

AC Input, Half-Pitch Phototransistor Optocoupler

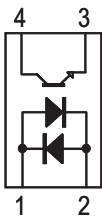
Data Sheet

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:

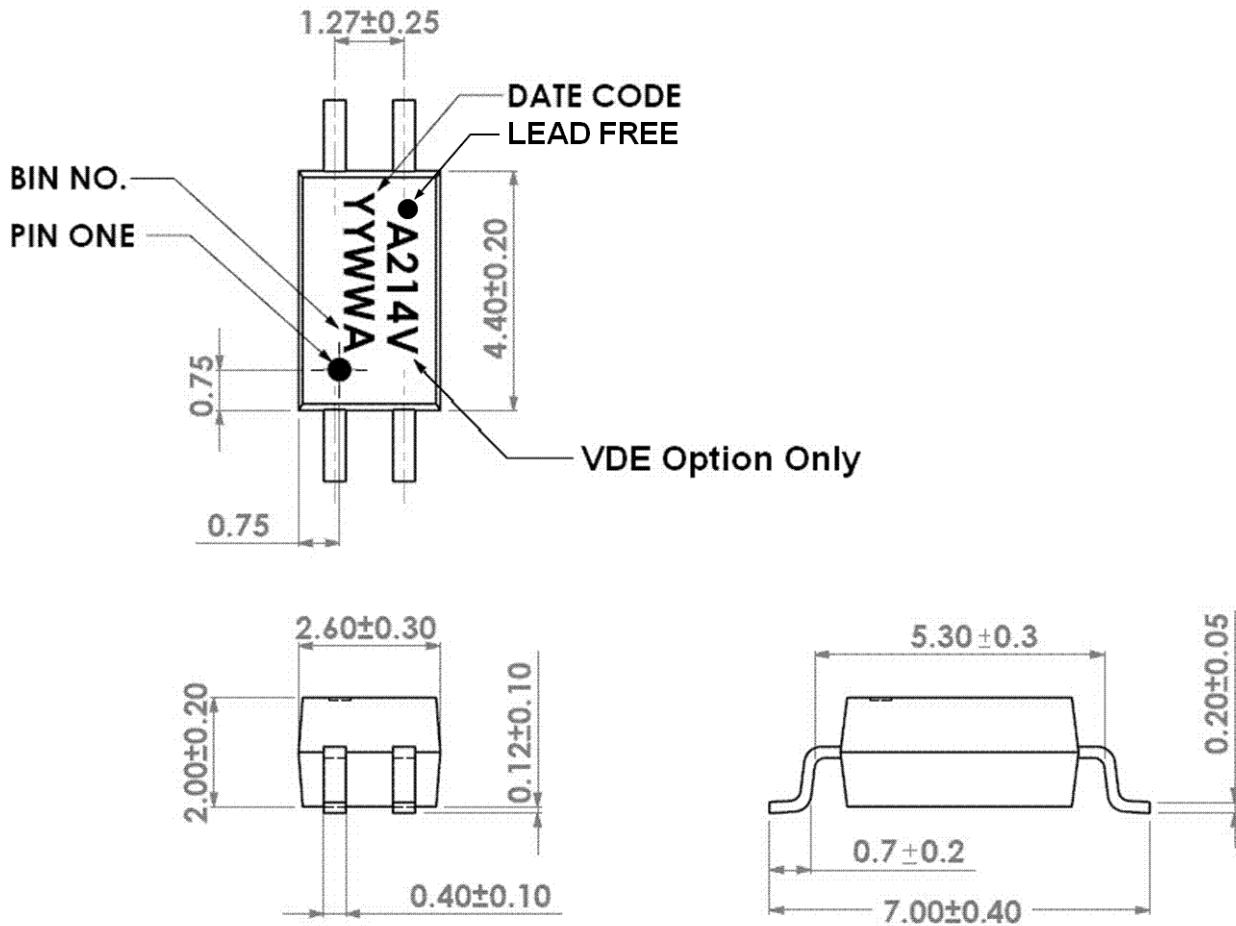
ACPL-214-560E to order product of SO-4 Surface Mount package in Tape and Reel packaging with IEC/EN/DIN EN 60767-5-5 Safety Approval, 20% < CTR < 400% and RoHS compliant.

