

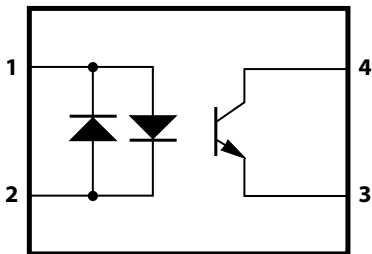
HCPL-354

AC Input Phototransistor Optocoupler SMD Mini-Flat Type

Description

The Broadcom[®] HCPL-354 contains a phototransistor, optically coupled to two LEDs connected inverse parallel. It can operate directly by AC input current. It is packaged in a 4-pin mini-flat SMD package with a 2.0-mm profile. The small dimension of this product allows significant space savings. The package volume is 30% smaller than that of conventional DIP type. Input-output isolation voltage is 3750 V_{rms}. Response time, t_r , is typically 4 μ s and minimum CTR is 20% at input current of ± 1 mA.

Functional Diagram



1. ANODE, CATHODE 3. EMITTER
2. CATHODE, ANODE 4. COLLECTOR

Features

- AC input response
- Current transfer ratio
(CTR: min. 20% at $I_F = \pm 1$ mA, $V_{CE} = 5$ V)
- Isolation voltage between input and output
($V_{iso} = 3,750$ V_{rms})
- Subminiature type
(The volume is smaller than that of conventional DIP type by as far as 30%)
- Mini-flat package
- 2.0 mm profile
- UL approved
- CSA approved
- IEC/EN 60747-5-5 approved
- Options available:
 - IEC/EN 60747-5-5 approvals (060)

Applications

- Detecting or monitoring AC signals
- Programmable controllers
- AC/DC-input modules
- AC line/digital logic isolation

CAUTION! Take normal static precautions in handling and assembly of this component to prevent damage and/or degradation that might be induced by electrostatic discharge (ESD). The components featured in this data sheet are not to be used in military or aerospace applications or environments. The components are not AEC-Q100 qualified and not recommended for automotive applications.

Ordering Information

HCPL-354 is UL Recognized with 3750 V_{rms} for 1 minute per UL1577 and is approved under CSA Component Acceptance Notice #5, File CA 88324.

| Part Number | RoHS Compliant Option | | Package | Surface Mount | Gull Wing | Tape and Reel | IEC/EN 60747-5-5 | Quantity |
|-------------|--------------------------|---------------------------|---------|---------------|-----------|---------------|------------------|----------------------|
| | Rank '0' 20%<CTR<400% | 'Rank 'A' 50%<CTR<150% | | | | | | |
| HCPL-354 | -000E | -00AE | SO-4 | X | | X | | 3000 pieces per reel |
| | -060E | -06AE | SO-4 | X | | X | 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 1:

HCPL-354-00AE to order product of Miniflat-4 AC Surface Mount package in Tape and Reel packaging with 50%<CTR<150% and RoHS compliant.

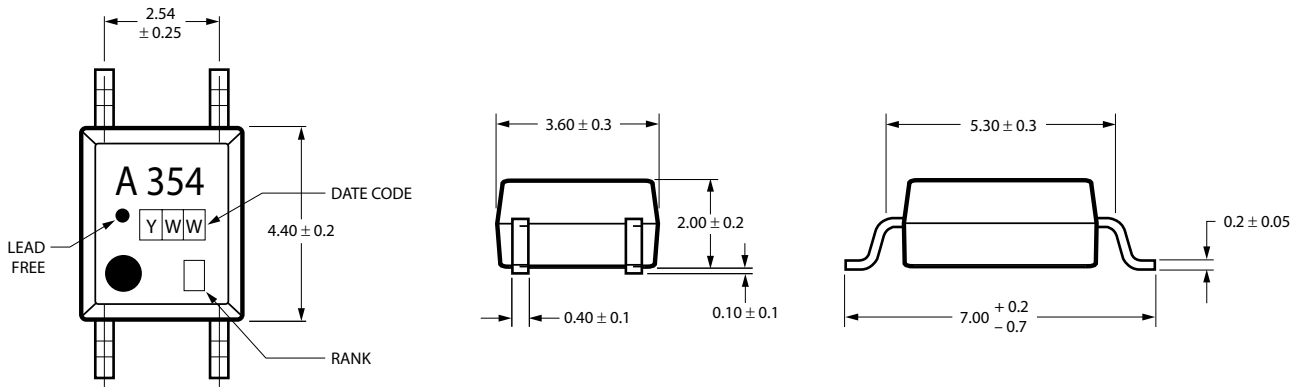
Example 2:

