

## ACPL-217

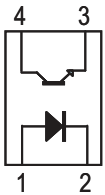
### DC-Input, Half-Pitch Phototransistor Optocoupler

#### Description

The Broadcom<sup>®</sup> ACPL-217 is a DC-input, single-channel, half-pitch phototransistor optocoupler that contains a light-emitting diode optically coupled to a phototransistor. It is packaged in a 4-pin SO package.

The input-output isolation voltage is rated at 3750V<sub>RMS</sub>. Response time,  $t_r$ , is 2  $\mu$ s typically, while minimum CTR is 50% at an input current of 5 mA.

#### ACPL-217 Pin Layout



Pin	Description
1	Anode
2	Cathode
3	Emitter
4	Collector

#### Features

- Current transfer ratio (CTR): 50% (minimum) at  $I_F = 5 \text{ mA}$ ,  $V_{CC} = 5V$
- High input-output isolation voltage ( $V_{ISO}$ ): 3750V<sub>RMS</sub>
- Non-saturated response time ( $t_r$ ): 2  $\mu$ s (typical) at  $V_{CC} = 10V$ ,  $I_C = 2 \text{ mA}$ ,  $R_L = 100\Omega$
- SO package
- CMR: 10 kV/ $\mu$ s (typical)
- Safety and regulatory approvals
  - cUL
  - IEC/EN/DIN EN 60747-5-5
- Available options
  - CTR Ranks 0, A, B, C, and D

#### Applications

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

**CAUTION!** It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD.

The components featured in this data sheet are not to be used in military or aerospace applications or environments.

## Ordering Information

ACPL-217-xxxx is UL recognized with 3750V<sub>RMS</sub> for 1 minute per UL1577 and Canadian Component Acceptance Notice #5.

Part Number	RoHS Compliant Option					Package	Surface Mount	Tape and Reel	IC Orientation	IEC/EN/DIN EN 60747-5-5	Quantity
	Rank 0 50% < CTR < 600% I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5V	Rank A 80% < CTR < 160% I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5V	Rank B 130% < CTR < 260% I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5V	Rank C 200% < CTR < 400% I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5V	Rank D 300% < CTR < 600% I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5V						
ACPL-217	-500E	-50AE	-50BE	-50CE	-50DE	SO-4	X	X	0°		3000 pieces per reel
	-560E	-56AE	-56BE	-56CE	-56DE	SO-4	X	X	0°	X	3000 pieces per reel
	-700E	-70AE	-70BE	-70CE	-70DE	SO-4	X	X	180°		3000 pieces per reel
	-760E	-76AE	-76BE	-76CE	-76DE	SO-4	X	X	180°	X	3000 pieces per reel

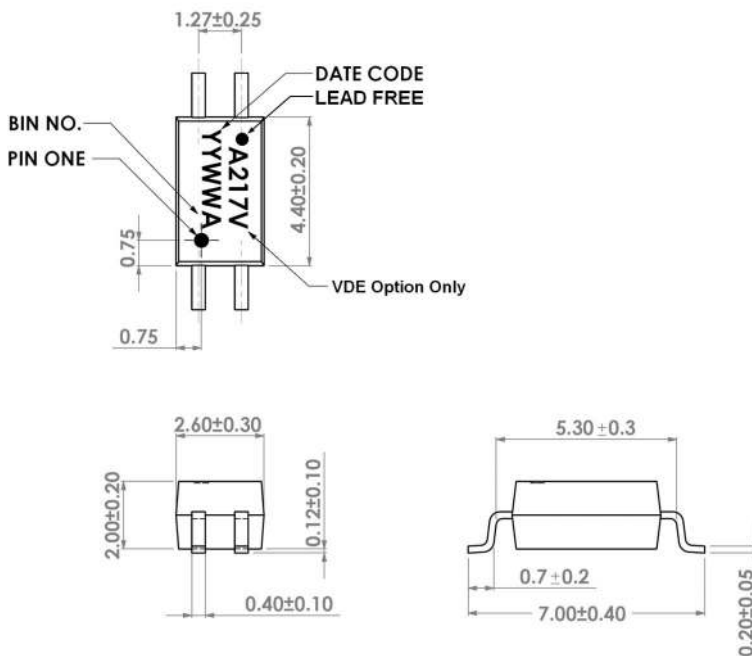
To order, choose a part number from the part number column and combine with the desired option from the option column to form an order entry.

