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ACPL-227/ACPL-247

DC Input, Multi-Channel Half-Pitch Phototransistor Optocoupler

Data Sheet

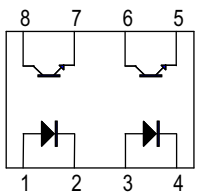
Description

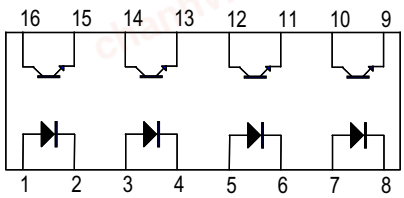
The ACPL-227 is a DC-input dual-channel half-pitch phototransistor optocoupler that contains two light-emitting diodes optically coupled to two separate phototransistors. It is packaged in an 8-pin SO package.

Likewise, the ACPL-247 is a DC-input quad-channel half-pitch phototransistor optocoupler that contains four light-emitting diodes optically coupled to four separate phototransistors. It is packaged in a 16-pin SO package.

For both devices, the input-output isolation voltage is rated at 3750V_{RMS}. Response time, t_r, is 2 µs typically, while minimum CTR is 50 percent at input current of 5 mA.

ACPL-227 and ACPL-247 Pin Layout





Pin 1	Anode
Pin 2	Cathode
Pin 3	Emitter
Pin 4	Collector

Pin 1, 3, 5, 7	Anode
Pin 2, 4, 6, 8	Cathode
Pin 9, 11, 13, 15	Emitter
Pin 10, 12, 14, 16	Collector

Features

- Current transfer ratio
  (CTR: 50% (min) at I_F = 5 mA, V_{CE} = 5V)
- High input-output isolation voltage
  (V_{ISO} = 3750V_{RMS})
- Non-saturated response time
  (t_r: 2 µs (typ) at V_{CC} = 10V, I_C = 2 mA, R_L= 100Ω)
- SO package
- CMR 10 kV/µs (typical)
- Safety and regulatory approvals
  - cUL
  - IEC/EN/DIN EN 60747-5-5
- Options available:
  - CTR Ranks 0, B, and C for ACPL-227 and Rank 0 only for ACPL-247

Applications

- I/O Interface for programmable controllers, computers
- Sequence controllers
- System appliances, measuring instruments
- Signal transmission between circuits of different potentials and impedances

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Ordering Information

ACPL-2x7-xxxx is UL Recognized with 3750V_{RMS} for 1 minute per UL1577 and Canadian Component Acceptance Notice #5.

Part Number	RoHS Compliant Option				Package	Number of Channels	Surface Mount	Tape and Reel	IEC/EN/DIN EN 60747-5-5	Quantity
	Rank 0 50% < CTR < 600%, I_F = 5 mA, V_{CE} = 5V	Rank 0 100% < CTR < 600%, I_F = 5 mA, V_{CE} = 5V	Rank B 130% < CTR < 260%, I_F = 5 mA, V_{CE} = 5V	Rank C 200% < CTR < 400%, I_F = 5 mA, V_{CE} = 5V						
ACPL-227	-500E		-50BE	-50CE	SO-8	Dual	X	X		2000 pcs per reel
	-560E		-56BE	-56CE	SO-8	Dual	X	X	X	2000 pcs per reel
ACPL-247		-500E			SO-16	Quad	X	X		2000 pcs per reel
		-560E			SO-16	Quad	X	X	X	2000 pcs per reel

To order, choose a part number from the part number column and combine with the desired option from the option column to form an order entry.

Example 1:

ACPL-227-56CE to order product of Dual Channel SO-8 Surface Mount package in Tape and Reel with IEC/EN/DIN EN 60747-5-5 Safety Approval, 200% < CTR < 400% and RoHS compliant.

Example 2:

ACPL-247-500E to order product of Quad Channel SO-16 Surface Mount package in Tape and Reel packaging with 100% < CTR < 600% and RoHS compliant.

Option data sheets are available. Contact your Broadcom sales representative or authorized distributor for information.

