

DC Input, Half-Pitch Phototransistor Optocoupler

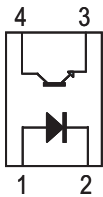
Data Sheet

Description

The 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 $2\ \mu s$ typically, while minimum CTR is 50% at 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% (min) at $I_F = 5\ \text{mA}$, $V_{CC} = 5V$)
- High input-output isolation voltage ($V_{ISO} = 3750V_{RMS}$)
- Non-saturated Response time (t_r : $2\ \mu s$ (typ) at $V_{CC} = 10V$, $I_C = 2\ \text{mA}$, $R_L = 100\ \Omega$)
- SO package
- CMR $10\ \text{kV}/\mu s$ (typical)
- Safety and regulatory approvals
 - cUL
 - IEC/EN/DIN EN 60747-5-2
- Options available:
 - 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.

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 & Reel	IC Orientation	IEC/EN/DIN EN 60747-5-2	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 = 5 mA, 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 pcs per reel
	-560E	-56AE	-56BE	-56CE	-56DE	SO-4	X	X	0°	X	3000 pcs per reel
	-700E	-70AE	-70BE	-70CE	-70DE	SO-4	X	X	180°		3000 pcs per reel
	-760E	-76AE	-76BE	-76CE	-76DE	SO-4	X	X	180°	X	3000 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:

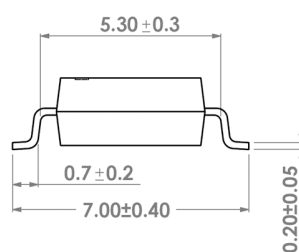
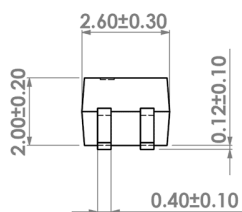
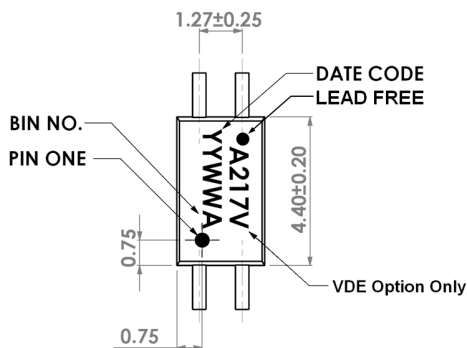
ACPL-217-560E to order product of SO-4 Surface Mount package in Tape & Reel packaging with IEC/EN/DIN EN 60767-5-2 Safety Approval, 50% < CTR < 600% and RoHS compliant.

Example 2:

ACPL-217-50BE to order product of SO-4 Surface Mount package in Tape & Reel packaging with 130% < CTR < 260% and 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). Non-Halide Flux should be used.

Absolute Maximum Ratings

Parameter	Symbol	ACPL-217	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	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 min, R.H. 40~60%)	V_{ISO}	3750	V_{RMS}	1 min
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	μA	$V_R = 5 \text{ V}$	
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}	5×10^{10}	1×10^{11}	—	Ω	DC500V, R.H. 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	—	μs	$V_{CC} = 10 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$	Figure 1
Response Time (Fall)	t_f	—	3	—	μs		
Turn-on Time	t_{on}	—	3	—	μs	$V_{CC} = 5 \text{ V}, I_F = 16 \text{ mA}, R_L = 1.9 \text{ k}\Omega$	Figure 1, Figure 17
Turn-off Time	t_{off}	—	3	—	μs		
Turn-ON Time	t_{ON}	—	2	—	μs		
Storage Time	T_S	—	25	—	μs		
Turn-OFF Time	t_{OFF}	—	40	—	μs		
Common Mode Rejection Voltage	CMR	—	10	—	kV/ μs	$T_A = 25^\circ\text{C}, R_L = 470 \Omega,$ $V_{CM} = 1.5 \text{ kV(peak)}, I_F = 0 \text{ mA},$ $V_{CC} = 9 \text{ V}, V_{np} = 100 \text{ mV}$	Figure 20

