BROADCOM®

Data Sheet

ACPL-227/ACPL-247

DC Input, Multi-Channel Half-Pitch Phototransistor Optocoupler

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.

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. The components are not AECQ100 qualified and are not recommended for automotive applications.

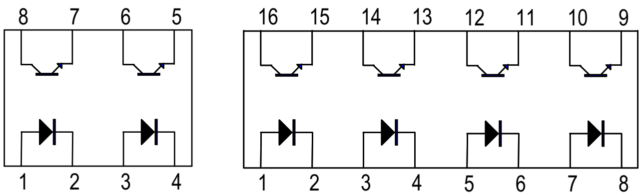
Features

- 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

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

Ordering Information

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

	RoHS Compliant Option									
Part Number	**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**	**Package**	**Number of Channels**	**Surface Mount**	**Tape and Reel**	**IEC/EN/ DIN EN 60747-5-5**	**Quantity**
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.

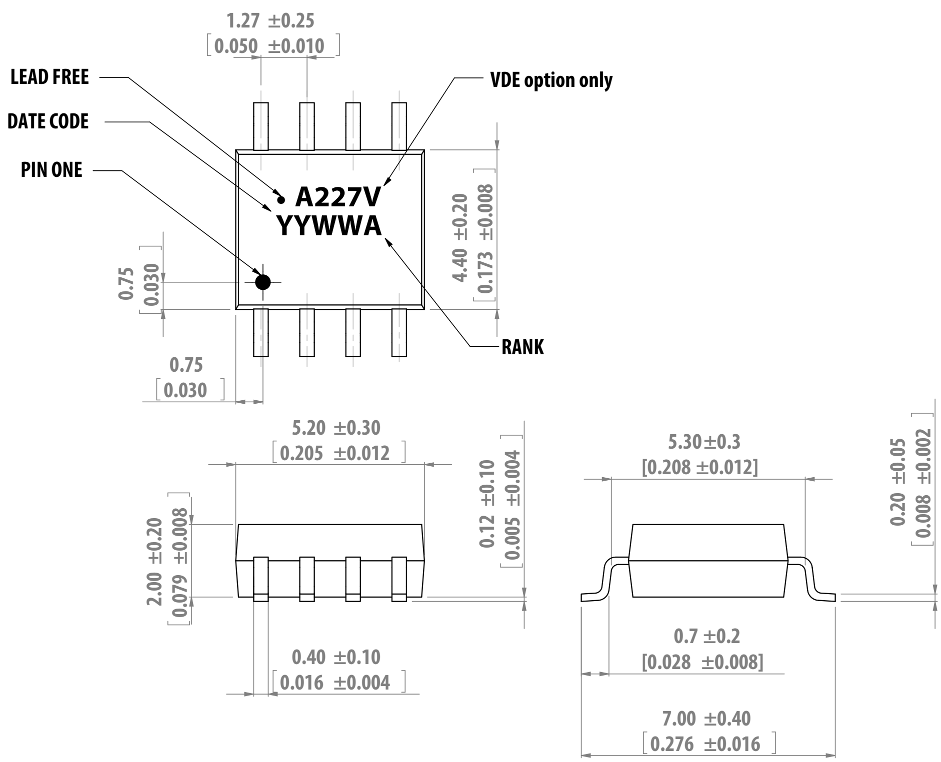
Example 2:

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.

