

AC Input, Half-Pitch Phototransistor Optocoupler

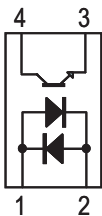
Data Sheet

Description

The ACPL-214 is an AC-input single channel half-pitch phototransistor optocoupler that contains two light-emitting diodes connected inversely parallel and optically coupled to a phototransistor. It is packaged in a 4-pin SO package.

The input-output isolation voltage is rated at 3750 V_{RMS} . Response time, t_r , is 2 μs typically, while minimum CTR is 20 percent at input current of 1 mA.

ACPL-214 Pin Layout



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

Features

- Current transfer ratio
(CTR: 20% (min) at $I_F = \pm 1$ mA, $V_{CC} = 5V$)
- High input-output isolation voltage
($V_{ISO} = 3750 V_{RMS}$)
- Non-saturated response time
(t_r : 2 μs (typ) at $V_{CC} = 10V$, $I_C = 2$ mA, $R_L = 100\Omega$)
- SO package
- CMR 10 kV/ μs (typical)
- Safety and regulatory approvals
 - cUL
 - IEC/EN/DIN EN 60747-5-5
- Options available:
 - CTR Ranks 0, A

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-214-xxxx is UL Recognized with 3750 V_{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 20% < CTR < 400% I _F = ±1 mA, V _{CE} = 5V	Rank A 50% < CTR < 250% I _F = ±1 mA, V _{CE} = 5V						
ACPL-214	-500E	-50AE	SO-4	X	X	0°		3000 pcs per reel
	-560E	-56AE	SO-4	X	X	0°	X	3000 pcs per reel
	-700E	-70AE	SO-4	X	X	180°		3000 pcs per reel
	-760E	-76AE	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:

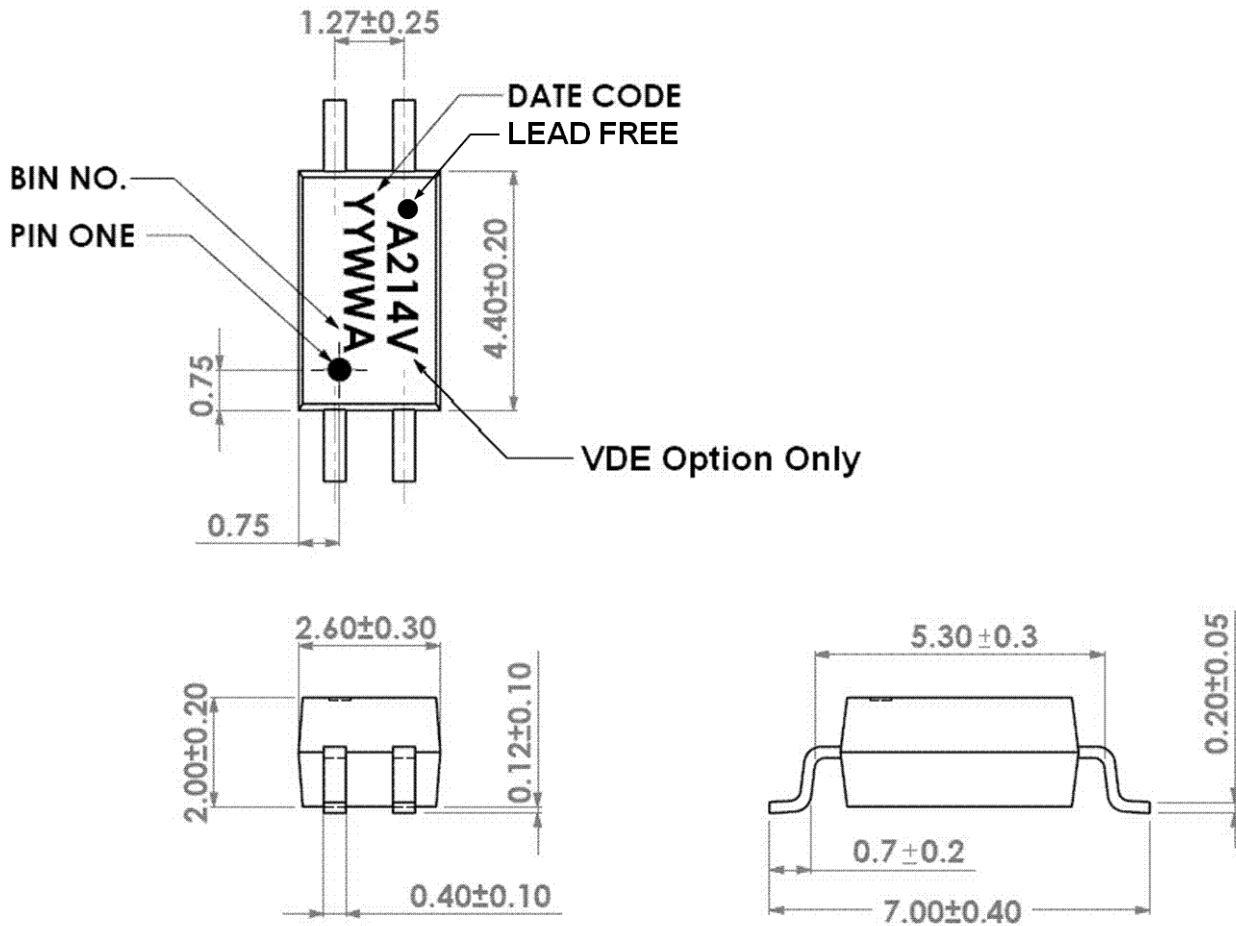
ACPL-214-560E to order product of SO-4 Surface Mount package in Tape and Reel packaging with IEC/EN/DIN EN 60767-5-5 Safety Approval, 20% < CTR < 400% and RoHS compliant.