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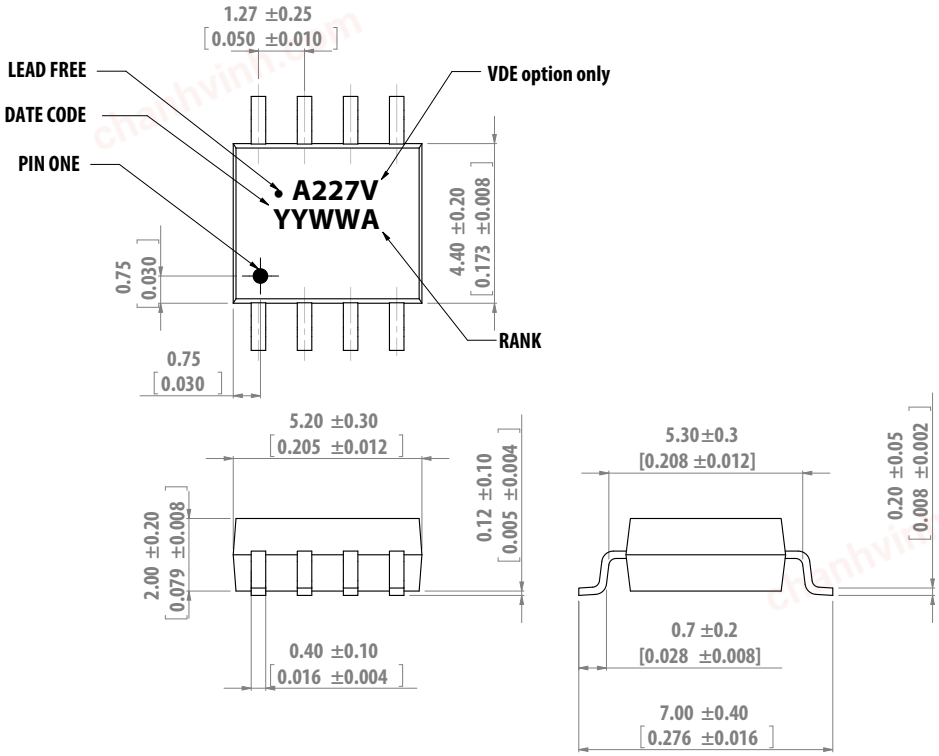
Package Outline Drawings

ACPL-227 PACKAGE OUTLINE



DIMENSIONS IN MILLIMETERS [INCHES]

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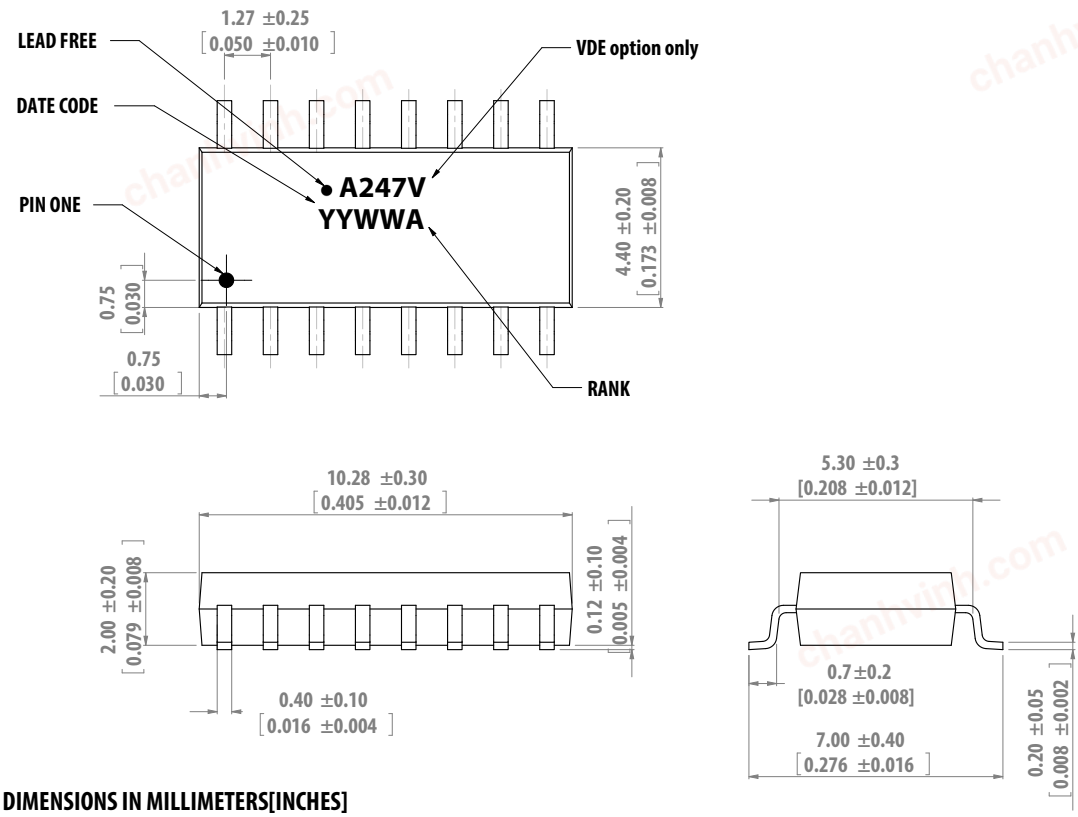
ACPL-247 PACKAGE OUTLINE