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 |

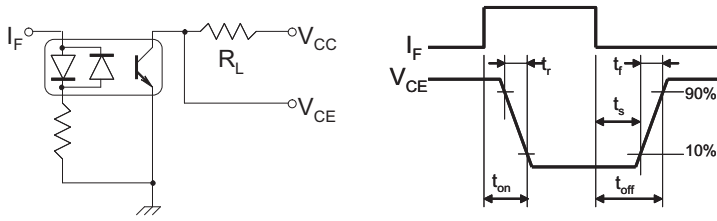
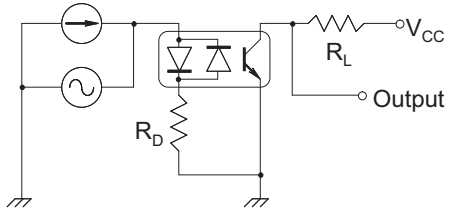
Figure 1 Switching Time Test Circuit**Figure 2 Frequency Response Test Circuit**

Figure 3 Forward Current vs. Ambient Temperature

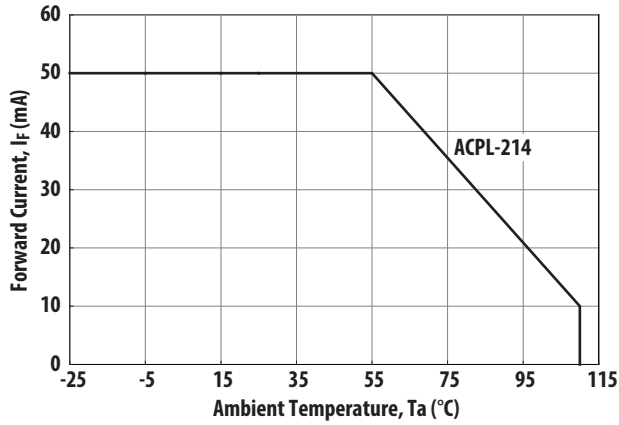


Figure 4 Collector Power Dissipation vs. Ambient Temperature

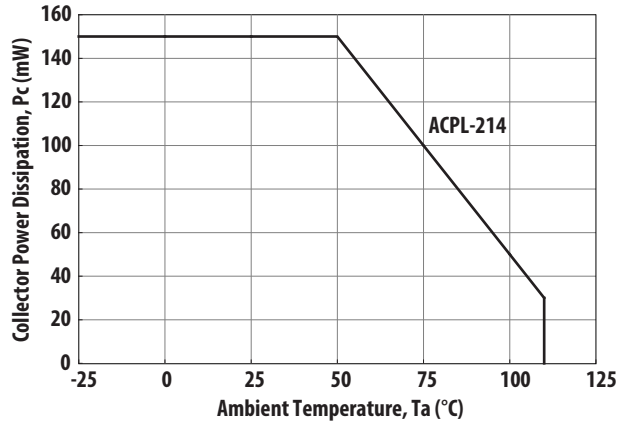


Figure 5 Pulse Forward Current vs. Duty Cycle Ratio

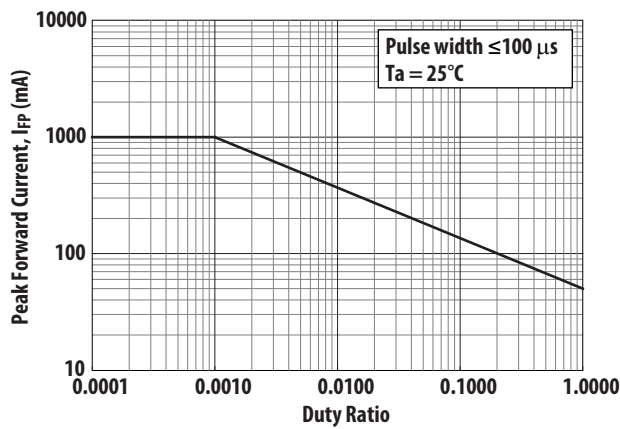