Example 2:

ACPL-214-50AE to order product of SO-4 Surface Mount package in Tape and Reel packaging with 50% < CTR < 250% 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-214	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	
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, R.H. 40%~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

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	$I_F = \pm 20 \text{ mA}$	Figure 6
Terminal Capacitance	C_t	—	60	—	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	20	—	400	%	$I_F = \pm 1 \text{ mA}, V_{CE} = 5\text{V}$	$CTR = (I_C / I_F) \times 100\%$
Saturated CTR	$CTR_{(sat)}$	—	100	—	%	$I_F = \pm 1 \text{ mA}, V_{CE} = 0.4\text{V}$	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	0.4	V	$I_F = \pm 8 \text{ mA}, I_C = 2.4 \text{ mA}$	Figure 14
Isolation Resistance	R_{iso}	5×10^{10}	1×10^{11}	—	Ω	DC500V, R.H. 40%~60%	
Floating Capacitance	C_F	—	0.8	1	pF	$V = 0, f = 1 \text{ MHz}$	
Cut-off Frequency (-3dB)	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		
Turn-off Time	t_{off}	—	3	—	μs		
Turn-ON Time	t_{ON}	—	2	—	μs	$V_{CC} = 5\text{V}, I_F = 16 \text{ mA},$ $R_L = 1.9 \text{ k}\Omega$	Figure 1, Figure 17
Storage Time	T_S	—	25	—	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

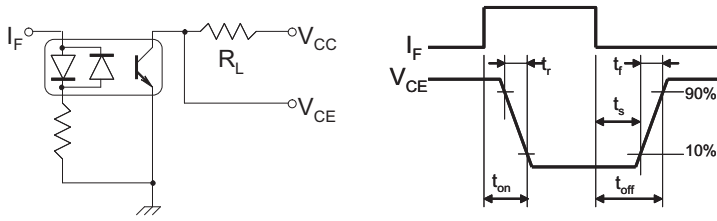
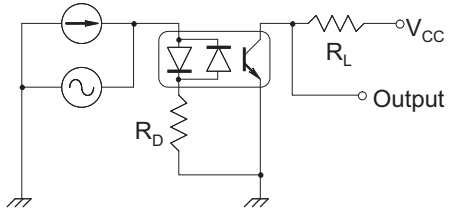
Figure 1 Switching Time Test Circuit**Figure 2 Frequency Response Test Circuit**