DIMENSIONS IN MILLIMETERS[INCHES]

Solder Reflow Temperature Profile

Recommended reflow condition as per JEDEC Standard, J-STD-020 (latest revision). Non-Halide Flux should be used.

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Absolute Maximum Ratings

Parameter	Symbol	ACPL-227	ACPL-247	Unit	Note
Storage Temperature	T_S	–55~125		°C	
Operating Temperature	T_A	–55~110		°C	
Average Forward Current	$I_{F(AVG)}$	50		mA	
Pulse Forward Current	I_{FSM}	1		A	
Reverse Voltage	V_R	6		V	
LED Power Dissipation (1 channel)	P_I	65		mW	
Collector Current	I_C	50		mA	
Collector-Emitter Voltage	V_{CEO}	80		V	
Emitter-Collector Voltage	V_{ECO}	7		V	
Isolation Voltage (AC for 1 minute, R.H. 40%~60%)	V_{ISO}	3750		V_{RMS}	1 minute
Collector Power Dissipation (1 channel)	P_C	150	100	mW	
Total Power Dissipation	P_{TOT}	200	170	mW	
Lead Solder Temperature	260°C for 10 seconds				

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Electrical Specifications

Over recommended ambient temperature at 25°C unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	Note
Forward Voltage	V_F	—	1.2	1.4	V	I_F = 20 mA	Figure 6
Reverse Current	I_R	—	—	10	µA	V_R = 5V	
Terminal Capacitance	C_t	—	30	—	pF	V = 0, f = 1 MHz	
Collector Dark Current	I_{CEO}	—	—	100	nA	V_{CE} = 48V, I_F = 0 mA	Figure 12
Collector-Emitter Breakdown Voltage	BV_{CEO}	80	—	—	V	I_C = 0.5 mA, I_F = 0 mA	
Emitter-Collector Breakdown Voltage	BV_{ECO}	7	—	—	V	I_E = 100 µA, I_F = 0 mA	
Current Transfer Ratio (ACPL-227 Only)	CTR	50	—	600	%	I_F = 5 mA, V_{CE} = 5V	CTR = (I_C / I_F) × 100%
Current Transfer Ratio (ACPL-247 Only)	CTR	100	—	600	%	I_F = 5 mA, V_{CE} = 5V	CTR = (I_C / I_F) × 100%
Saturated CTR	$CTR_{(sat)}$	—	60	—	%	I_F = 1 mA, V_{CE} = 0.4V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	0.4	V	I_F = ±8 mA, I_C = 2.4 mA	Figure 14
Isolation Resistance	R_{iso}	5×10^{10}	1×10^{11}	—	Ω	DC500V, R.H. 40%~60%	
Floating Capacitance	C_F	—	0.6	1	pF	V = 0, f = 1 MHz	
Cut-off Frequency (–3 dB)	F_C	—	80	—	kHz	V_{CC} = 5V, I_C = 2 mA, R_L = 100Ω	Figure 2, Figure 19
Response Time (Rise)	t_r	—	2	—	µs	V_{CC} = 10V, I_C = 2 mA, R_L = 100Ω	Figure 1
Response Time (Fall)	t_f	—	3	—	µs		
Turn-on Time	t_{on}	—	3	—	µs		
Turn-off Time	t_{off}	—	3	—	µs		
Turn-ON Time	t_{ON}	—	2	—	µs	V_{CC} = 5V, I_F = 16 mA, R_L = 1.9 kΩ	Figure 1, Figure 17
Storage Time	T_S	—	25	—	µs		
Turn-OFF Time	t_{OFF}	—	40	—	µs		
Common Mode Rejection Voltage	CMR	—	10	—	kV/µs	T_A = 25°C, R_L = 470Ω, V_{CM} = 1.5 kV(peak), I_F = 0 mA, V_{CC} = 9V, V_{np} = 100 mV	Figure 20