HCPL-354-060E to order product of Miniflat-4 AC Surface Mount package in Tape and Reel pack- aging with 20%<CTR<400%, IEC/EN 60747-5-5 Safety Approval and RoHS compliant.

Option data sheets are available. Contact your Broadcom sales representative or authorized distributor for information.

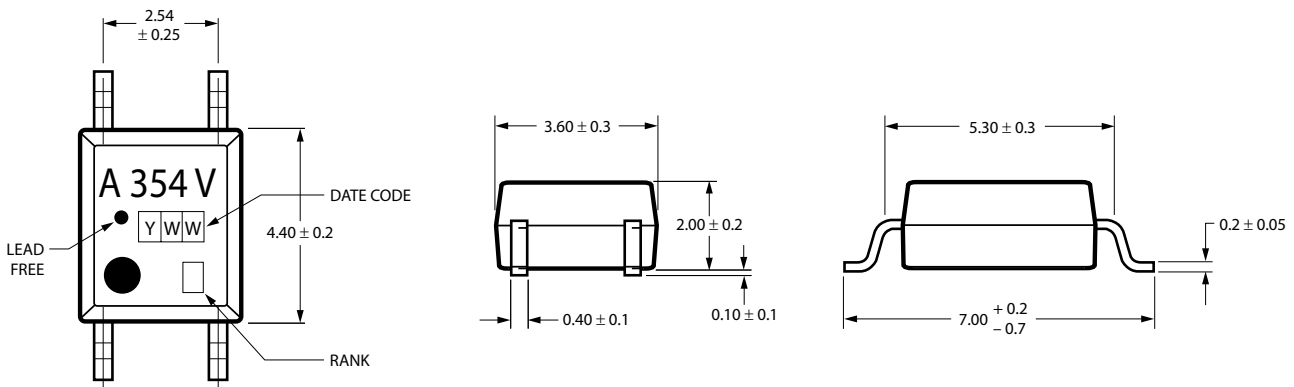
Package Outline Drawing

HCPL-354-000E



DIMENSIONS IN MILLIMETERS.

HCPL-354-060E



DIMENSIONS IN MILLIMETERS.

Solder Reflow Profile

Recommended reflow condition as per JEDEC Standard, J-STD-020 (latest revision). Non-halide flux should be used.

Absolute Maximum Ratings

| Parameters | Symbol | Min. | Max. | Units |
|---|-----------|------|------|-----------|
| Storage Temperature | T_S | -55 | 150 | °C |
| Ambient Operating Temperature | T_A | -55 | 100 | °C |
| Lead Solder Temperature for 10s (1.6 mm below seating plane) | T_{sol} | — | 260 | °C |
| Average Forward Current | I_F | — | ±50 | mA |
| Input Power Dissipation | P_I | — | 70 | mW |
| Collector Current | I_C | — | 50 | mA |
| Collector-Emitter Voltage | V_{CEO} | — | 35 | V |
| Emitter-Collector Voltage | V_{ECO} | — | 6 | V |
| Collector Power Dissipation | P_C | — | 150 | mW |
| Total Power Dissipation | P_{tot} | — | 170 | mW |
| Isolation Voltage (AC for 1 minute, RH = 40 ~ 60%) ^a | V_{iso} | — | 3750 | V_{rms} |

a. Isolation voltage shall be measured using the following method:

- (a) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
- (b) The isolation voltage tester with zero-cross circuit is used.
- (c) The waveform of applied voltage is a sine wave.