Figure 1 Switching Time Test Circuit

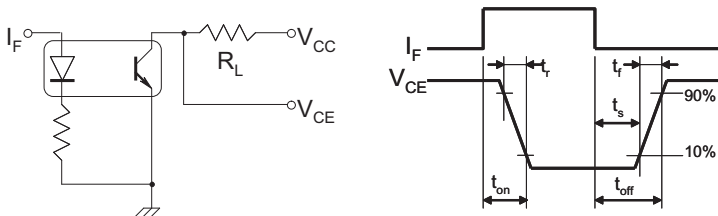


Figure 2 Frequency Response Test Circuit

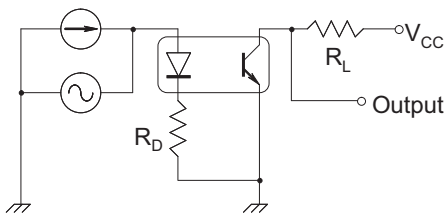


Figure 3 Forward Current vs. Ambient Temperature

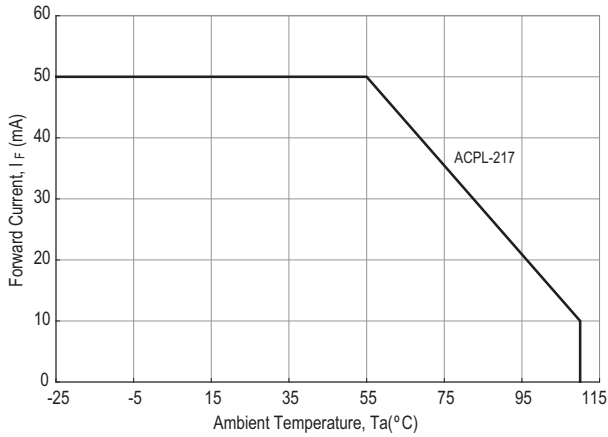


Figure 4 Collector Power Dissipation vs. Ambient Temperature

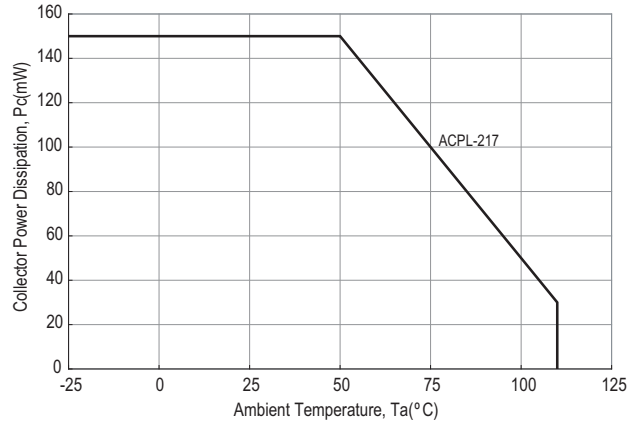


Figure 5 Pulse Forward Current vs. Duty Cycle Ratio

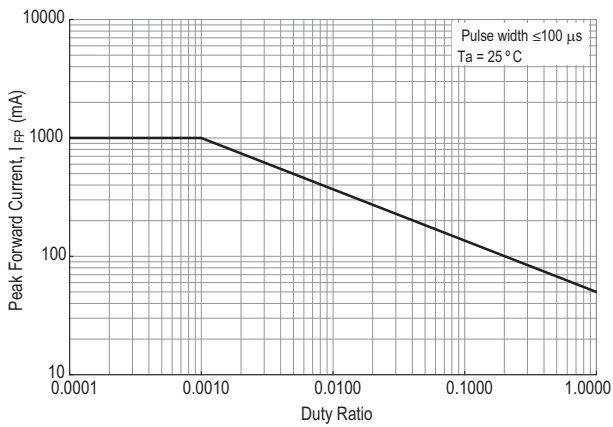


Figure 6 Forward Current vs. Forward Voltage

