BROADCOM®

Data Sheet

ACPL-217

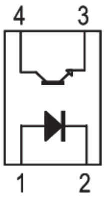
DC-Input, Half-Pitch Phototransistor Optocoupler

Description

The Broadcom® 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 $3750V_{RMS}$. Response time, t_r, is 2 µs 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 mA, V_{CC} = 5V
- High input-output isolation voltage (V_{ISO}): $3750V_{RMS}$
- Non-saturated response time (t_r): 2 µs (typical) 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
- 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_{RMS} for 1 minute per UL1577 and Canadian Component Acceptance Notice #5.

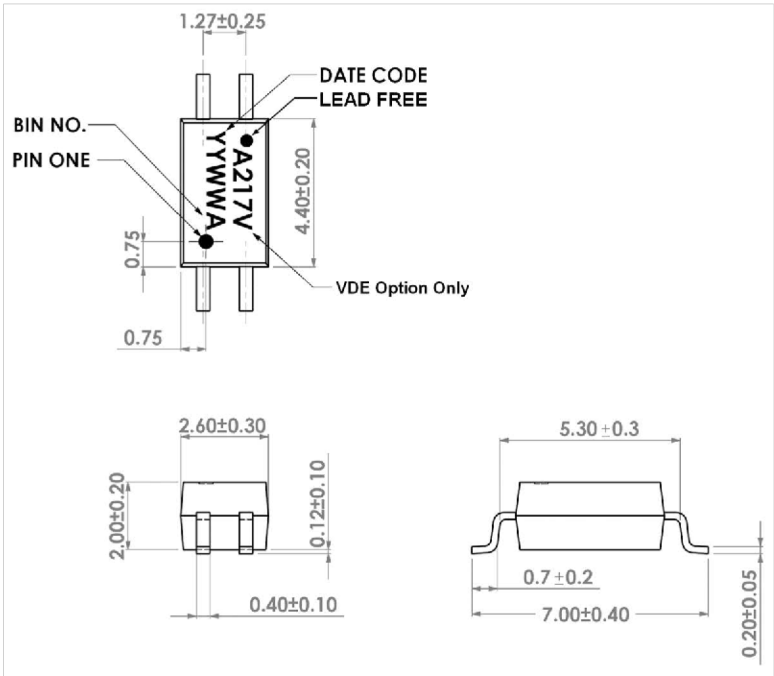
Part Number	RoHS Compliant Option					Package	Surface Mount	Tape and Reel	IC Orientation	IEC/EN/DIN EN 60747-5-5	Quantity
	Rank 0 50% < CTR < 600% I_F = 5 mA, V_{CE} = 5V	Rank A 80% < CTR < 160% I_F = 5 mA, V_{CE} = 5V	Rank B 130% < CTR < 260% I_F = 5mA, V_{CE} = 5V	Rank C 200% < CTR < 400% I_F = 5 mA, V_{CE} = 5V	Rank D 300% < CTR < 600% I_F = 5 mA V_{CE} = 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 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	CTR	50	—	600	%	I_F = 5 mA, V_{CE} = 5V	CTR = (I_C/I_F) * 100%
Saturated CTR	CTR(sat)	—	100	—	%	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 x 10^{10}	1 x 10^{11}	—	Ω	DC = 500V, RH = 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