Electrical Specifications ($T_A = 25^\circ\text{C}$)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--------------------------------------|---------------|--------------------|--------------------|------|---------------|---|
| Forward Voltage | V_F | — | 1.2 | 1.4 | V | $I_F = \pm 20 \text{ mA}$ |
| Terminal Capacitance | C_t | — | 30 | 250 | pF | $V = 0, f = 1 \text{ kHz}$ |
| Collector Dark Current | I_{CEO} | — | - | 100 | nA | $V_{CE} = 20\text{V}, I_F = 0$ |
| Collector-Emitter Breakdown Voltage | BV_{CEO} | 35 | — | — | V | $I_C = 0.1 \text{ mA}, I_F = 0$ |
| Emitter-Collector Breakdown Voltage | BV_{ECO} | 6 | — | — | V | $I_E = 10 \mu\text{A}, I_F = 0$ |
| Collector Current | I_C | 0.2 | — | 4 | mA | $I_F = \pm 1 \text{ mA}$ |
| Current Transfer Ratio ^a | CTR | 20 | — | 400 | % | $V_{CE} = 5\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | 0.1 | 0.2 | V | $I_F = \pm 20 \text{ mA}, I_C = 1 \text{ mA}$ |
| Isolation Resistance | R_{iso} | 5×10^{10} | 1×10^{11} | — | Ω | DC 500V, 40 ~ 60% RH |
| Floating Capacitance | C_f | — | 0.6 | 1 | pF | $V = 0, f = 1 \text{ MHz}$ |
| Response Time (Rise) | t_r | — | 4 | 18 | μs | $V_{CE} = 2\text{V}, I_C = 2 \text{ mA}$ |
| Response Time (Fall) | t_f | — | 3 | 18 | μs | $R_L = 100\Omega$ |

a. $CTR = (I_C / I_F) \times 100\%$.

| Rank Mark | CTR (%) | Conditions |
|-----------|----------|--|
| A | 50 ~ 150 | $I_F = \pm 1 \text{ mA}, V_{CE} = 5\text{V}, T_A = 25^\circ\text{C}$ |
| No Mark | 20 ~ 400 | |