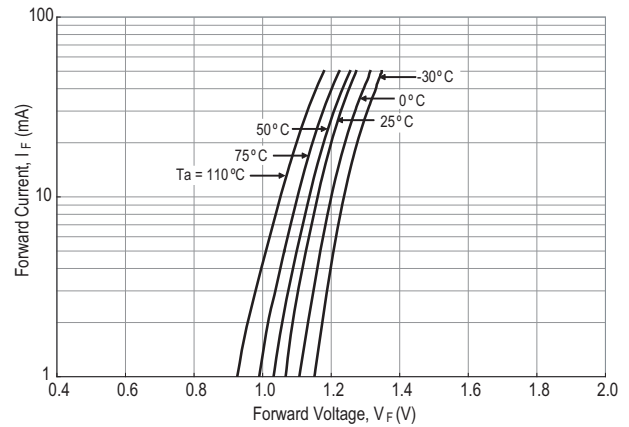


Figure 7 Forward Voltage Temperature Coefficient vs. Forward Current

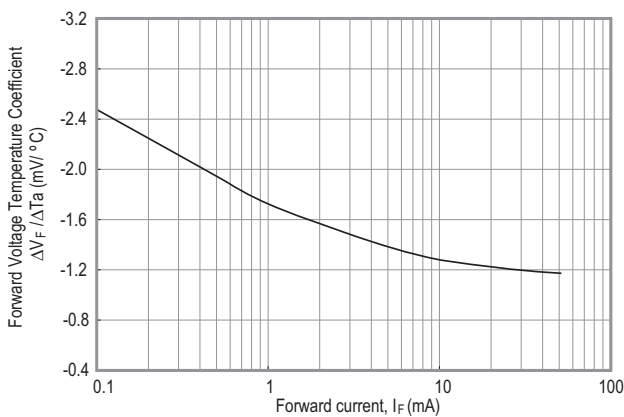


Figure 8 Pulse Forward Current vs. Pulse Forward Voltage

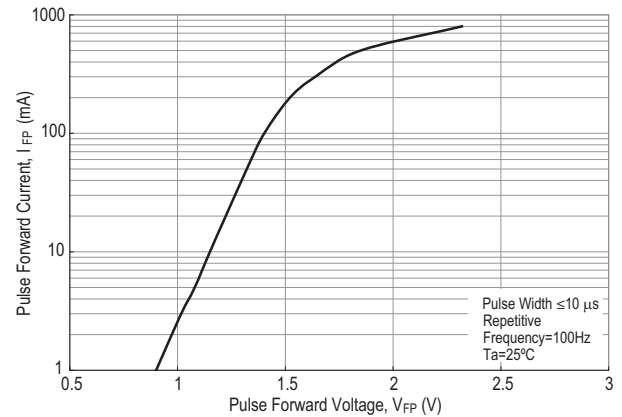


Figure 9 Collector Current vs. Collector-Emmitter Voltage

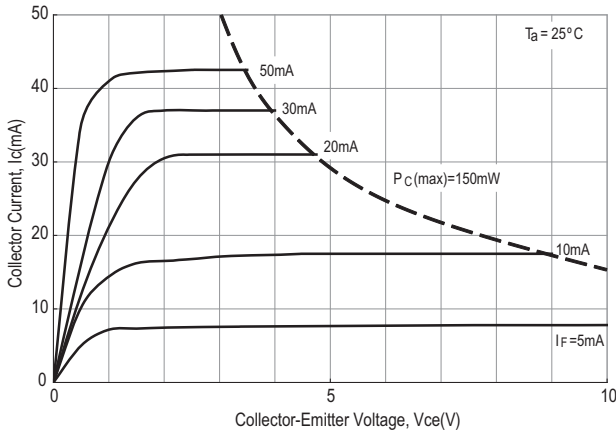


Figure 10 Collector Current vs. Small Collector-Emmitter Voltage

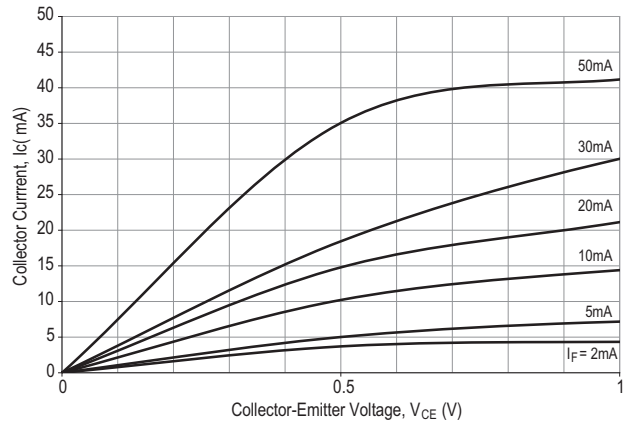


