

TOSHIBA

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

NEW PRODUCT GUIDE

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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

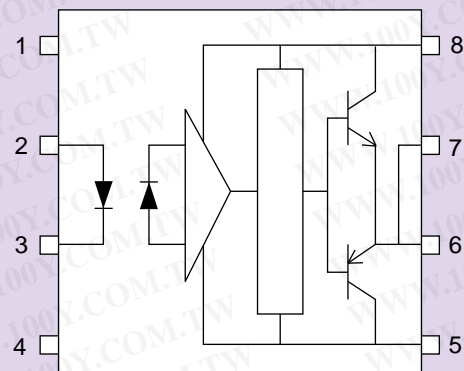
- IGBT gate drive
- Power MOSFET gate drive
- Inverter
- Servo motor control
- UPS
- Induction heater

Features

- Input threshold current: $I_F = 5 \text{ mA}$ (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 specify option D4.

Pin Configuration

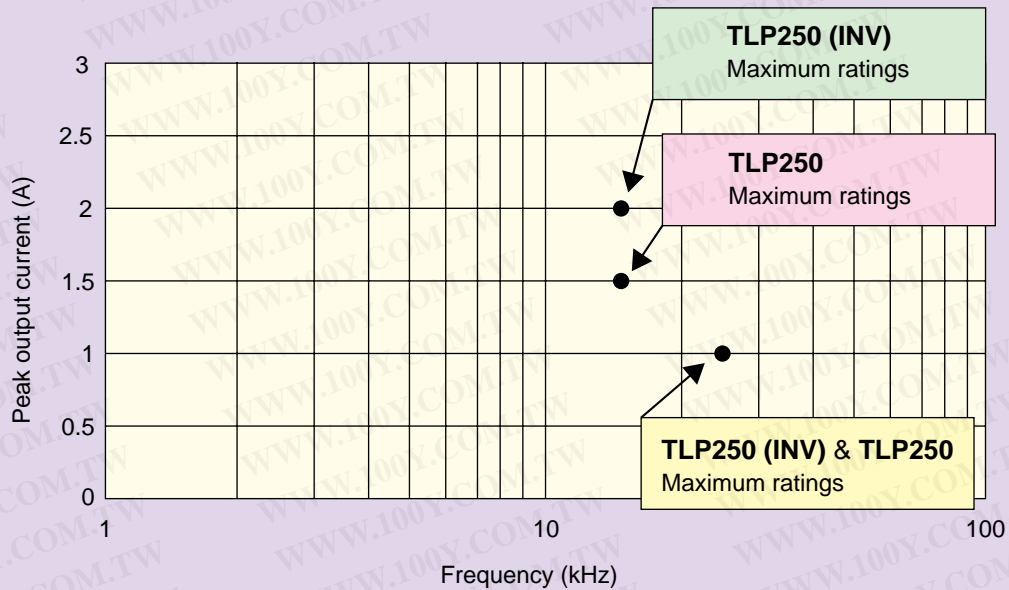


- 1: NC
- 2: LED ANODE
- 3: LED CATHODE
- 4: NC
- 5: GND
- 6: V_O (output)
- 7: V_O
- 8: V_{CC}

Truth Table

		Tr1	Tr2
LED	ON	ON	OFF
INPUT	OFF	OFF	ON

Peak output current — frequency



● TLP250 (INV) vs. TLP250

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

● 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 = 25°C)

Parameter		Symbol	Rating	Unit	
LED	Forward Current	I _F	20	mA	
	Forward Current Derating (Ta ≥ 70°C)	ΔI _F /ΔTa	-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)		ΔV _O /ΔTa	-0.73	V/°C
	Supply Voltage		V _{CC}	35	V
	Supply Voltage Derating (Ta ≥ 70°C)		ΔV _{CC} /ΔTa	-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, I_{OPH} ≤ -1.0 A (≤ 2.5 μs), I_{OPL} ≤ +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		ΔV _F /ΔTa	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}	V _{CC} = 30 V (*1)	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	
Supply Current	H Level	I _{CCH}	V _{CC} = 30 V	I _F = 10 mA	—	7	mA
	L Level	I _{CCL}		V _F = 0.8 V	—	7.5	
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