**Example:** Specify ACPL-217-560E to order the following product: SO-4 Surface Mount package in Tape and Reel packaging, with IEC/EN/DIN EN 60747-5-5 Safety Approval, 50% < CTR < 600%, that is RoHS compliant.

**Example:** Specify ACPL-217-50BE to order the following product: SO-4 Surface Mount package in Tape and Reel packaging, 130% < CTR < 260%, that is RoHS compliant.

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

## Package Outline Drawings



## Solder Reflow Temperature Profile

Recommended reflow condition as per JEDEC Standard, J-STD-020 (latest revision). Use non-halide flux.

## Absolute Maximum Ratings

Parameter	Symbol	ACPL-217	Unit	Note
Storage Temperature	$T_S$	-55 to 125	°C	—
Operating Temperature	$T_A$	-55 to 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	$P_I$	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, RH = 40% to 60%)	$V_{ISO}$	3750	$V_{RMS}$	1 minute
Collector Power Dissipation	$P_C$	150	mW	—
Total Power Dissipation	$P_{TOT}$	200	mW	—
Lead Solder Temperature	260°C for 10 seconds			

## Electrical Specifications (DC)

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	$I_F = 20 \text{ mA}$	Figure 6
Reverse Current	$I_R$	—	—	10	$\mu\text{A}$	$V_R = 5 \text{ V}$	
Terminal Capacitance	$C_t$	—	30	—	pF	$V = 0, f = 1 \text{ MHz}$	
Collector Dark Current	$I_{CEO}$	—	—	100	nA	$V_{CE} = 48 \text{ V}, I_F = 0 \text{ mA}$	Figure 12
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	80	—	—	V	$I_C = 0.5 \text{ mA}, I_F = 0 \text{ mA}$	
Emitter-Collector Breakdown Voltage	$BV_{ECO}$	7	—	—	V	$I_E = 100 \mu\text{A}, I_F = 0 \text{ mA}$	
Current Transfer Ratio	CTR	50	—	600	%	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$	$\text{CTR} = (I_C/I_F) * 100\%$
Saturated CTR	CTR(sat)	—	100	—	%	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	—	—	0.4	V	$I_F = 8 \text{ mA}, I_C = 2.4 \text{ mA}$	Figure 14
Isolation Resistance	$R_{ISO}$	$5 \times 10^{10}$	$1 \times 10^{11}$	—	$\Omega$	DC = 500V, RH = 40% ~ 60%	
Floating Capacitance	$C_F$	—	0.6	1	pF	$V = 0, f = 1 \text{ MHz}$	
Cut-off Frequency (-3 dB)	$F_C$	—	80	—	kHz	$V_{CC} = 5 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$	Figure 2, Figure 19
Response Time (Rise)	$t_r$	—	2	—	$\mu\text{s}$	$V_{CC} = 10 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$	Figure 1
Response Time (Fall)	$t_f$	—	3	—	$\mu\text{s}$		
Turn-on Time	$t_{on}$	—	3	—	$\mu\text{s}$		
Turn-off Time	$t_{off}$	—	3	—	$\mu\text{s}$		
Turn-ON Time	$t_{ON}$	—	2	—	$\mu\text{s}$	$V_{CC} = 5 \text{ V}, I_F = 16 \text{ mA}, R_L = 1.9 \text{ k}\Omega$	Figure 1, Figure 17
Storage Time	$T_S$	—	25	—	$\mu\text{s}$		
Turn-OFF Time	$t_{OFF}$	—	40	—	$\mu\text{s}$		
Common Mode Rejection Voltage	CMR	—	10	—	kV/ $\mu\text{s}$	$T_A = 25^\circ\text{C}, R_L = 470 \Omega, V_{CM} = 1.5 \text{ kV(peak)}, I_F = 0 \text{ mA}, V_{CC} = 9 \text{ V}, V_{np} = 100 \text{ mV}$	Figure 20