Figure 11 Collector Current vs. Forward Current

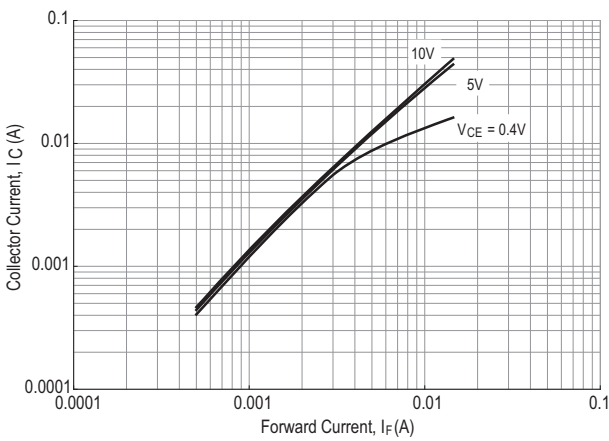


Figure 12 Collector Dark Current vs. Ambient Temperature

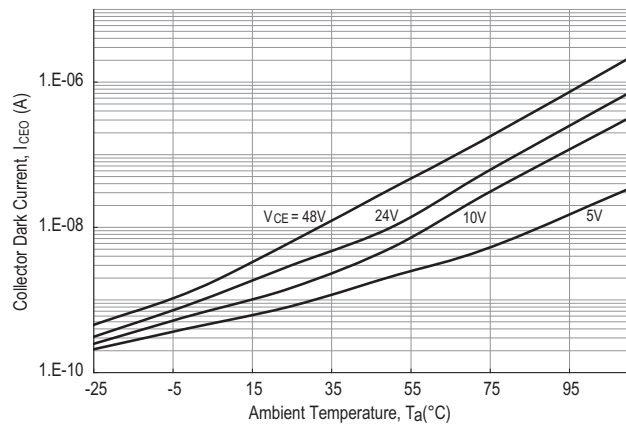


Figure 13 Current Transfer Ratio vs. Forward Current

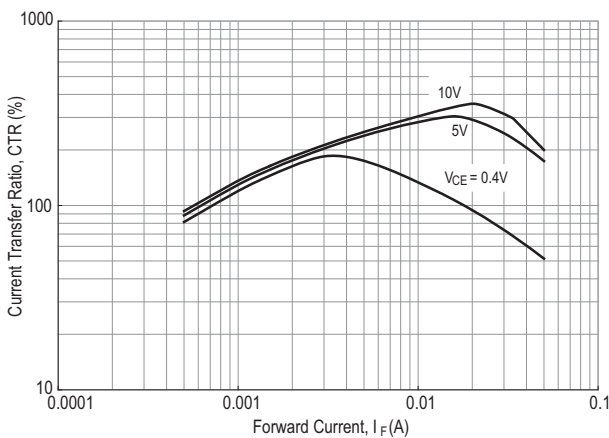


Figure 14 Collector-Emmitter Saturation Voltage vs. Ambient Temperature

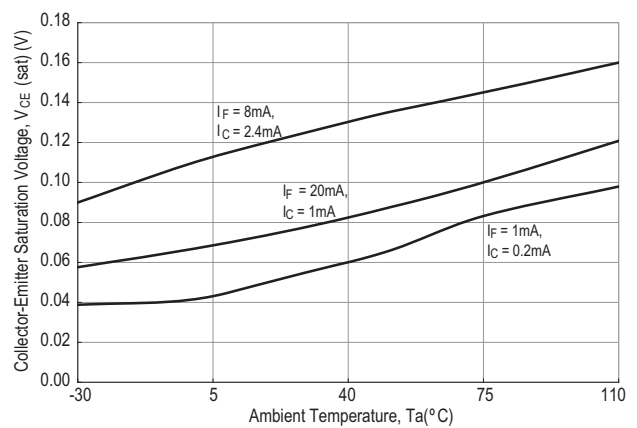


Figure 15 Collector Current vs. Ambient Temperature

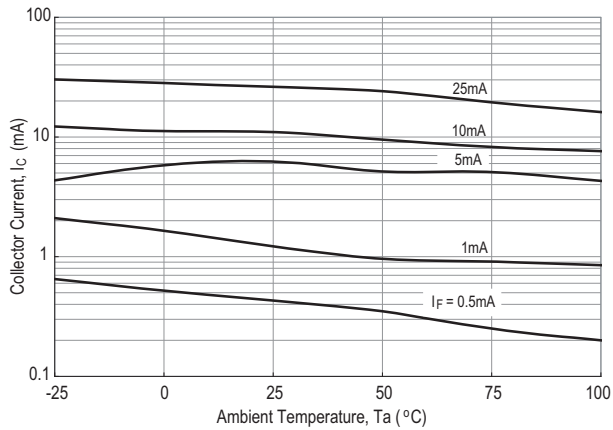