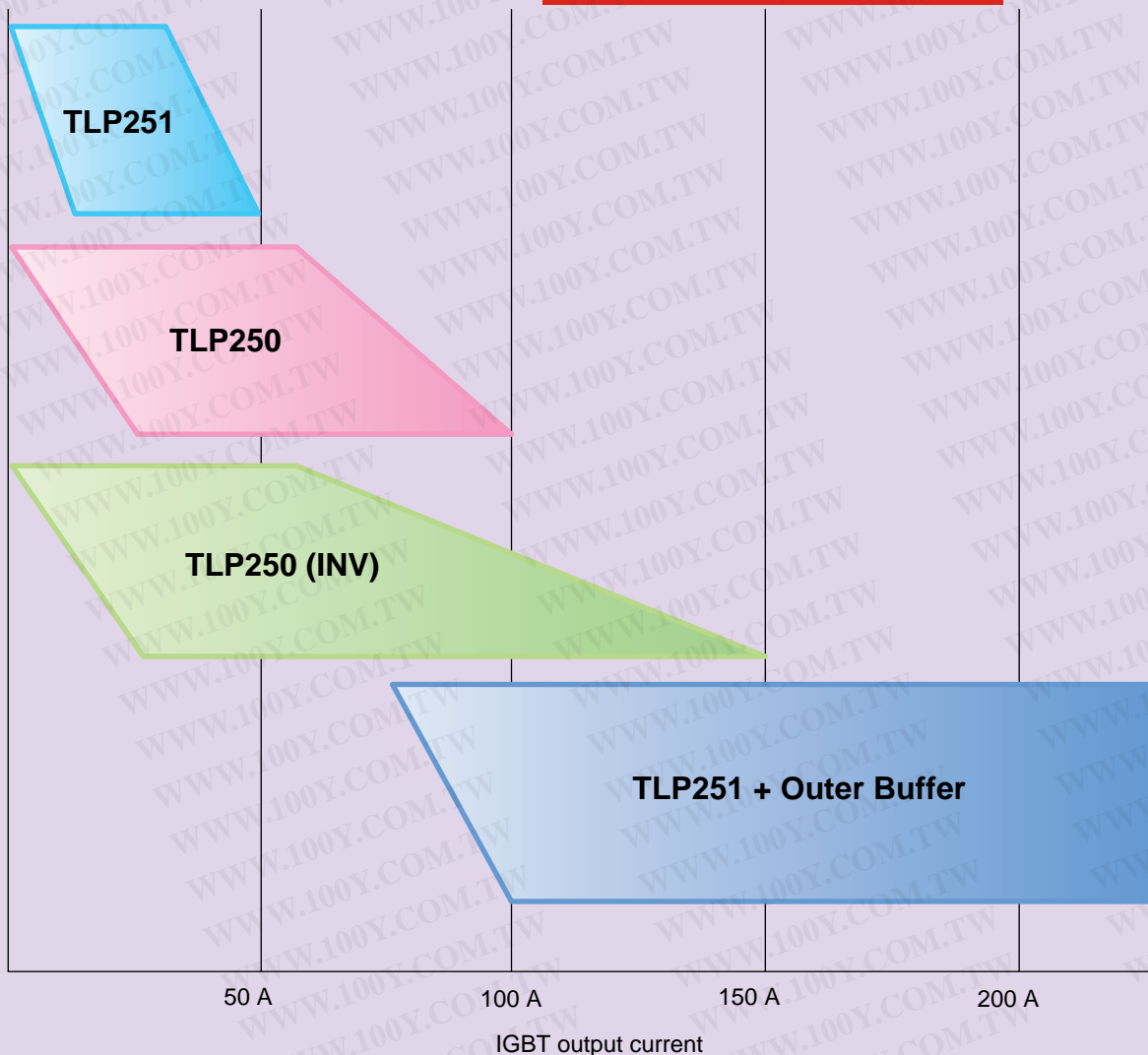
* All typical values are at Ta = 25°C (*1): Duration of I/O time ≤ 50 μs

Switching Characteristics

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

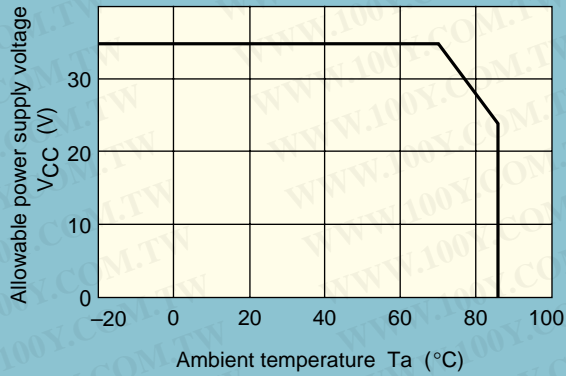
Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Propagation Delay Time	L → H	$I_F = 8 \text{ mA}$ $V_{CC} = 15 \text{ V}, V_{EE} = -15 \text{ V},$ $R_L = 20 \Omega, C_L = 10 \text{ nF}$	0.05	0.15	0.5	μs
	H → L		0.05	0.15	0.5	
Switching Time Dispersion between ON and OFF	$ \tau_{pHL} - \tau_{pLH} $		—	—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