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Figure 1 Switching Time Test Circuit

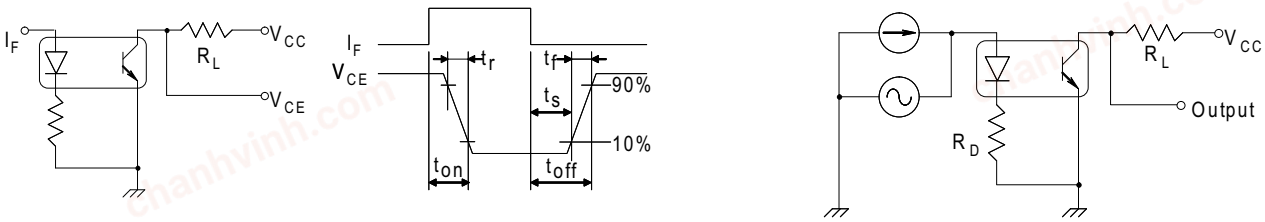

Figure 2 Frequency Response Test Circuit

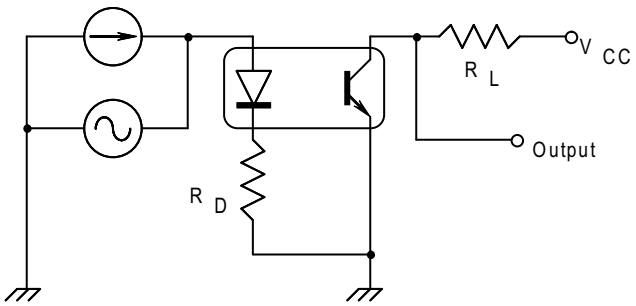

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Figure 3 Forward Current vs. Ambient Temperature