Figure 1: Switching Time Test Circuit

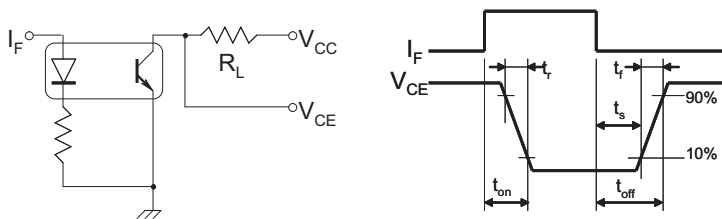
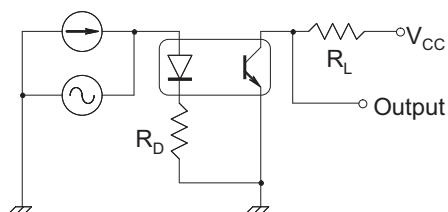
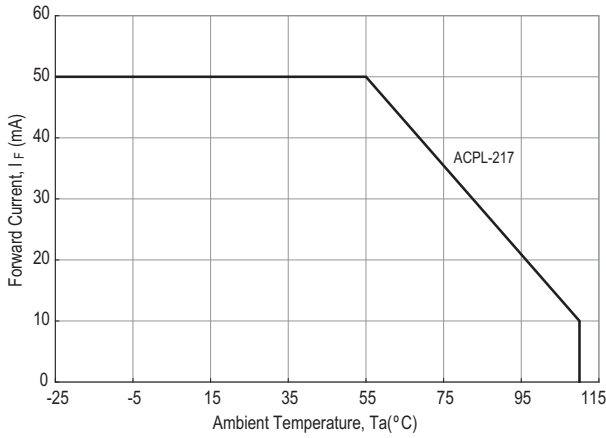


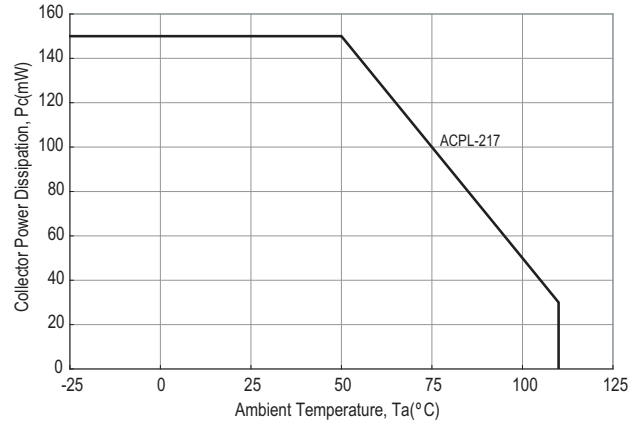
Figure 2: Frequency Response Test Circuit



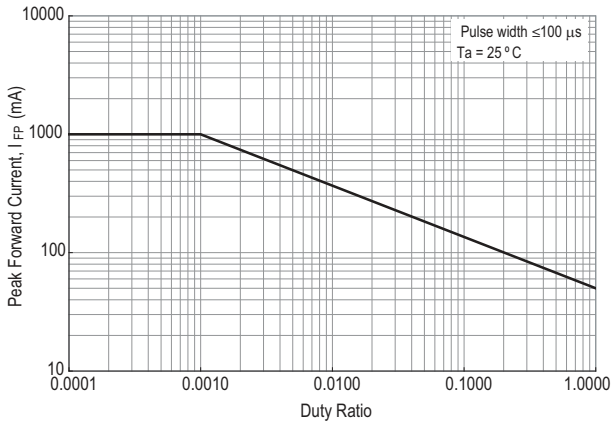
**Figure 3: Forward Current vs. Ambient Temperature**



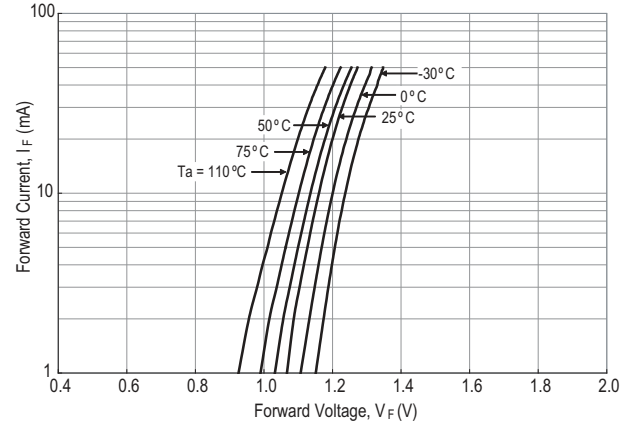
**Figure 4: Collector Power Dissipation vs. Ambient Temperature**