Figure 3 Forward Current vs. Ambient Temperature

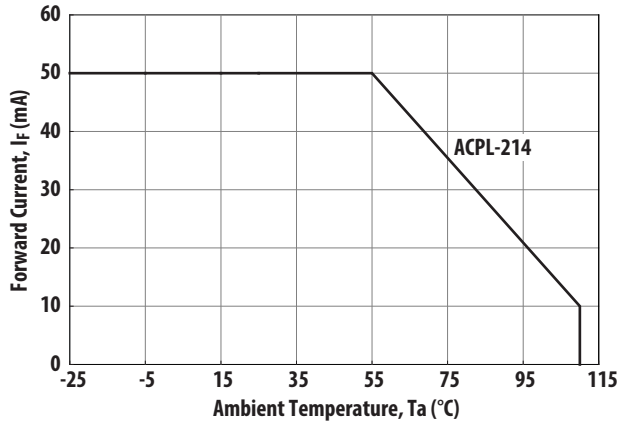


Figure 4 Collector Power Dissipation vs. Ambient Temperature

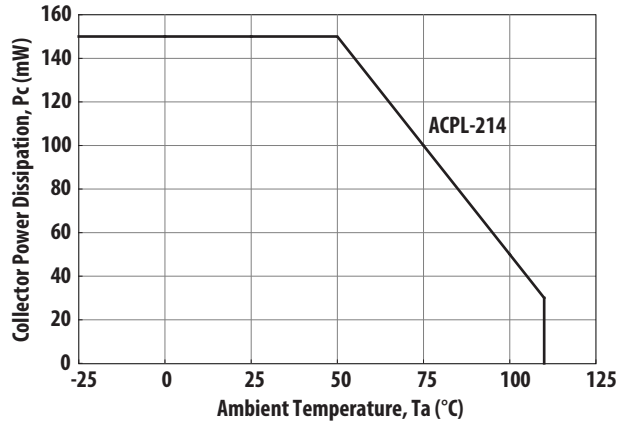


Figure 5 Pulse Forward Current vs. Duty Cycle Ratio

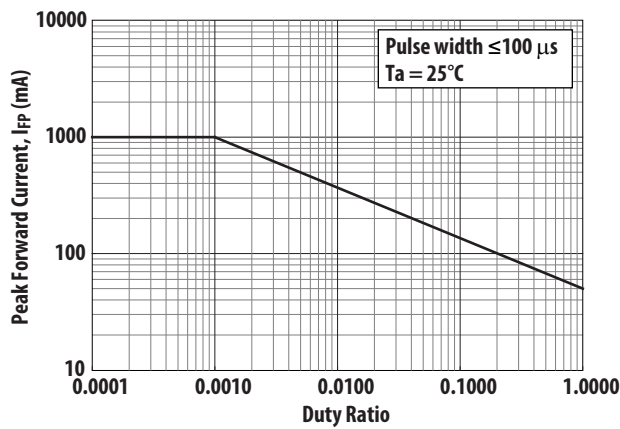


Figure 6 Forward Current vs. Forward Voltage

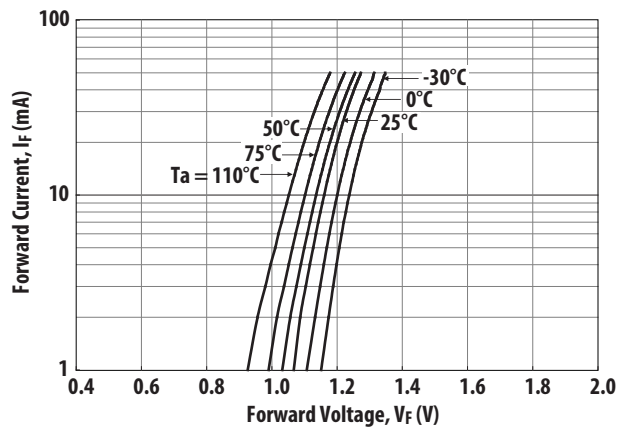


Figure 7 Forward Voltage Temperature Coefficient vs. Forward Current