Figure 1: Switching Time Test Circuit

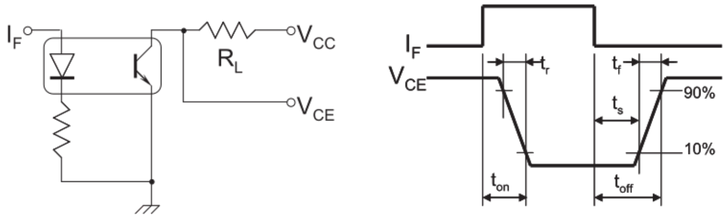


Figure 2: Frequency Response Test Circuit

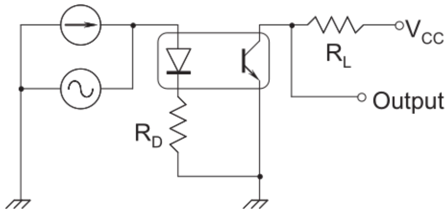


Figure 3: Forward Current vs. Ambient Temperature

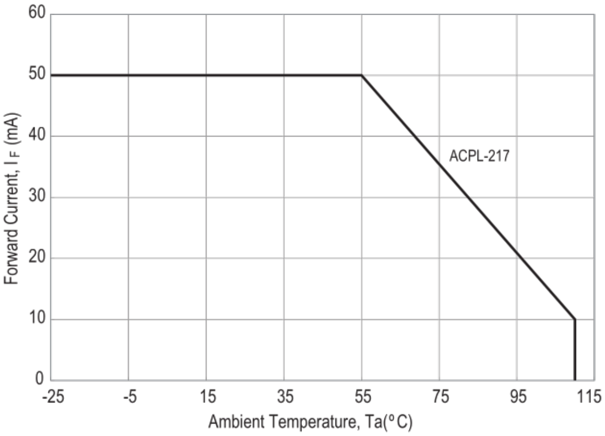


Figure 4: Collector Power Dissipation vs. Ambient Temperature

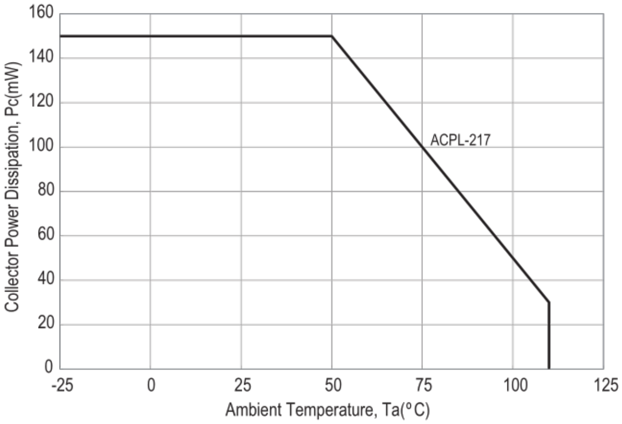


Figure 5: Pulse Forward Current vs. Duty Cycle Ratio

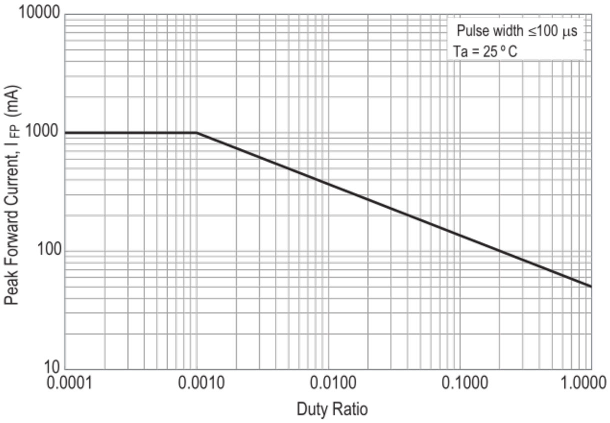


Figure 6: Forward Current vs. Forward Voltage