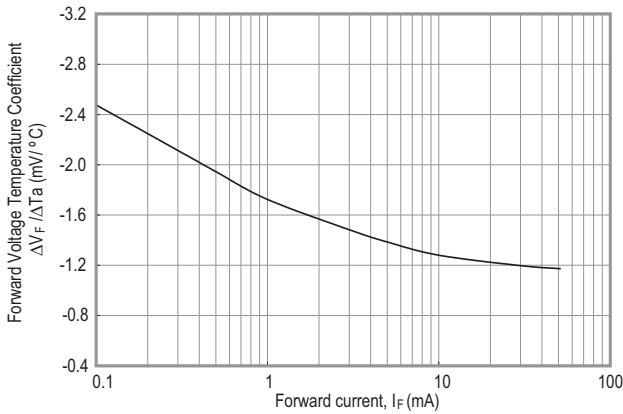
**Figure 5: Pulse Forward Current vs. Duty Cycle Ratio**



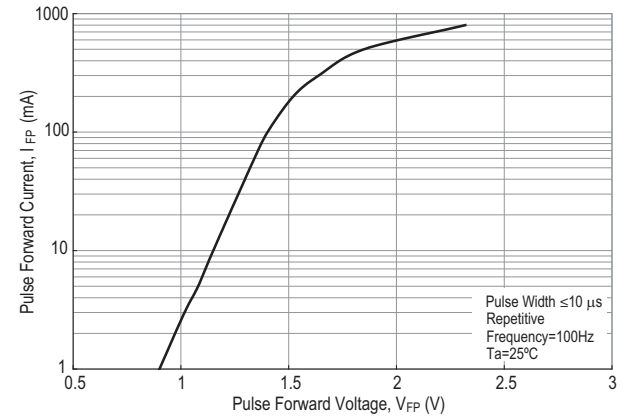
**Figure 6: Forward Current vs. Forward Voltage**



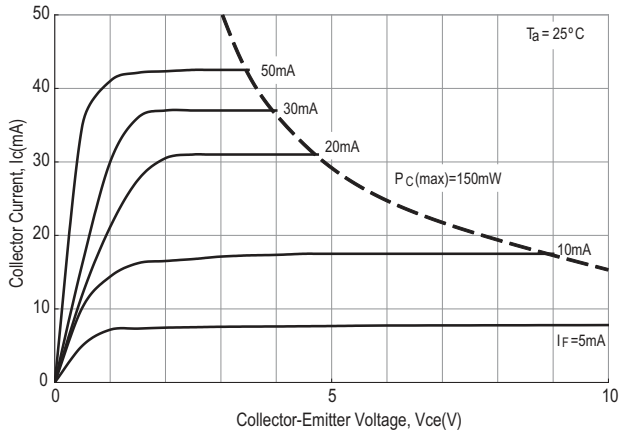
**Figure 7: Forward Voltage Temperature Coefficient vs. Forward Current**



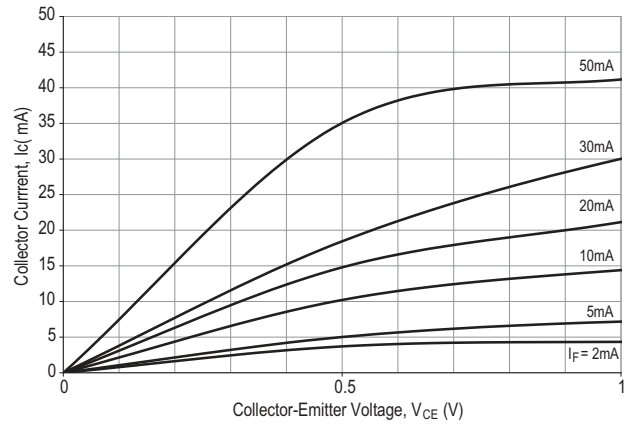
**Figure 8: Pulse Forward Current vs. Pulse Forward Voltage**



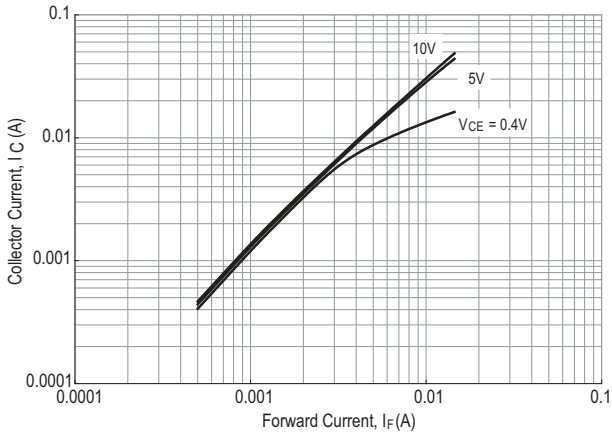
**Figure 9: Collector Current vs. Collector-Emitter Voltage**