Figure 6 Forward Current vs. Forward Voltage

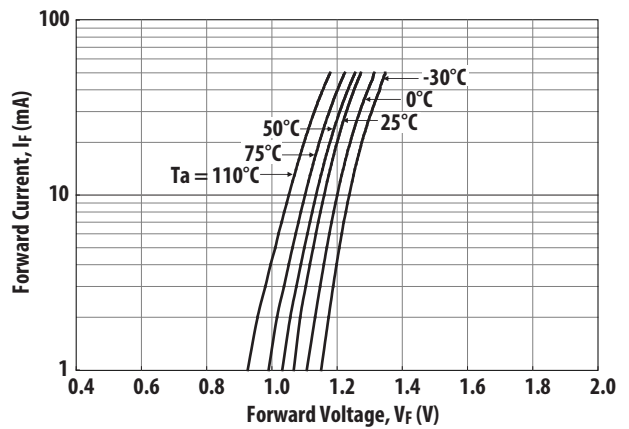


Figure 7 Forward Voltage Temperature Coefficient vs. Forward Current

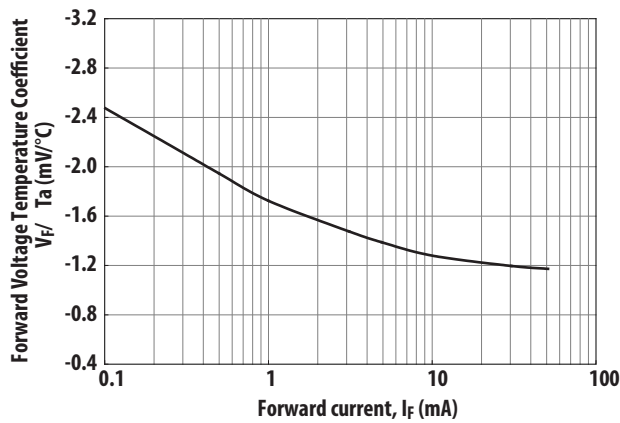


Figure 8 Pulse Forward Current vs. Pulse Forward Voltage

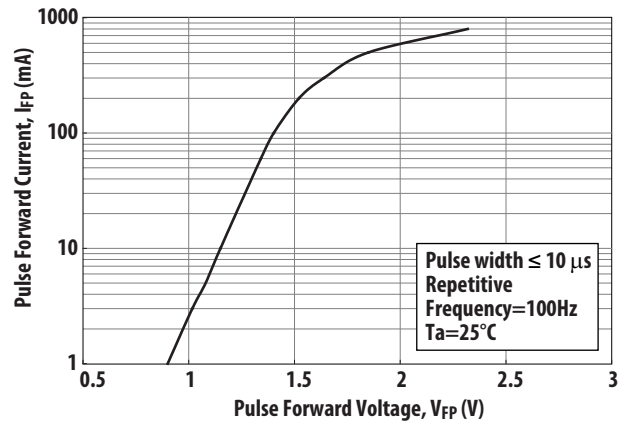


Figure 9 Collector Current vs. Collector-Emitter Voltage

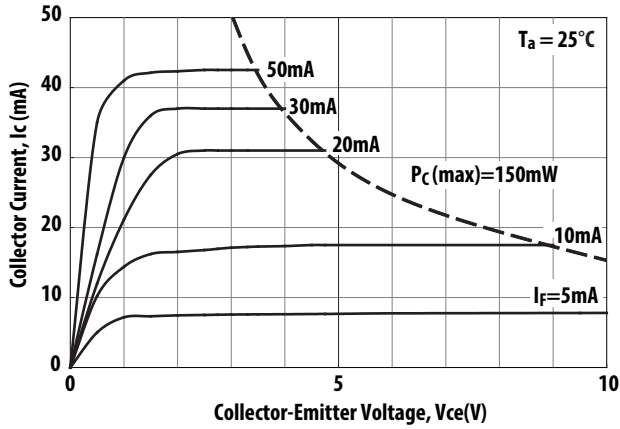


Figure 10 Collector Current vs. Small Collector-Emitter Voltage

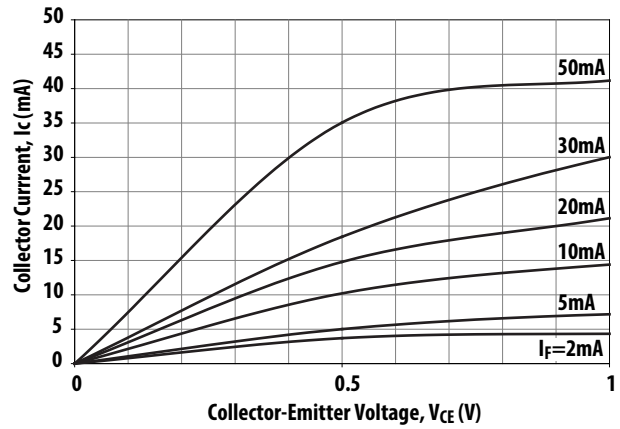