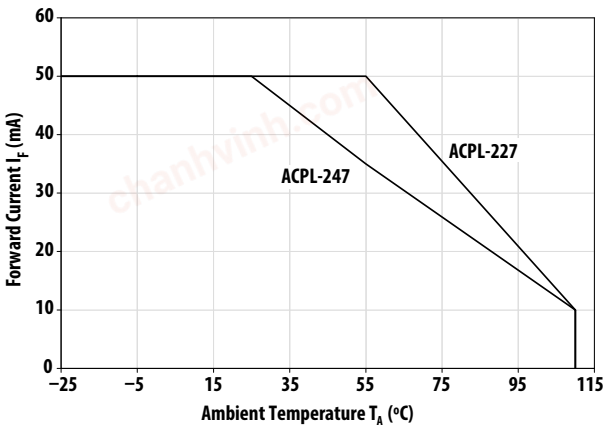

Figure 4 Collector Power Dissipation vs. Ambient Temperature

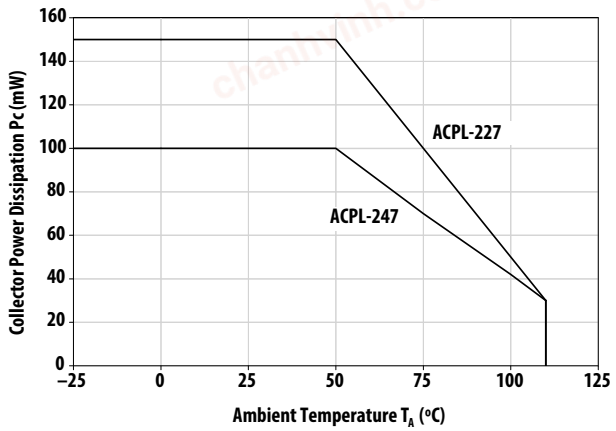

Figure 5 Pulse Forward Current vs. Duty Cycle Ratio

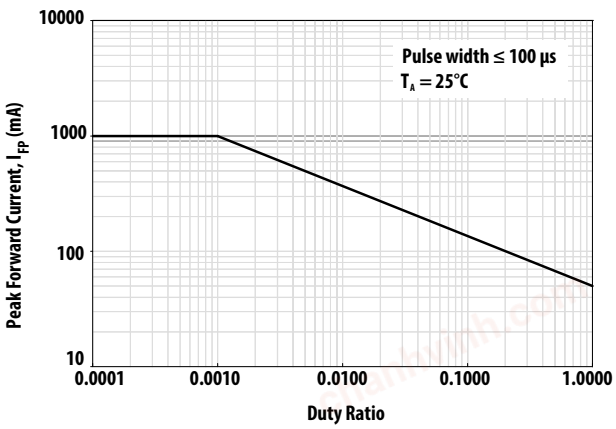

Figure 6 Forward Current vs. Forward Voltage

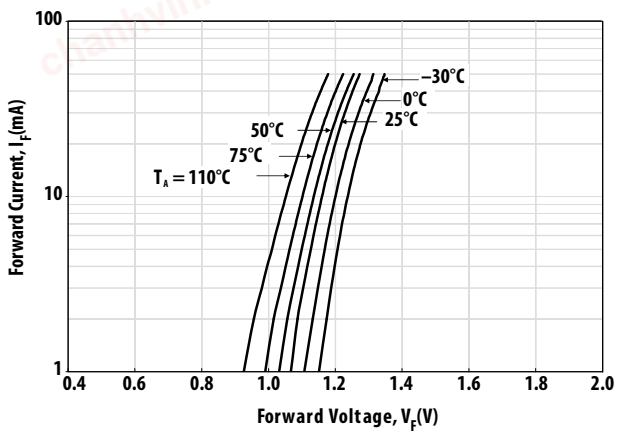

Figure 7 Forward Voltage Temperature Coefficient vs. Forward Current

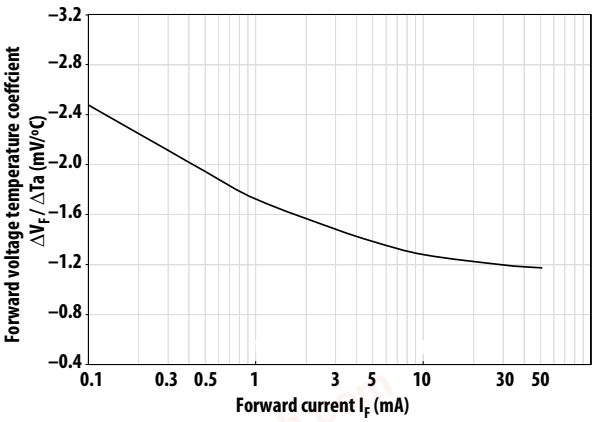

Figure 8 Pulse Forward Current vs. Pulse Forward Voltage

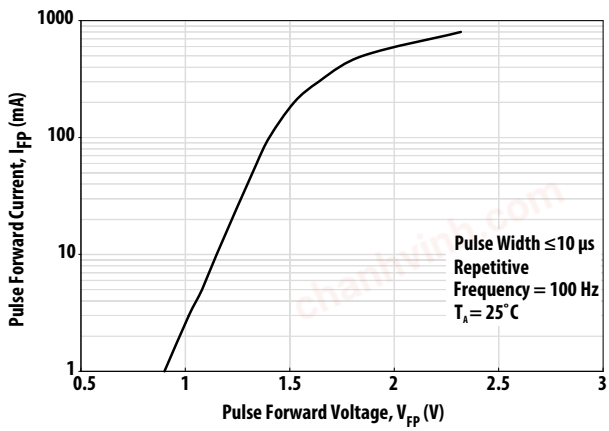

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Figure 9 Collector Current vs. Collector-Emitter Voltage