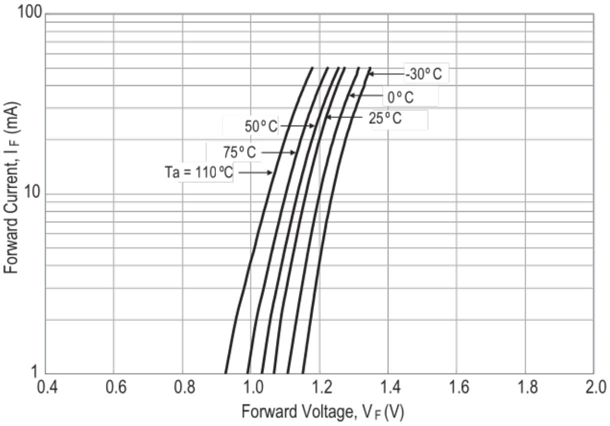


Figure 7: Forward Voltage Temperature Coefficient vs. Forward Current

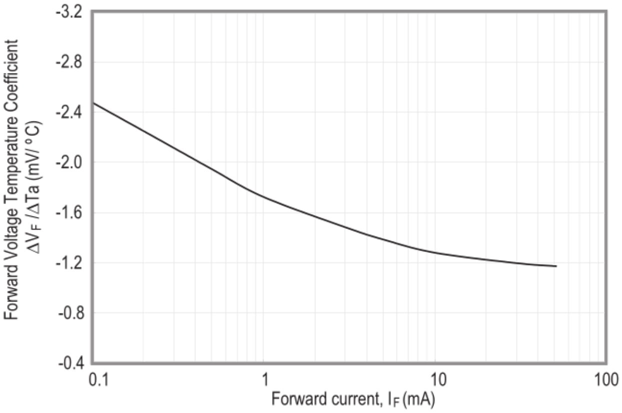


Figure 8: Pulse Forward Current vs. Pulse Forward Voltage

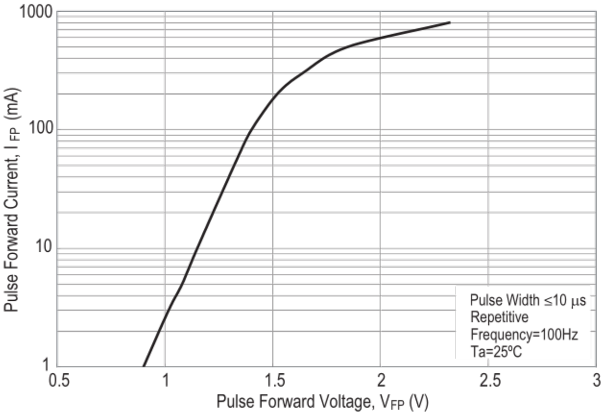


Figure 9: Collector Current vs. Collector-Emitter Voltage

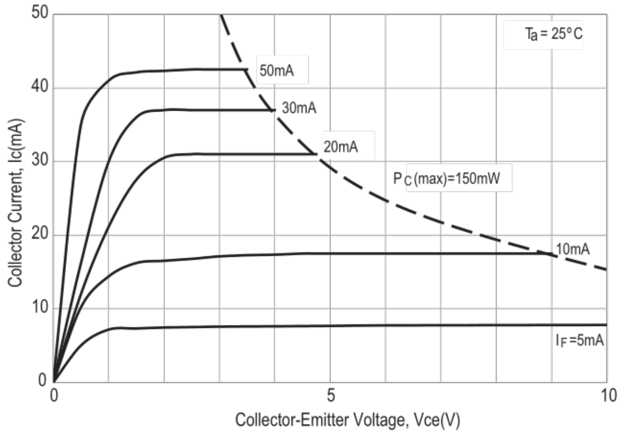


Figure 10: Collector Current vs. Small Collector-Emitter Voltage

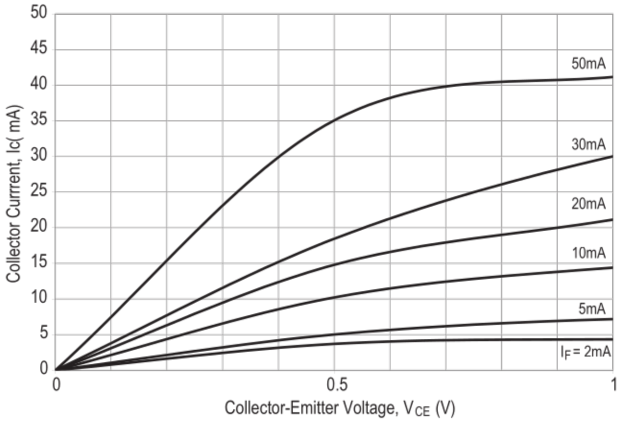


Figure 11: Collector Current vs. Forward Current

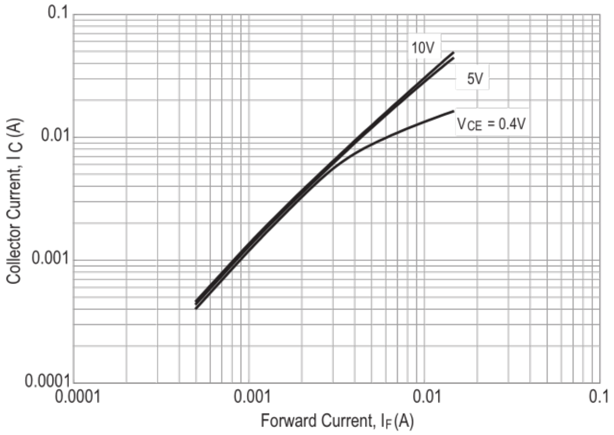