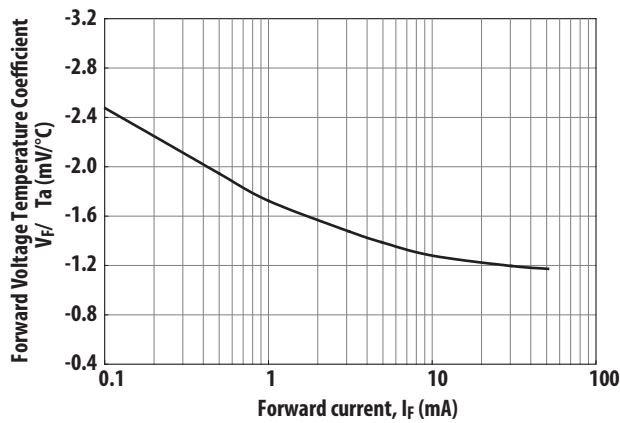


Figure 8 Pulse Forward Current vs. Pulse Forward Voltage

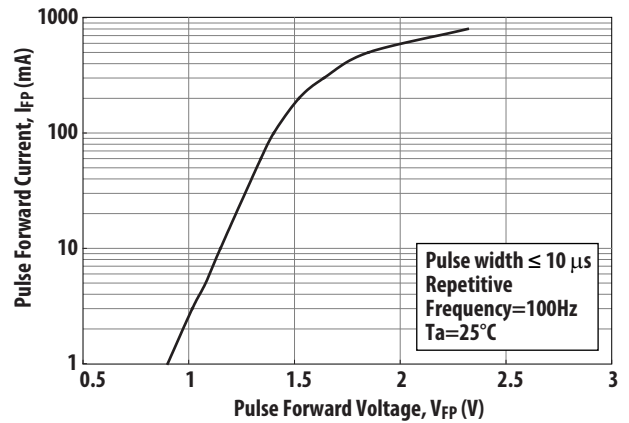


Figure 9 Collector Current vs. Collector-Emitter Voltage

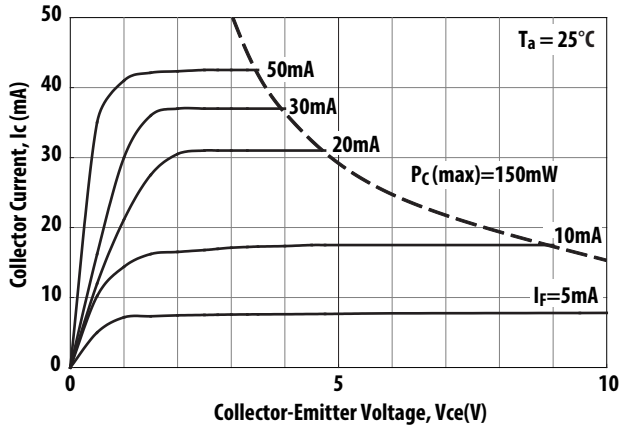


Figure 10 Collector Current vs. Small Collector-Emitter Voltage

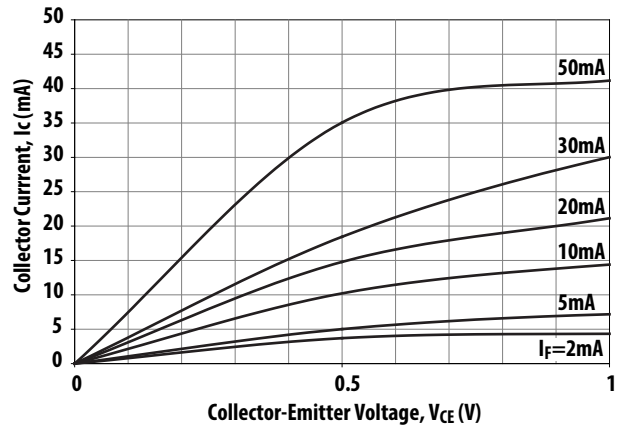


Figure 11 Collector Current vs. Forward Current

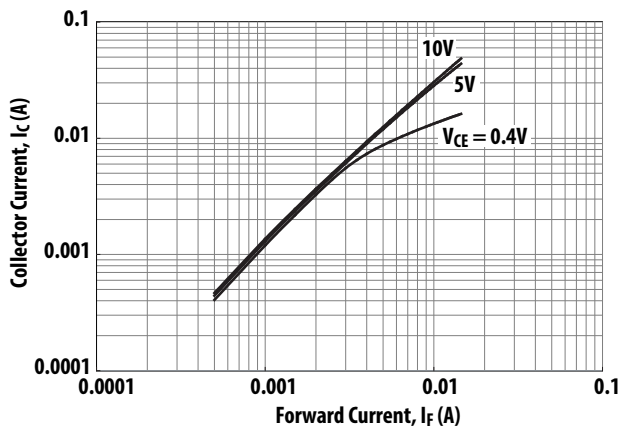