Figure 1: Forward Current vs. Ambient Temperature

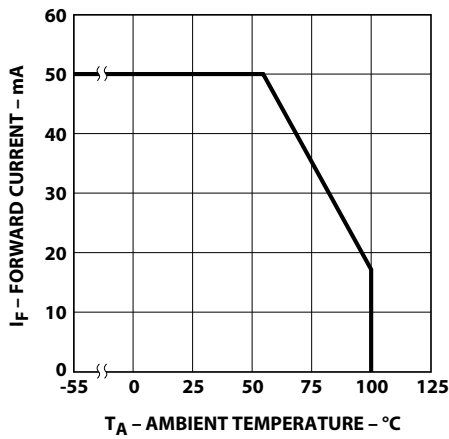


Figure 2: Collector Power Dissipation vs. Ambient Temperature

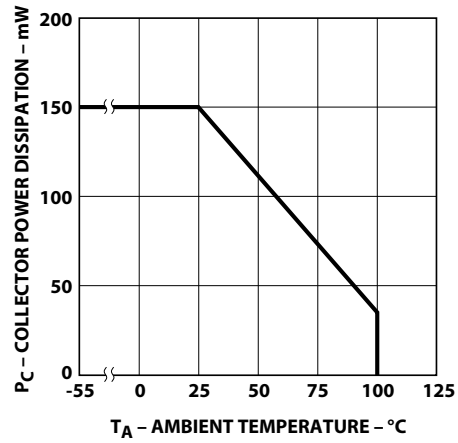


Figure 3: Collector-Emitter Saturation Voltage vs. Forward Current

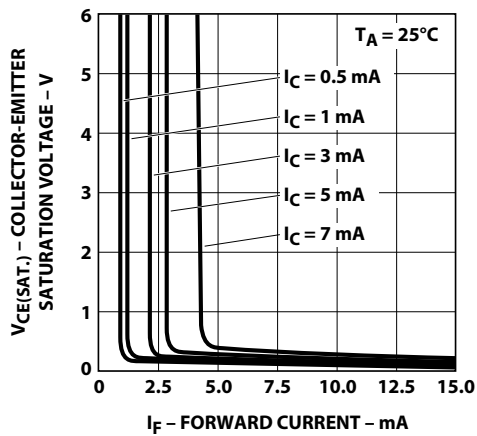


Figure 4: Forward Current vs. Forward Voltage

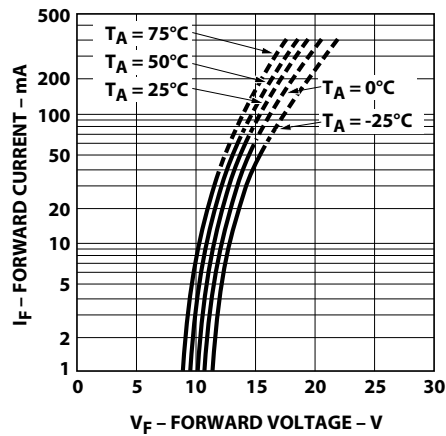


Figure 5: Current Transfer Ratio vs. Forward Current

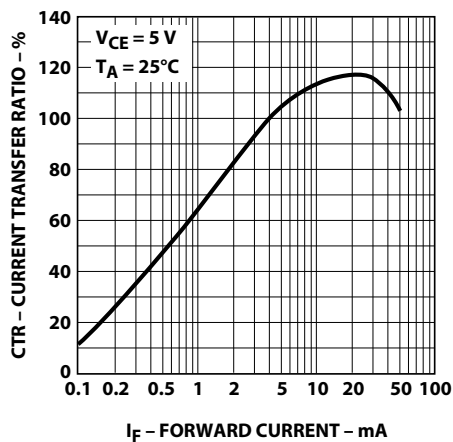


Figure 6: Collector Current vs. Collector-Emitter Voltage

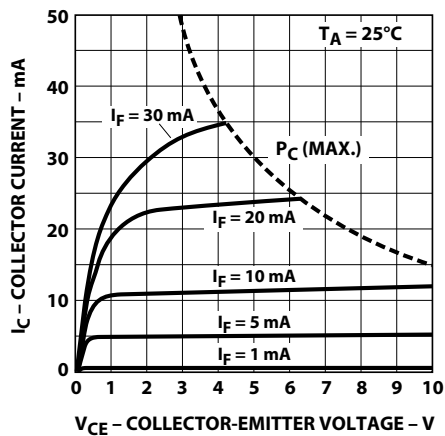


Figure 7: Relative Current Transfer Ratio vs. Ambient Temperature