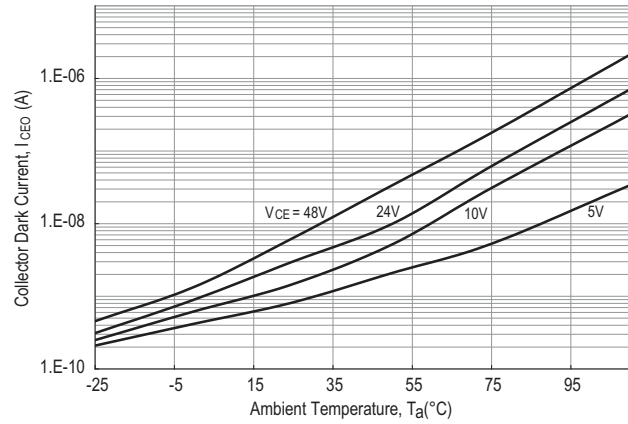
**Figure 10: Collector Current vs. Small Collector-Emitter Voltage**



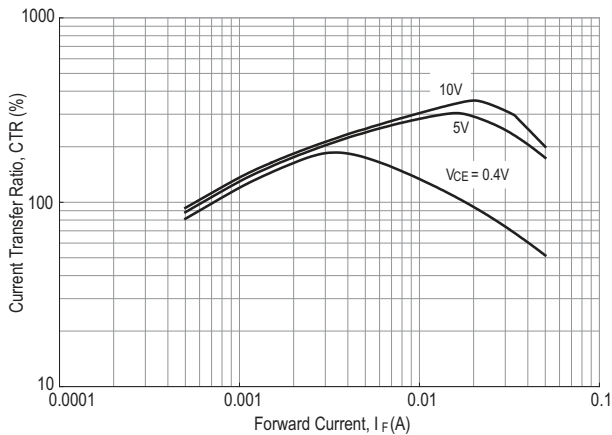
**Figure 11: Collector Current vs. Forward Current**



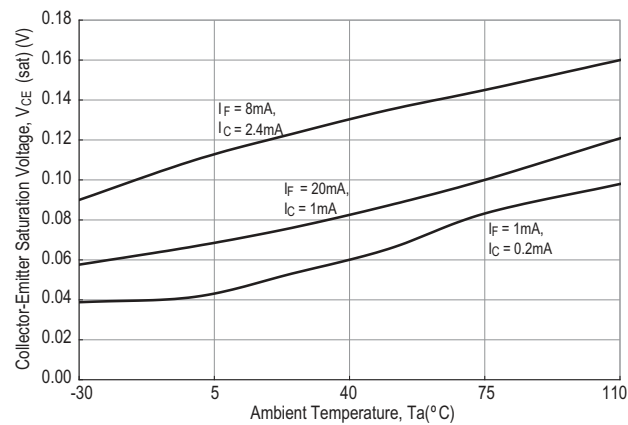
**Figure 12: Collector Dark Current vs. Ambient Temperature**



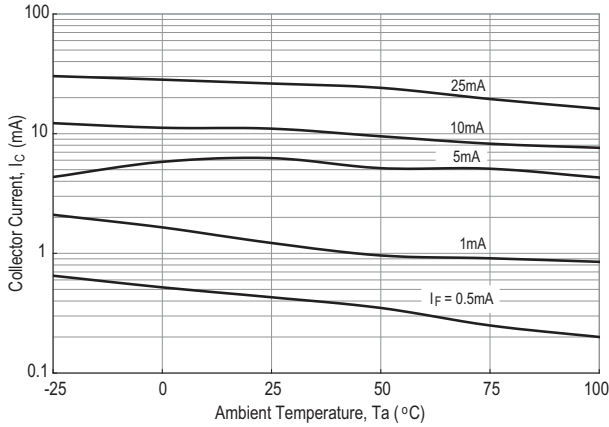
**Figure 13: Current Transfer Ratio vs. Forward Current**