Figure 12 Collector Dark Current vs. Ambient Temperature

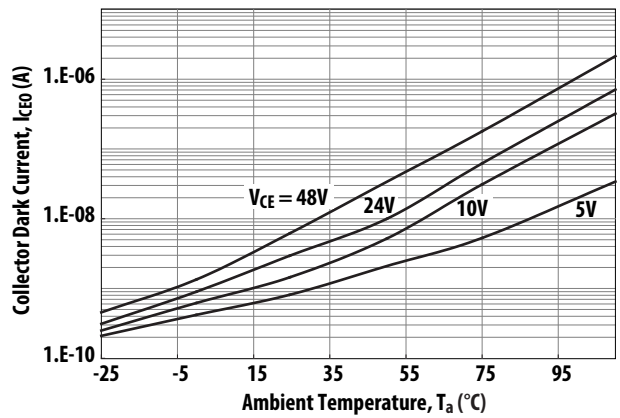


Figure 13 Current Transfer Ratio vs. Forward Current

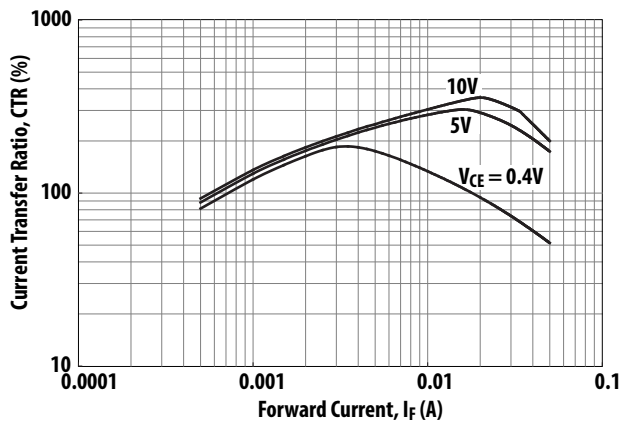


Figure 14 Collector-Emitter Saturation Voltage vs. Ambient Temperature

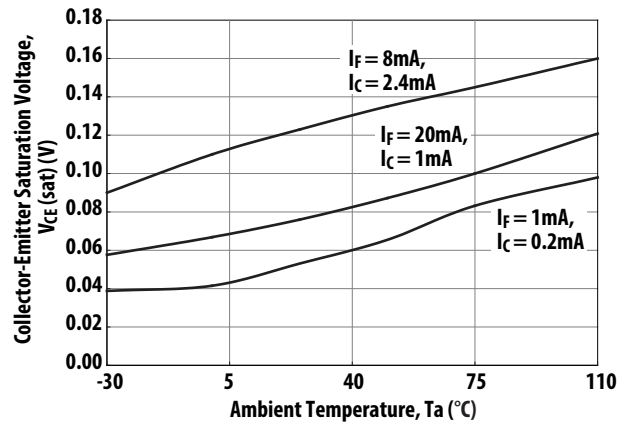


Figure 15 Collector Current vs. Ambient Temperature

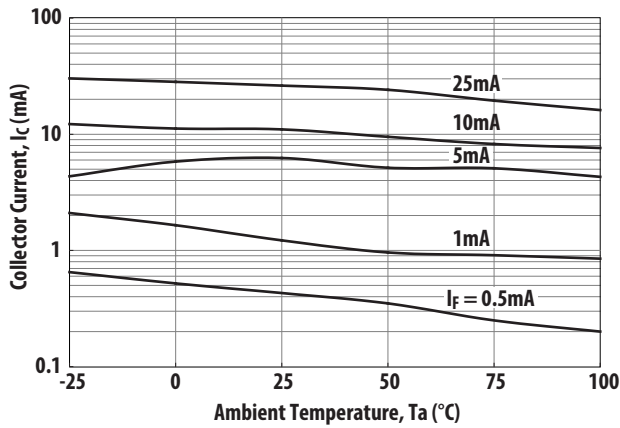


Figure 16 Switching Time vs. Load Resistance