Figure 12: Collector Dark Current vs. Ambient Temperature

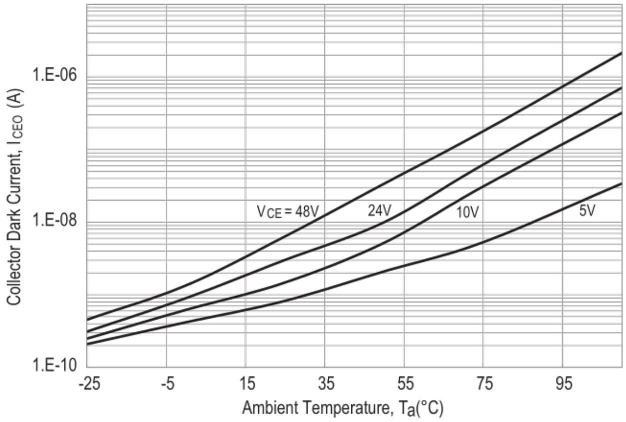


Figure 13: Current Transfer Ratio vs. Forward Current

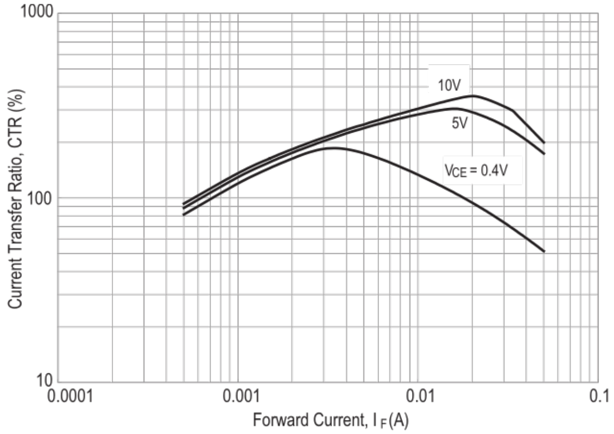


Figure 14: Collector-Emitter Saturation Voltage vs. Ambient Temperature

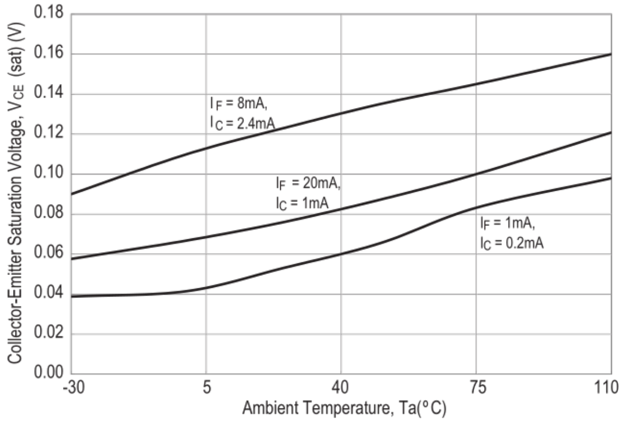


Figure 15: Collector Current vs. Ambient Temperature

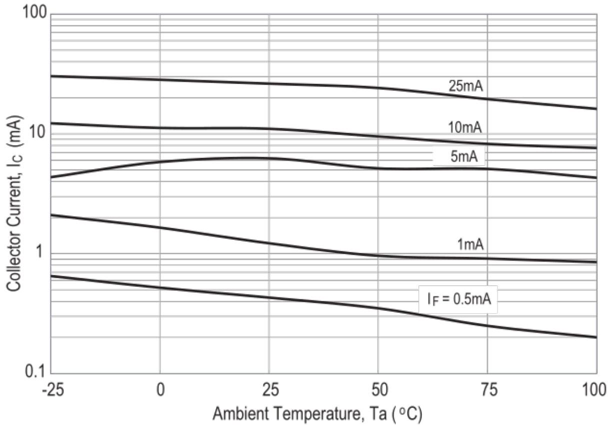


Figure 16: Switching Time vs. Load Resistance

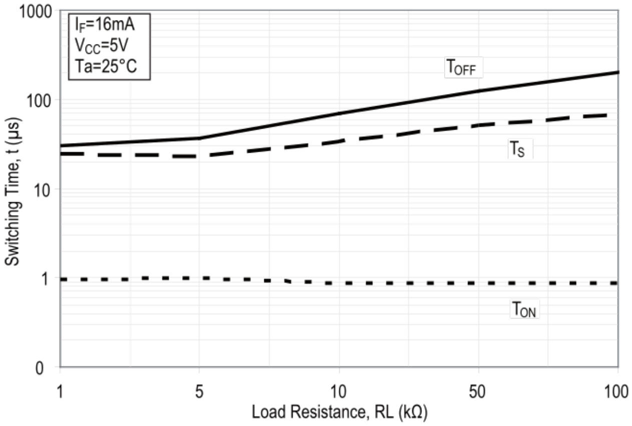