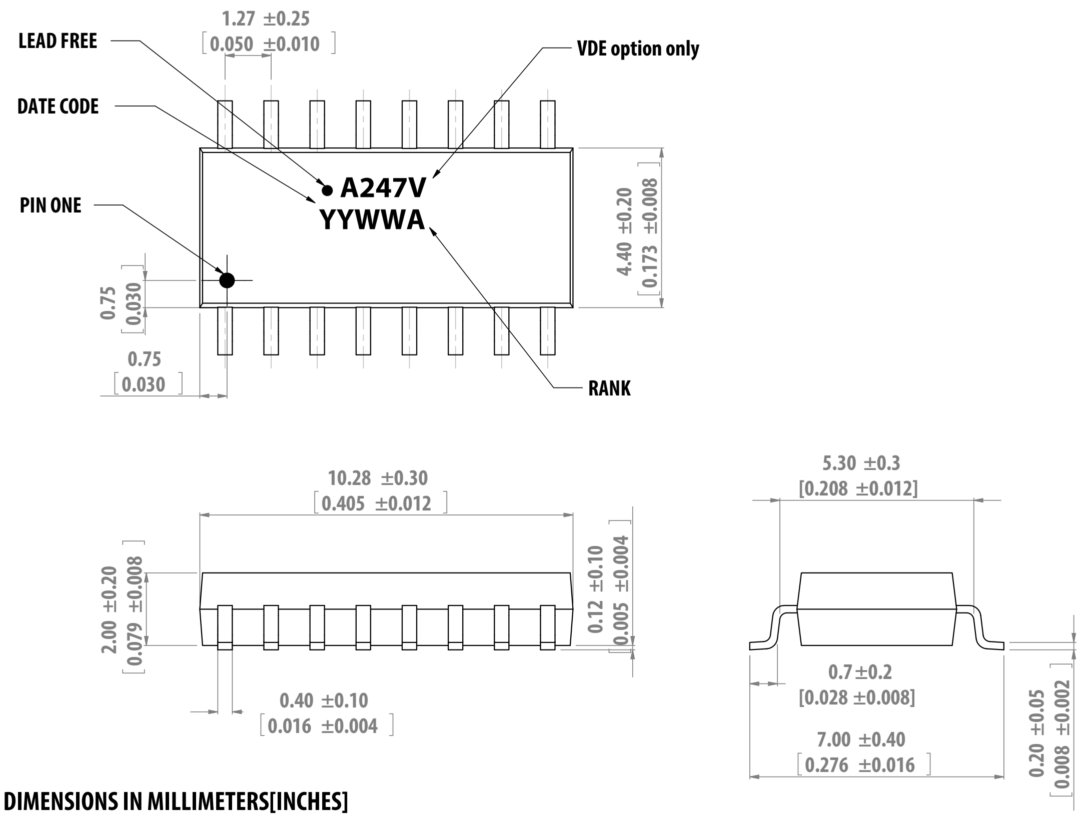
Package Outline Drawings

ACPL-227 Package Outline



DIMENSIONS IN MILLIMETERS [INCHES]

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.

Absolute Maximum Ratings

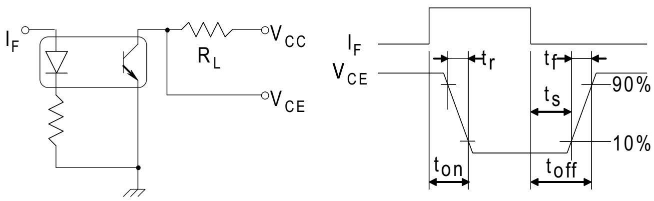
Parameter	Symbol	ACPL-227	ACPL-247	Unit	Note
Storage Temperature	T_S	–55~125		°C	
Operating Temperature	T_A	–55~110		°C	
Average Forward Current	$I_{F(AVG)}$	50		mA	
Pulse Forward Current	I_{FSM}	1		A	
Reverse Voltage	V_R	6		V	
LED Power Dissipation (1 channel)	P_I	65		mW	
Collector Current	I_C	50		mA	
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		Vrms	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				