Figure 11 Collector Current vs. Forward Current

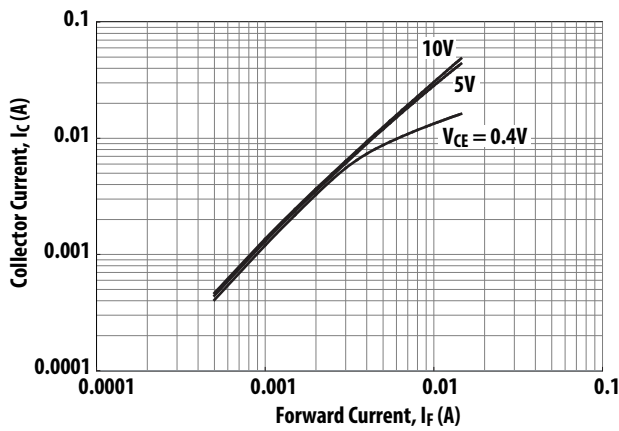


Figure 12 Collector Dark Current vs. Ambient Temperature

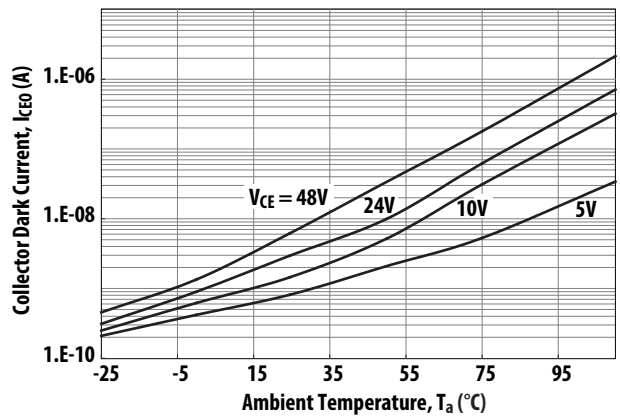


Figure 13 Current Transfer Ratio vs. Forward Current

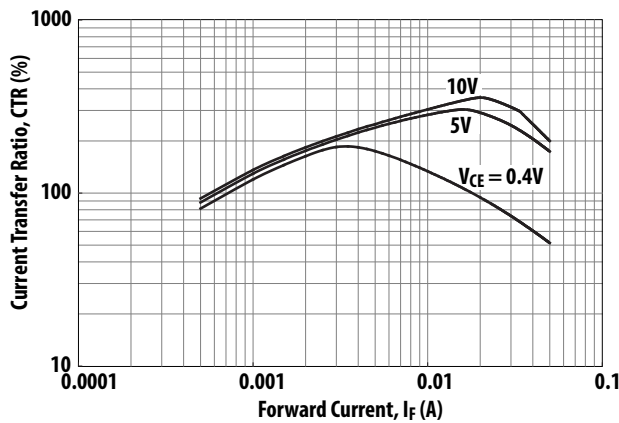


Figure 14 Collector-Emitter Saturation Voltage vs. Ambient Temperature

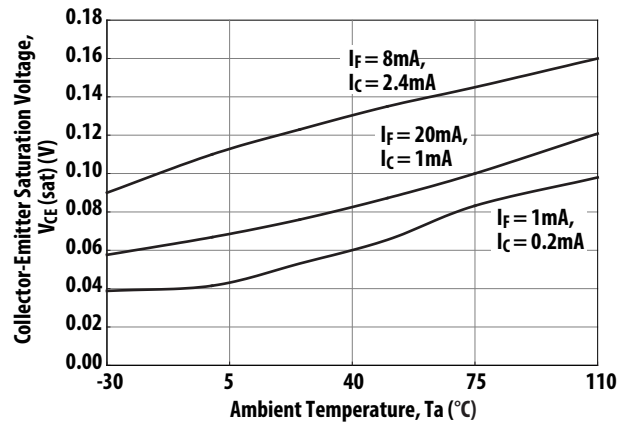


Figure 15 Collector Current vs. Ambient Temperature

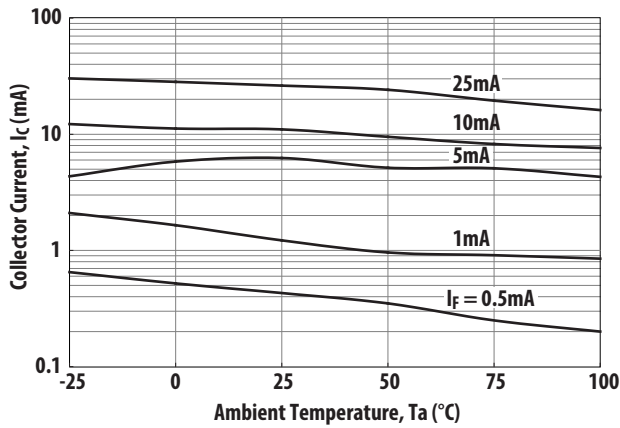