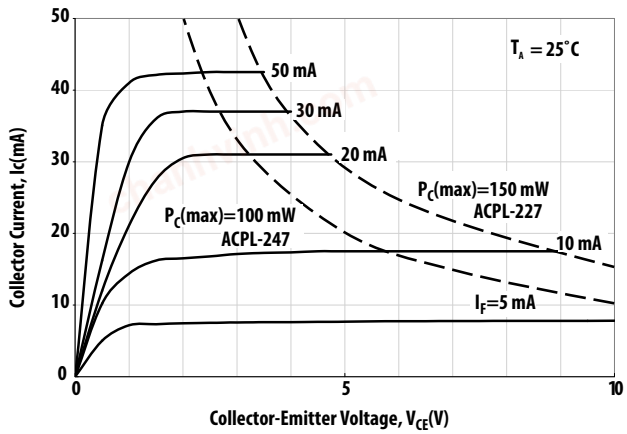

Figure 10 Collector Current vs. Small Collector-Emitter Voltage

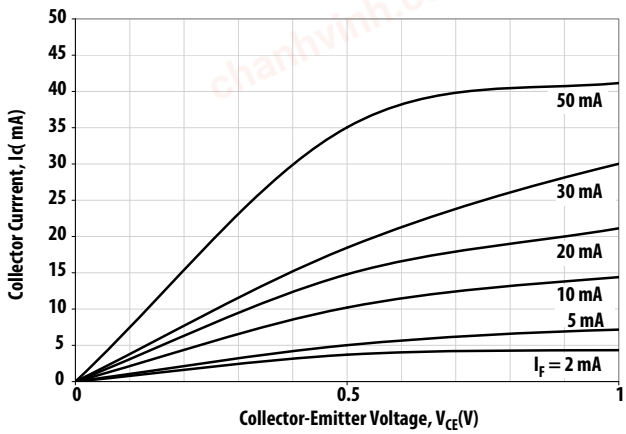

Figure 11 Collector Current vs. Forward Current

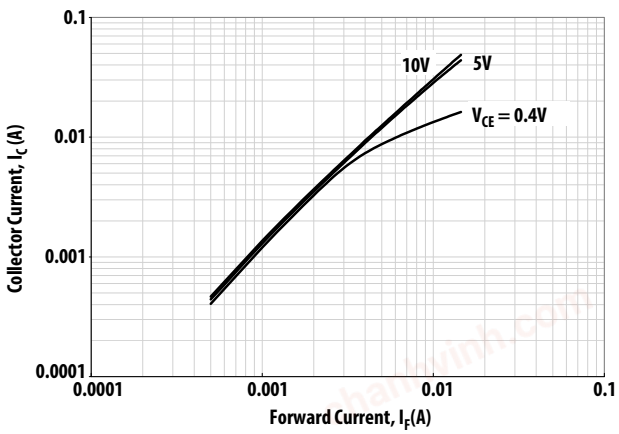

Figure 12 Collector Dark Current vs. Ambient Temperature

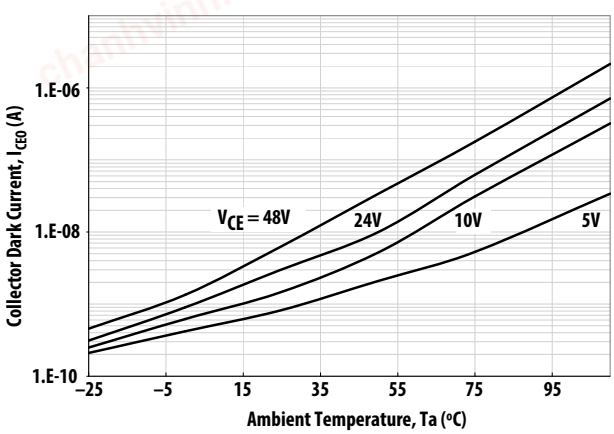