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

Figure 1: Switching Time Test Circuit



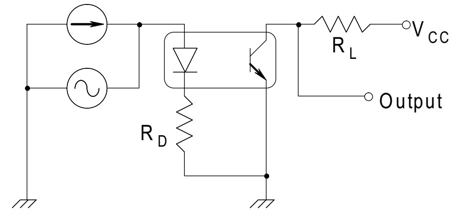


Figure 2: Frequency Response Test Circuit

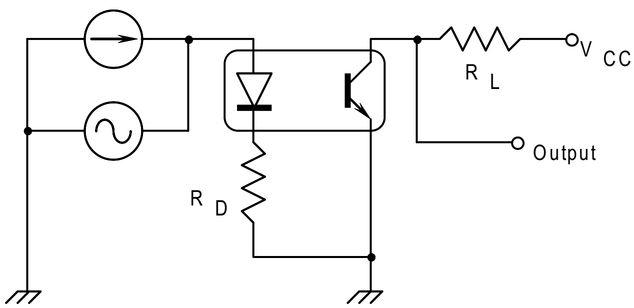


Figure 3: Forward Current vs. Ambient Temperature

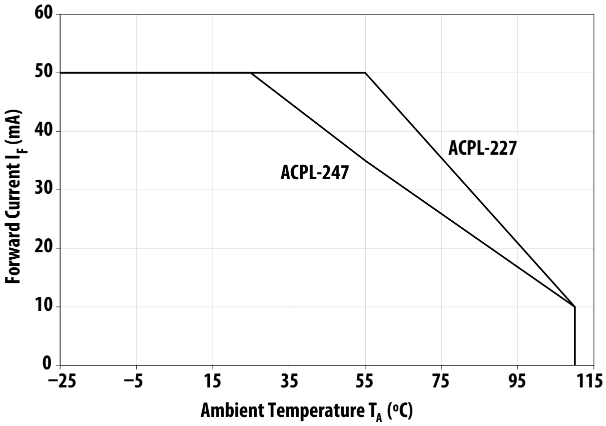


Figure 4: Collector Power Dissipation vs. Ambient Temperature

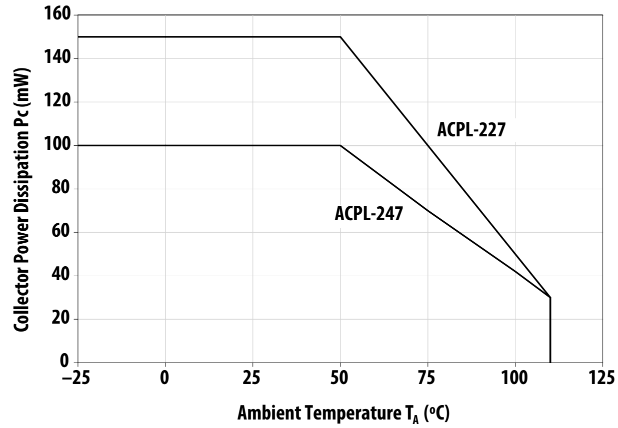


Figure 5: Pulse Forward Current vs. Duty Cycle Ratio

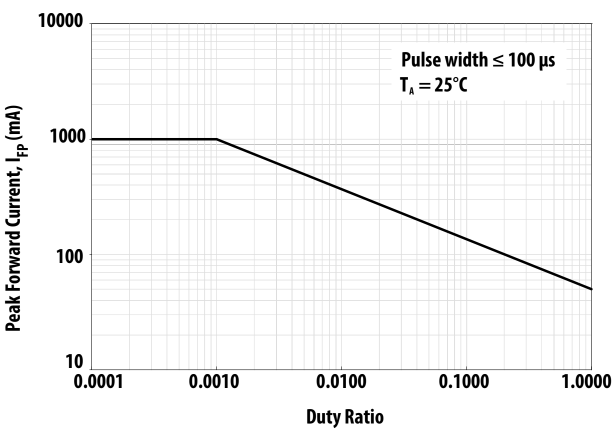


