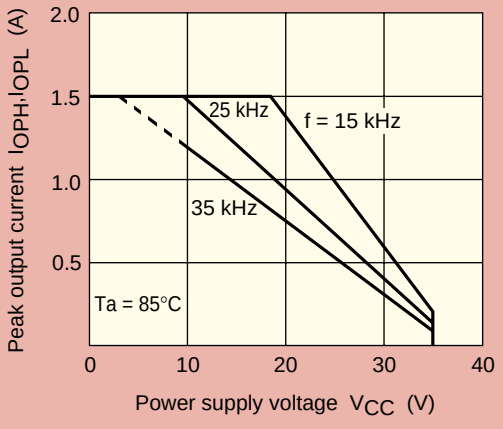
I_{OPH}, I_{OPL} — V_{CC}



I_{OPH}, I_{OPL} — V_{CC}



I_{OPH}, I_{OPL} — V_{CC}



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Website: http://doc.semicon.toshiba.co.jp/indexus.htm