Figure 17: Switching Time vs. Ambient Temperature

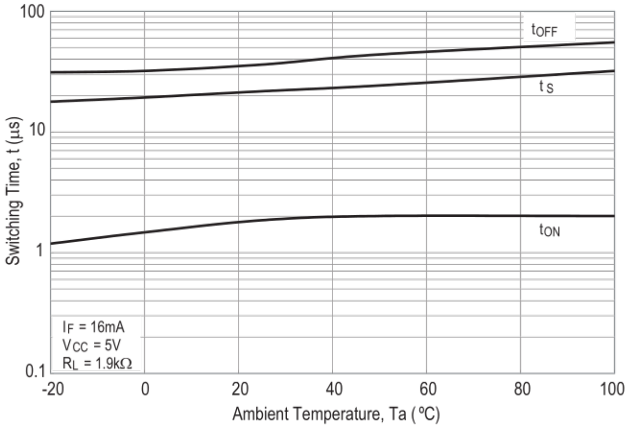


Figure 18: Collector-Emitter Saturation Voltage vs. Forward Current

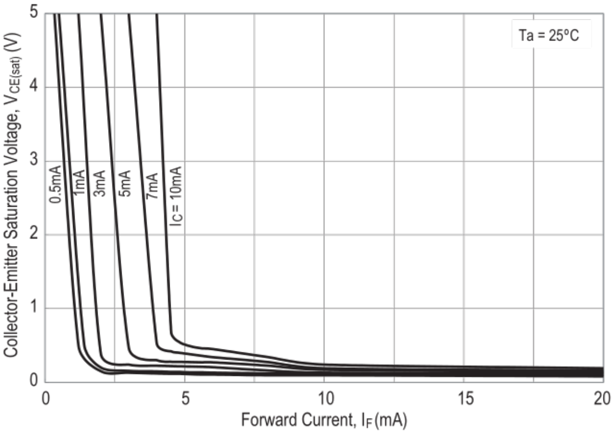


Figure 19: Frequency Response

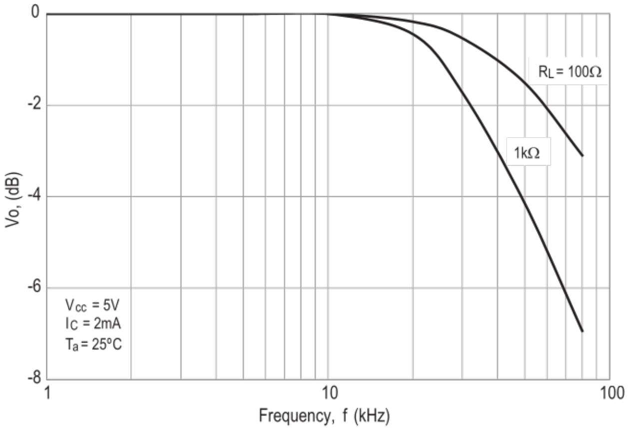
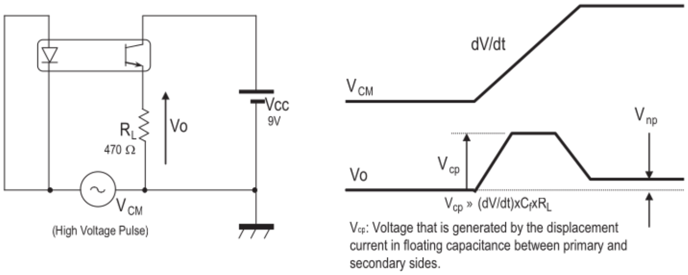


Figure 20: CMR Test Circuit



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

BROADCOM®

Lead (Pb) Free
RoHS 6 fully
compliant

RoHS 6 fully compliant options available;
-xxxE denotes a lead-free product