Figure 6: Forward Current vs. Forward Voltage

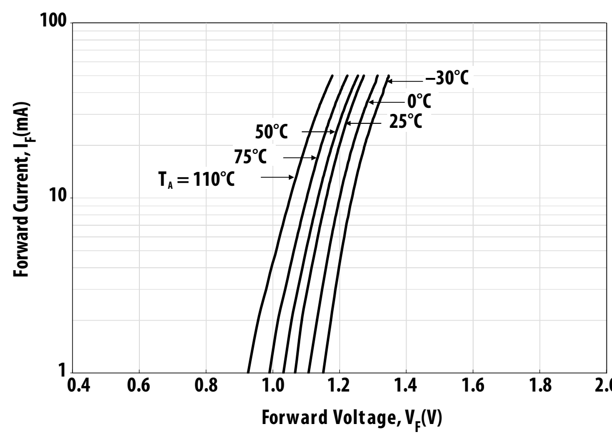


Figure 7: Forward Voltage Temperature Coefficient vs. Forward Current

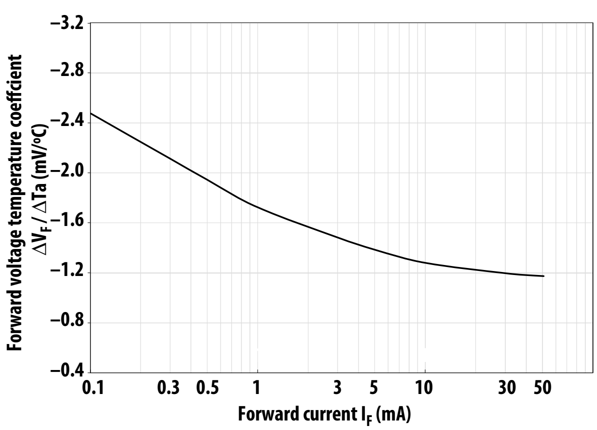


Figure 8: Pulse Forward Current vs. Pulse Forward Voltage

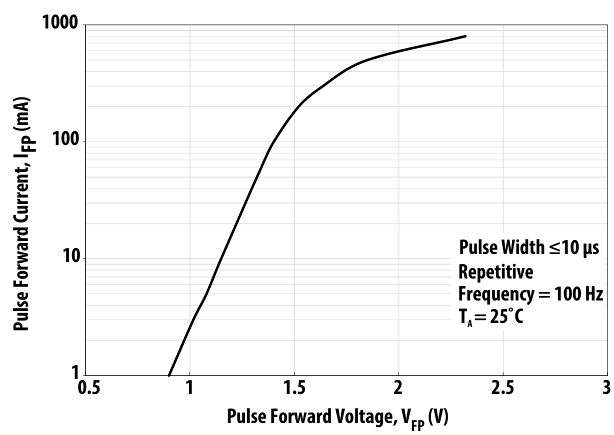


Figure 9: Collector Current vs. Collector-Emitter Voltage

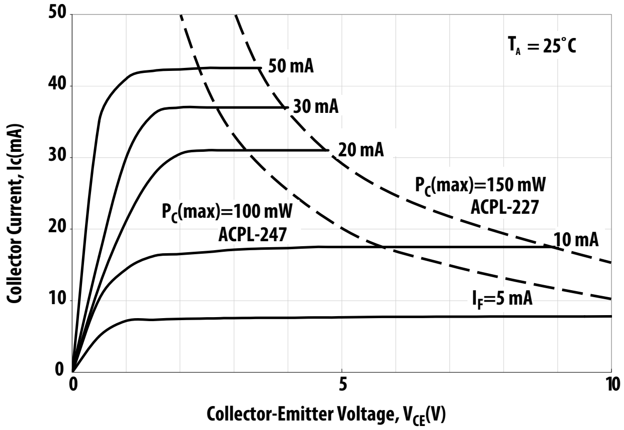


Figure 10: Collector Current vs. Small Collector-Emitter Voltage

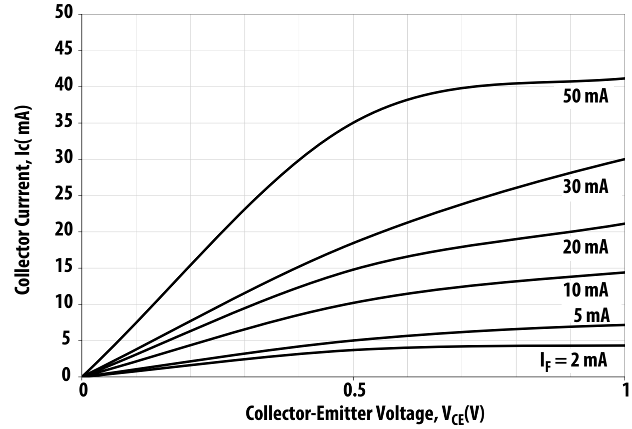