Figure 16 Switching Time vs. Load Resistance

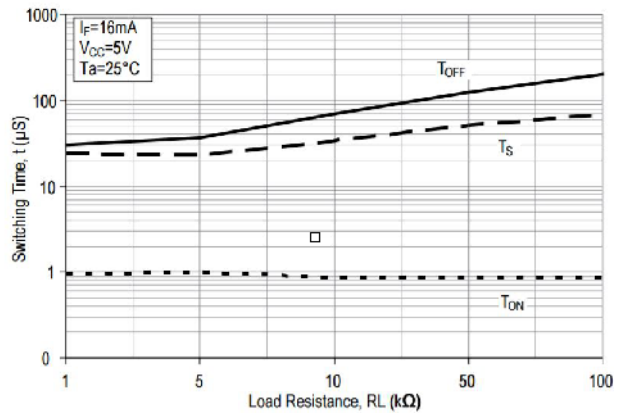


Figure 17 Switching Time vs. Ambient Temperature

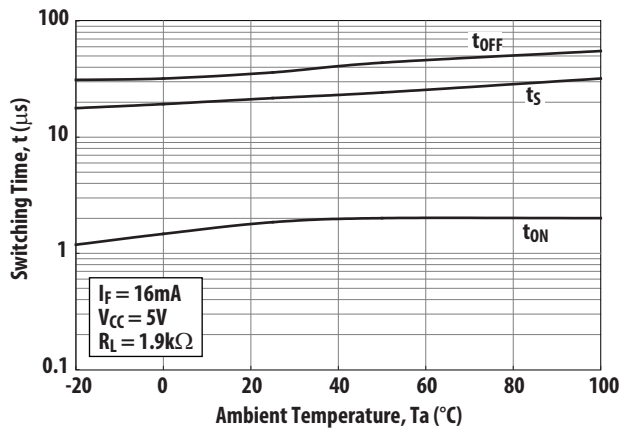


Figure 18 Collector-Emitter Saturation Voltage vs. Forward Current

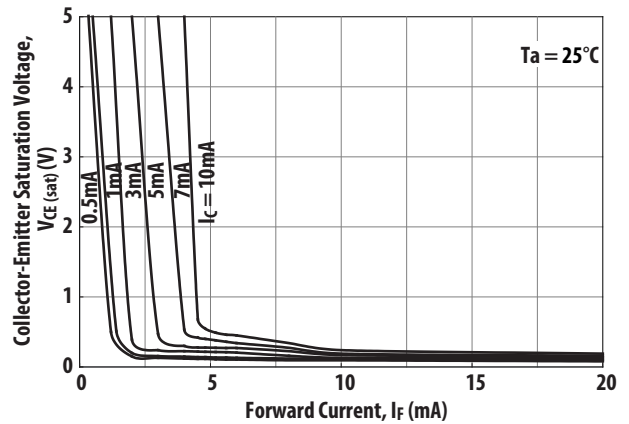


Figure 19 Frequency Response

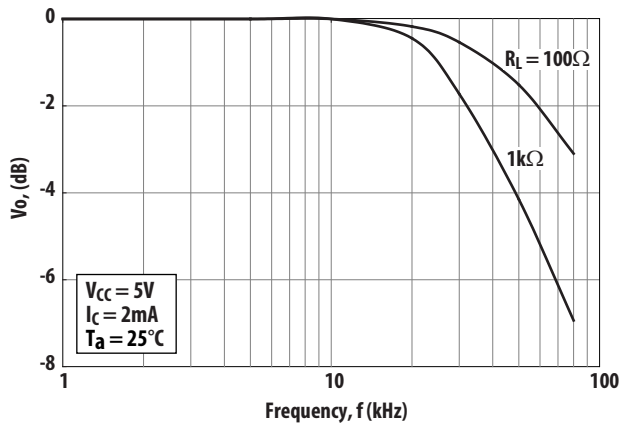
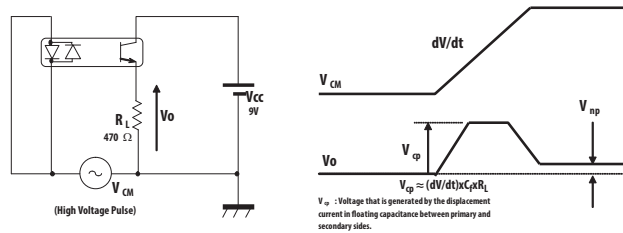


Figure 20 CMR Test Circuit



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