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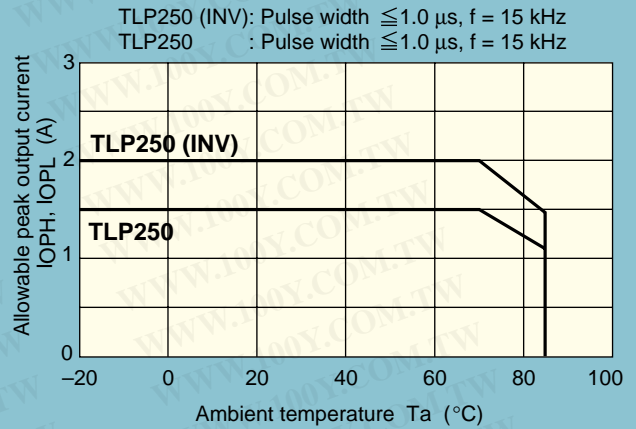
TLP250

$V_{CC} - T_a$



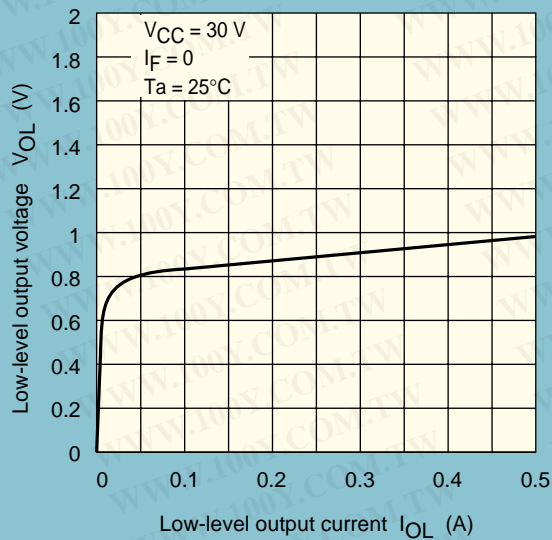
TLP250, TLP250 (INV)

$I_{OPH}, I_{OPL} - T_a$



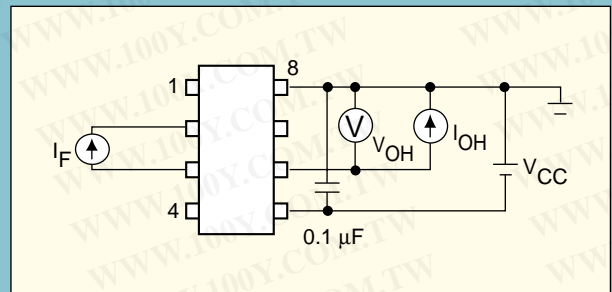
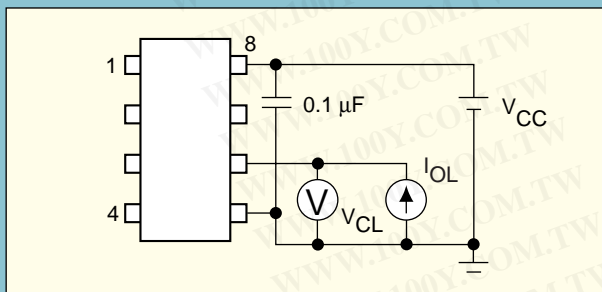
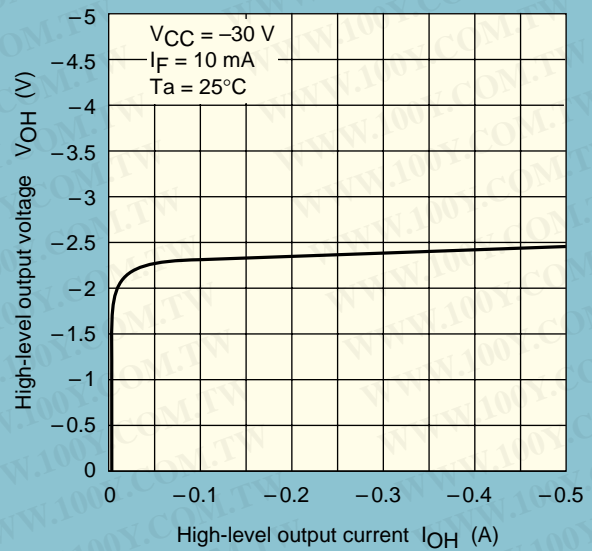
TLP250, TLP250 (INV)