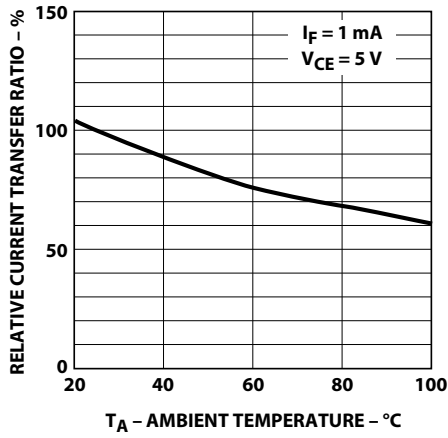


Figure 8: Collector-Emitter Saturation Voltage vs. Ambient Temperature

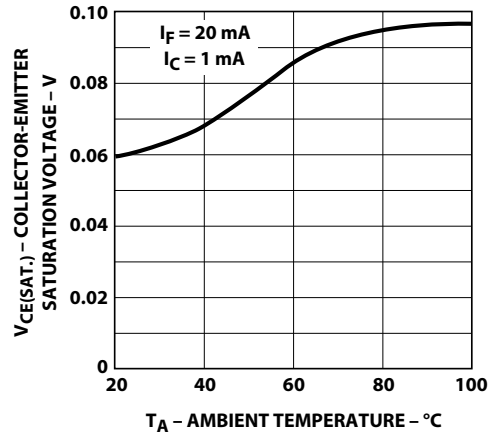


Figure 9: Collector Dark Current vs. Ambient Temperature

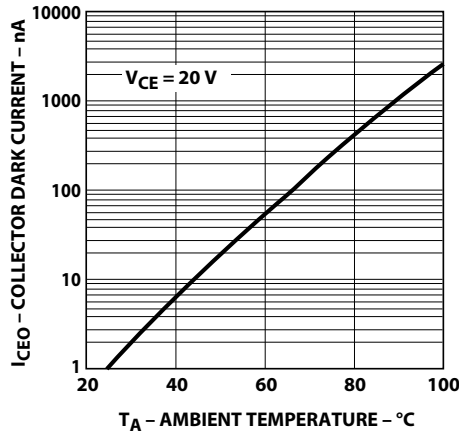


Figure 10: Response Time vs. Load Resistance

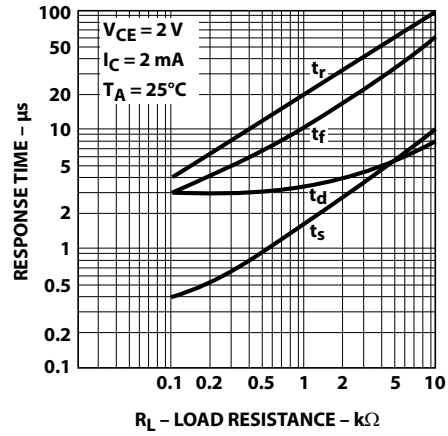


Figure 11: Frequency Response

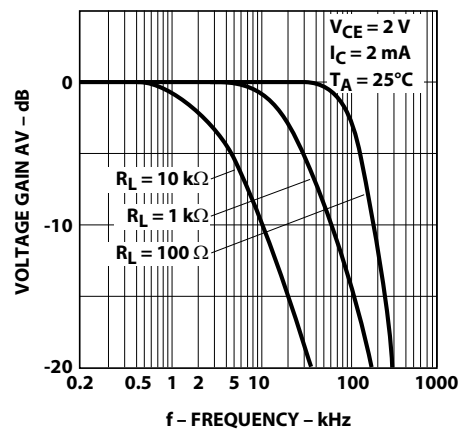


Figure 12: Test Circuit for Response Time

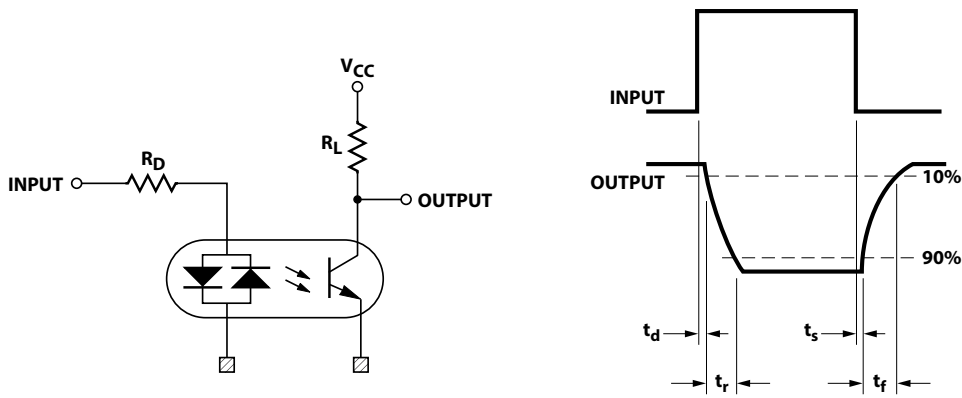
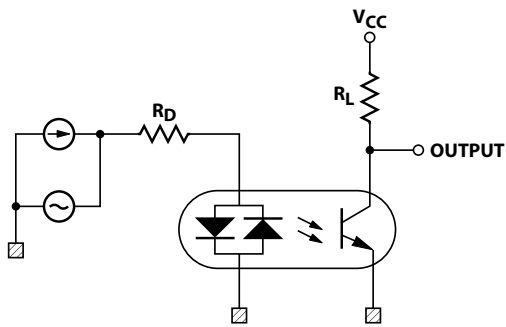


Figure 13: Test Circuit for Frequency Response



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