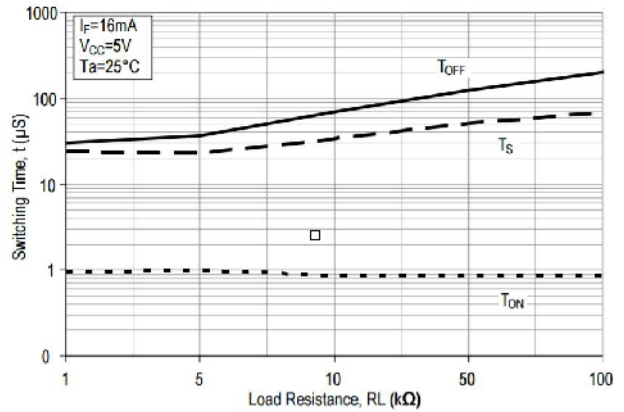


Figure 17 Switching Time vs. Ambient Temperature

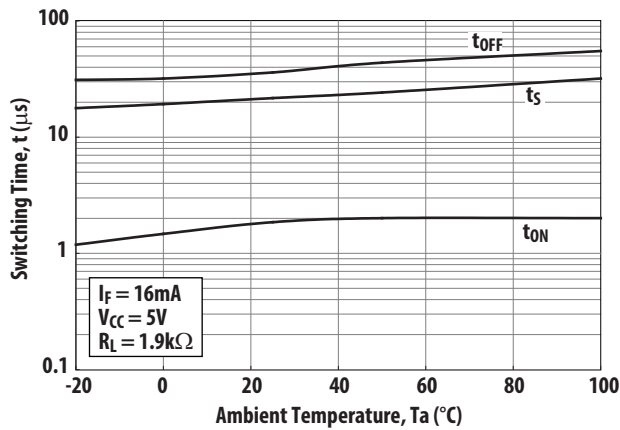


Figure 18 Collector-Emitter Saturation Voltage vs. Forward Current

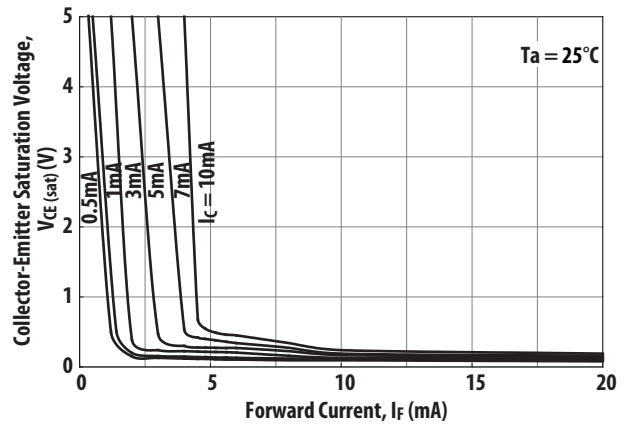


Figure 19 Frequency Response

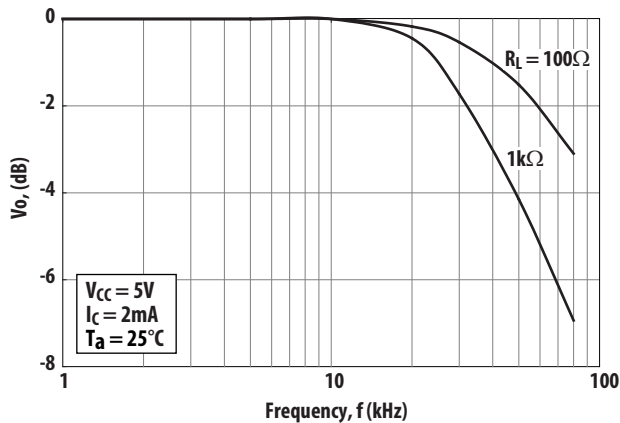
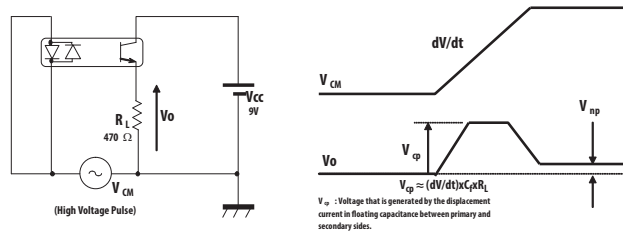


Figure 20 CMR Test Circuit



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