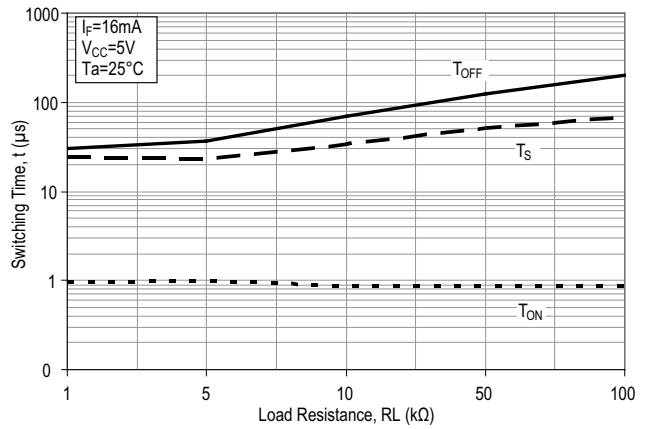
**Figure 14: Collector-Emitter Saturation Voltage vs. Ambient Temperature**



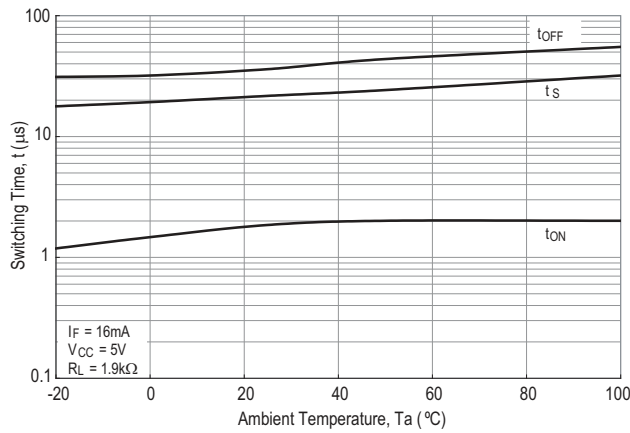
**Figure 15: Collector Current vs. Ambient Temperature**



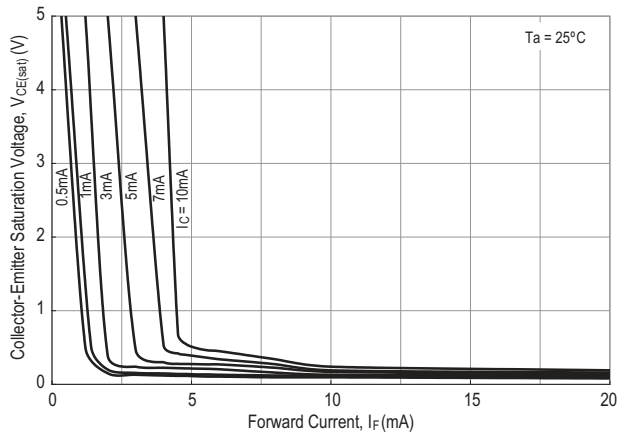
**Figure 16: Switching Time vs. Load Resistance**



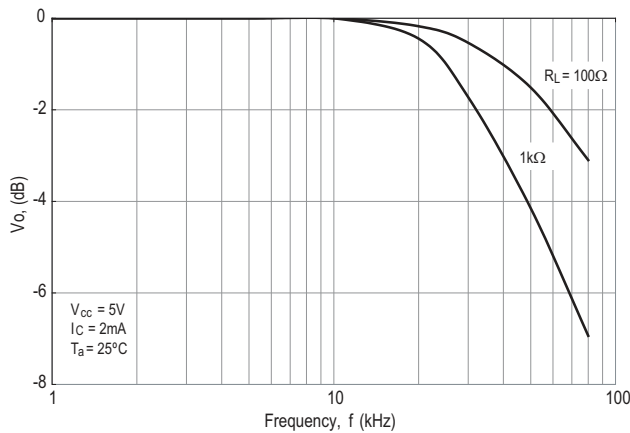
**Figure 17: Switching Time vs. Ambient Temperature**



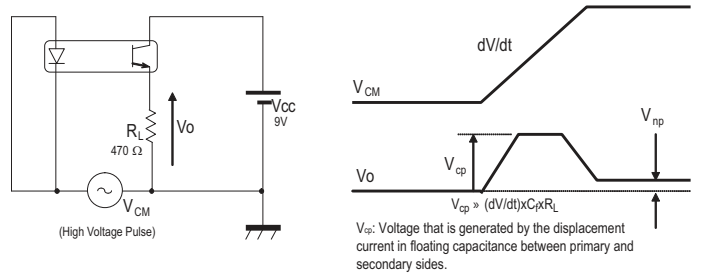
**Figure 18: Collector-Emitter Saturation Voltage vs. Forward Current**



**Figure 19: Frequency Response**



**Figure 20: CMR Test Circuit**



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