Figure 13 Current Transfer Ratio vs. Forward Current

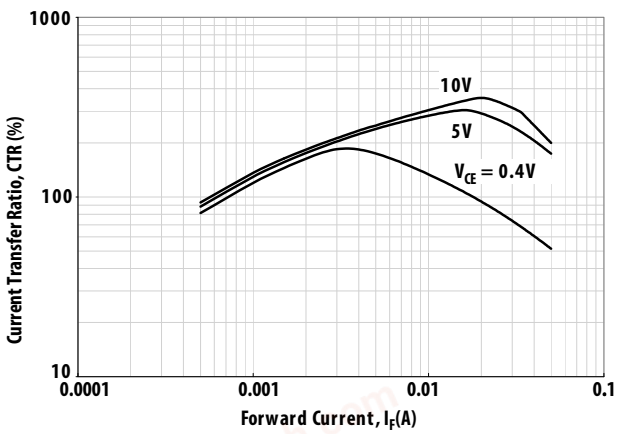

Figure 14 Collector-Emitter Saturation Voltage vs. Ambient Temperature

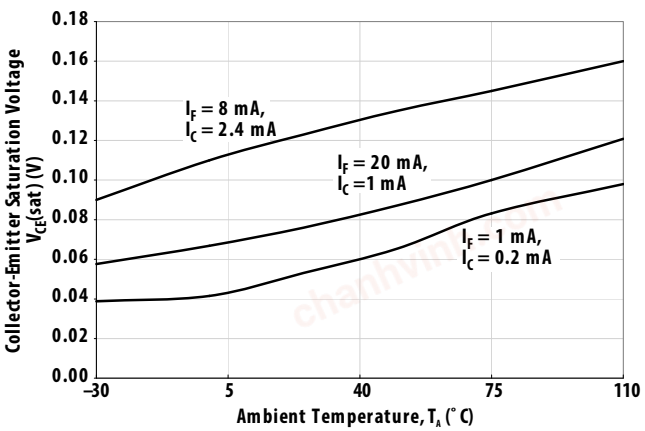

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Figure 15 Collector Current vs. Ambient Temperature