Figure 16 Switching Time vs. Load Resistance

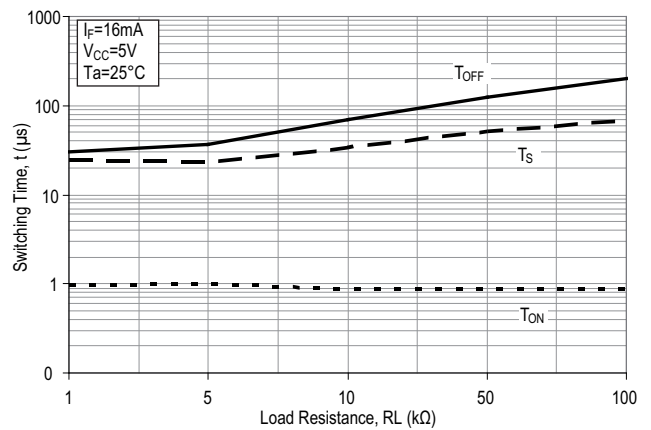


Figure 17 Switching Time vs. Ambient Temperature

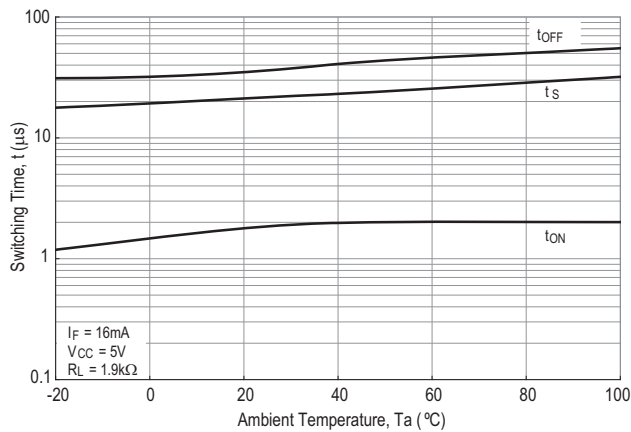


Figure 18 Collector-Emitter Saturation Voltage vs. Forward Current

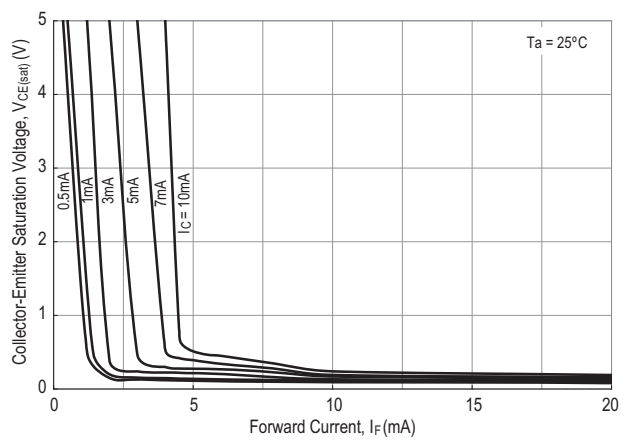


Figure 19 Frequency Response

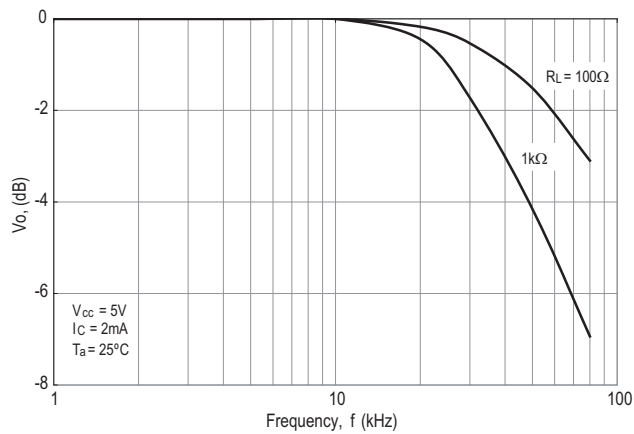
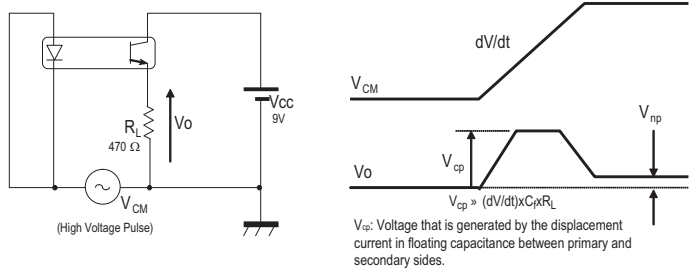


Figure 20 CMR Test Circuit



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