Figure 11: Collector Current vs. Forward Current

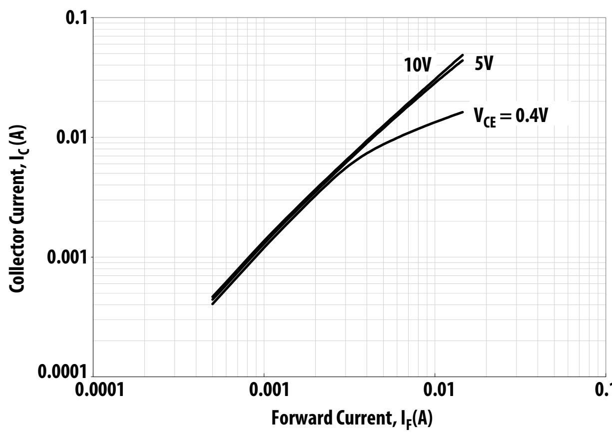


Figure 12: Collector Dark Current vs. Ambient Temperature

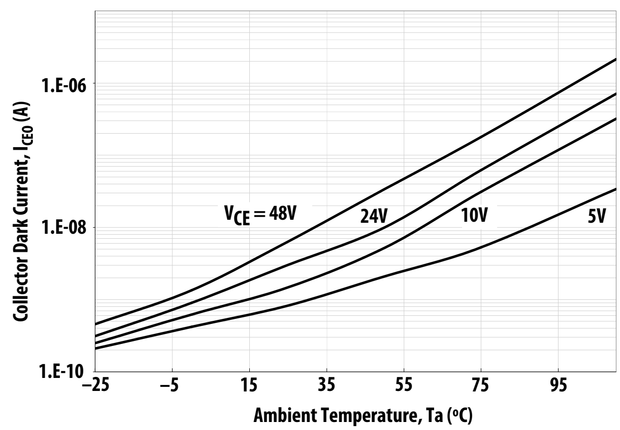


Figure 13: Current Transfer Ratio vs. Forward Current

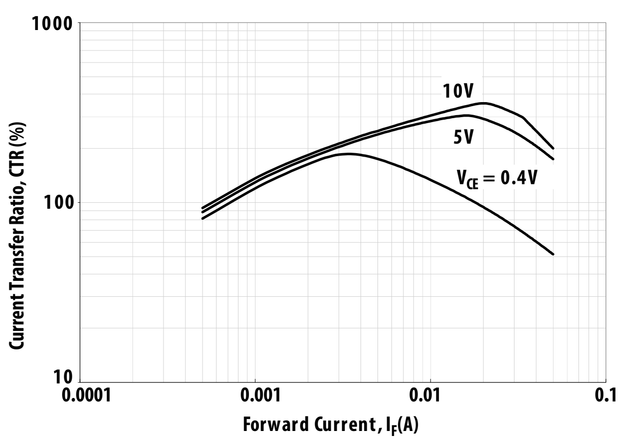


Figure 14: Collector-Emitter Saturation Voltage vs. Ambient Temperature

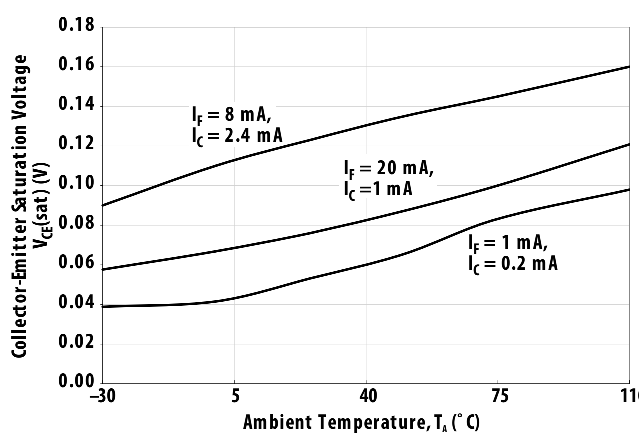


Figure 15: Collector Current vs. Ambient Temperature

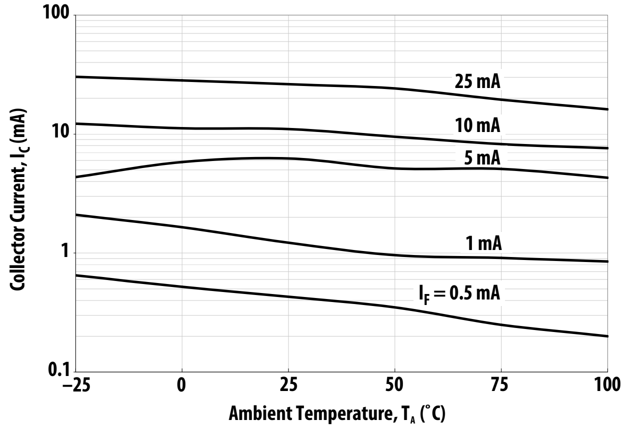