$V_{OL} - I_{OL}$



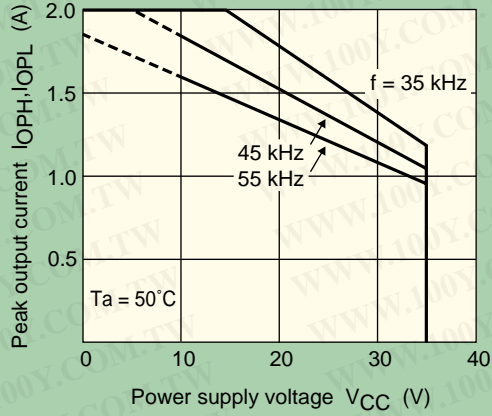
TLP250, TLP250 (INV)

$V_{OH} - I_{OH}$

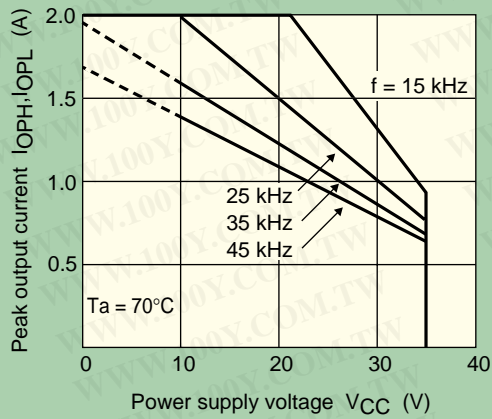


TLP250 (INV)

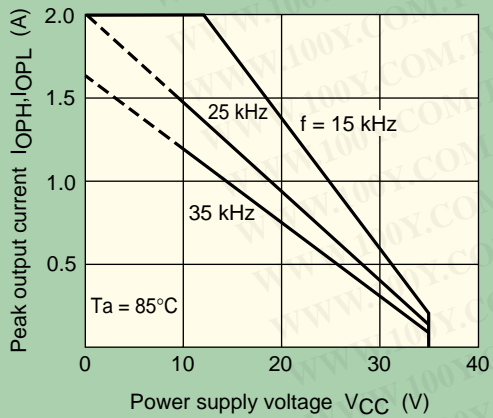
$I_{OPH}, I_{OPL} - V_{CC}$



$I_{OPH}, I_{OPL} - V_{CC}$

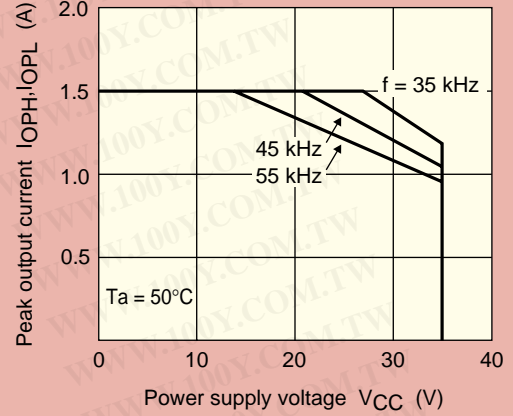


$I_{OPH}, I_{OPL} - V_{CC}$

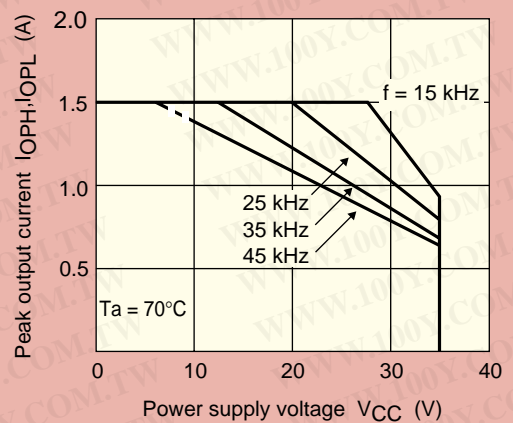


TLP250

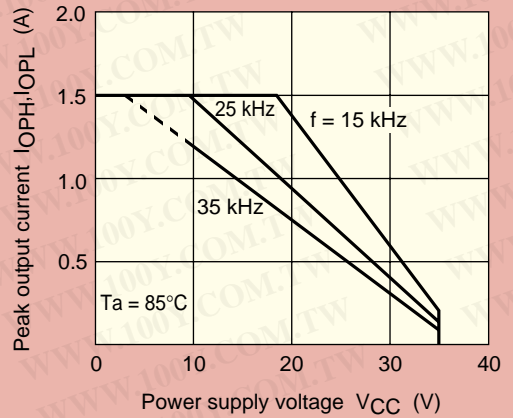
$I_{OPH}, I_{OPL} - V_{CC}$



$I_{OPH}, I_{OPL} - V_{CC}$



$I_{OPH}, I_{OPL} - V_{CC}$



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

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