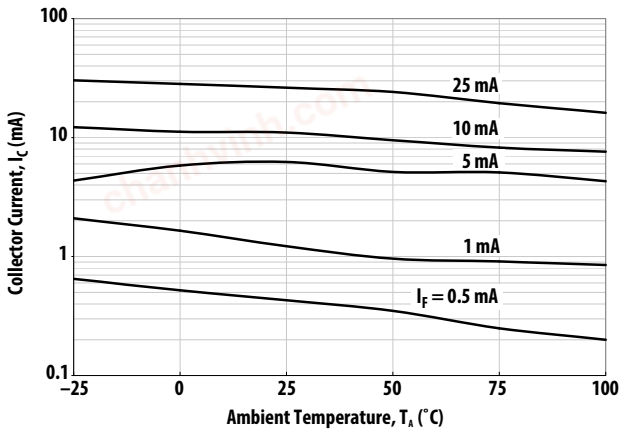


Figure 16 Switching Time vs. Load Resistance

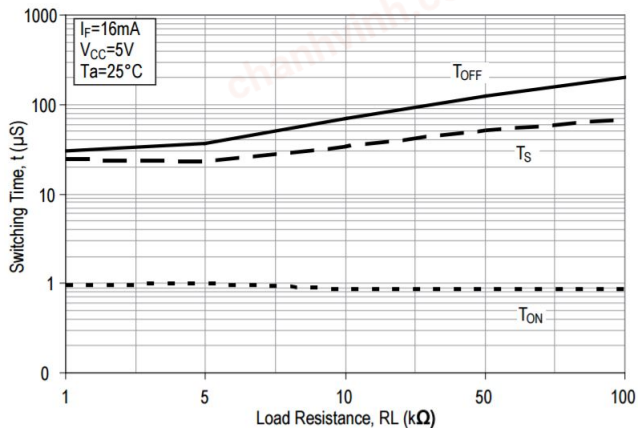


Figure 17 Switching Time vs. Ambient Temperature

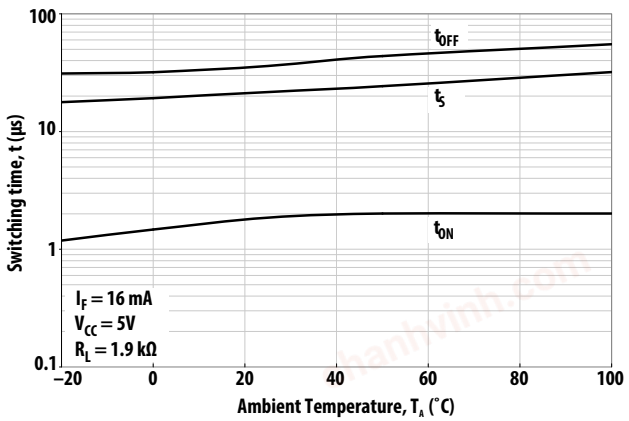


Figure 18 Collector-Emitter Saturation Voltage vs. Forward Current

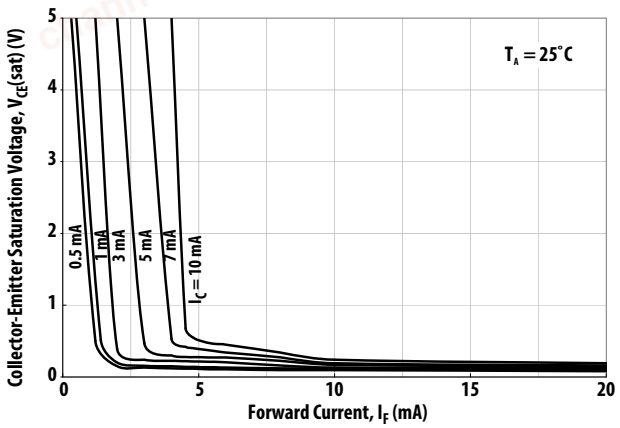


Figure 19 Frequency Response

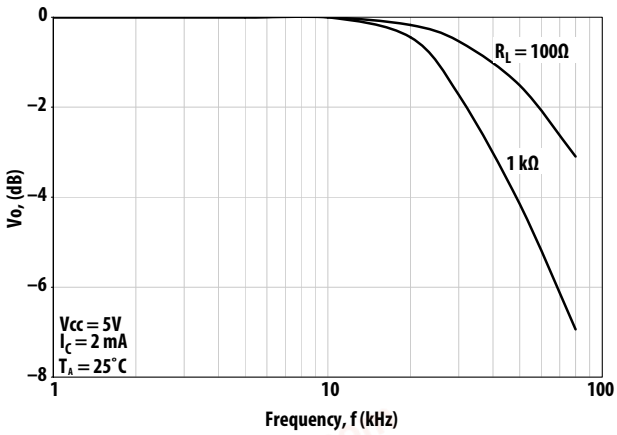
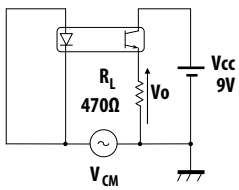
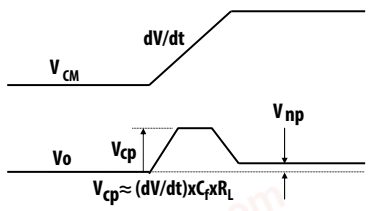


Figure 20 CMR Test Circuit



(High Voltage Pulse)



V_{cp} : Voltage that is generated by the displacement current in floating capacitance between primary and secondary sides.

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AV02-0752EN – January 23, 2018

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