Figure 16: Switching Time vs. Load Resistance

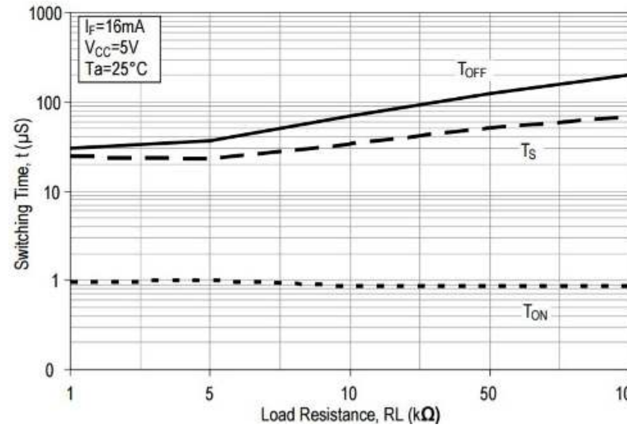


Figure 17: Switching Time vs. Ambient Temperature

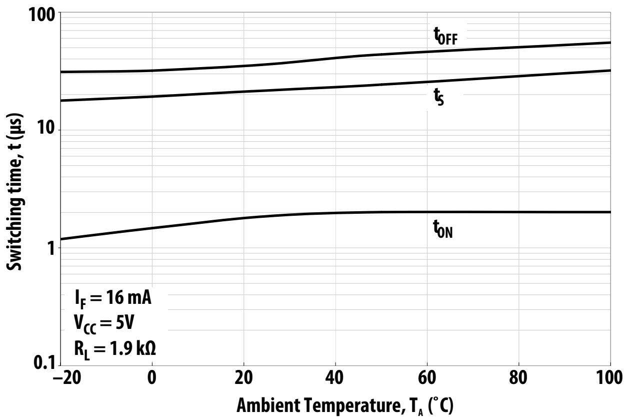


Figure 18: Collector-Emitter Saturation Voltage vs. Forward Current

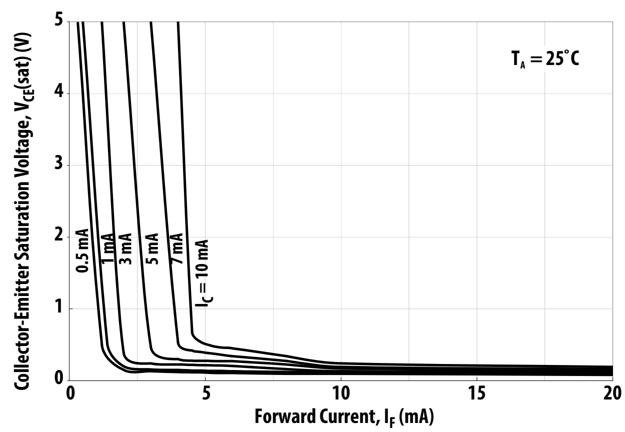


Figure 19: Frequency Response

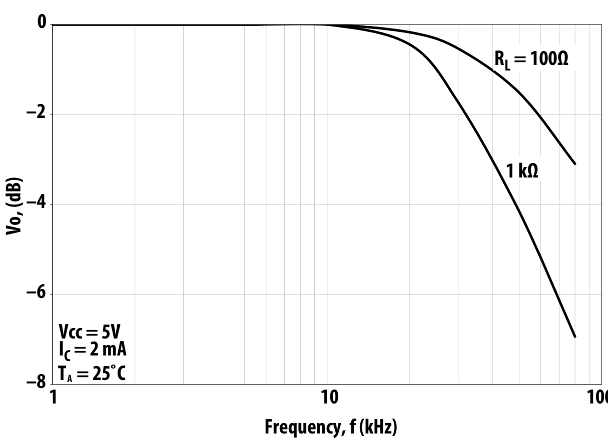
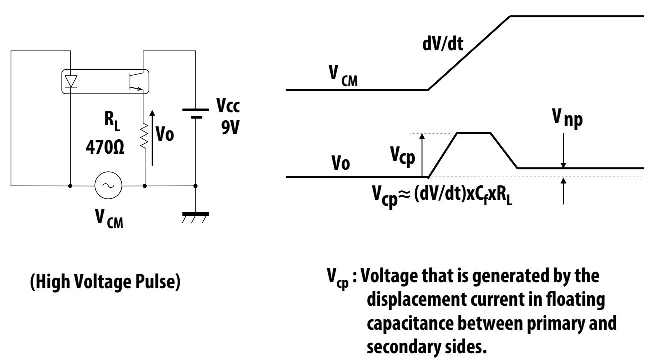


Figure 20: CMR Test Circuit



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