Agilent HCPL-354
AC Input Phototransistor Optocoupler SMD Mini-Flat Type
Data Sheet

Description
The HCPL-354 contains a phototransistor, optically coupled to two light emitting diodes 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 saving. 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 µs and minimum CTR is 20% at input current of ± 1 mA.

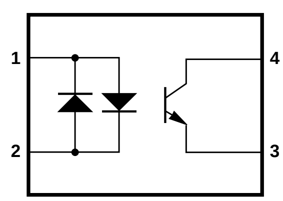
Ordering Information
Specify Part Number followed by Option Number (if desired).

HCPL-354-XXXE

- Lead Free
- Option Number

000 = No Options
060 = IEC/EN/DIN EN 60747-5-2 Option
00A = Rank Mark A

Functional Diagram



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

Features
- **AC input response**
- **Current transfer ratio (CTR: min. 20% at I_F = ± 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/DIN EN 60747-5-2 approved**
- **Options available:**
  - **IEC/EN/DIN EN 60747-5-2 approvals (060)**

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

__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.

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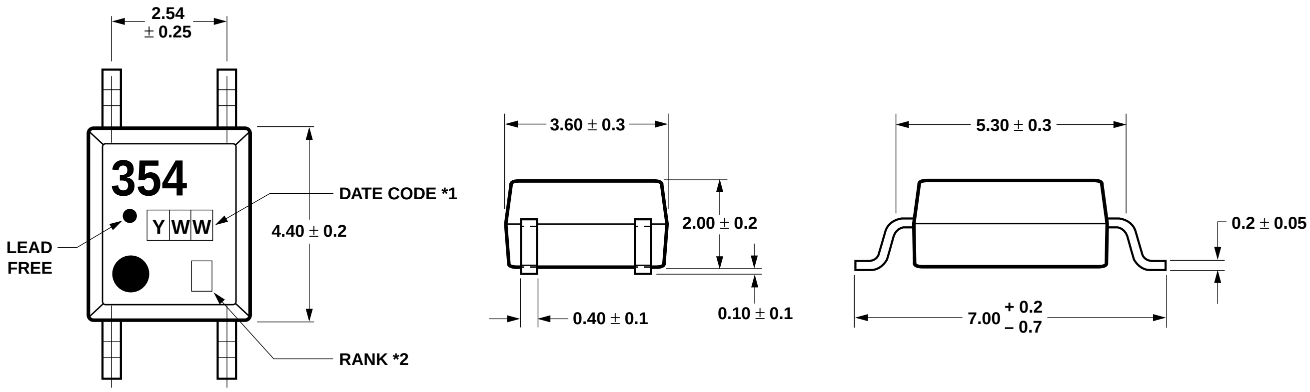
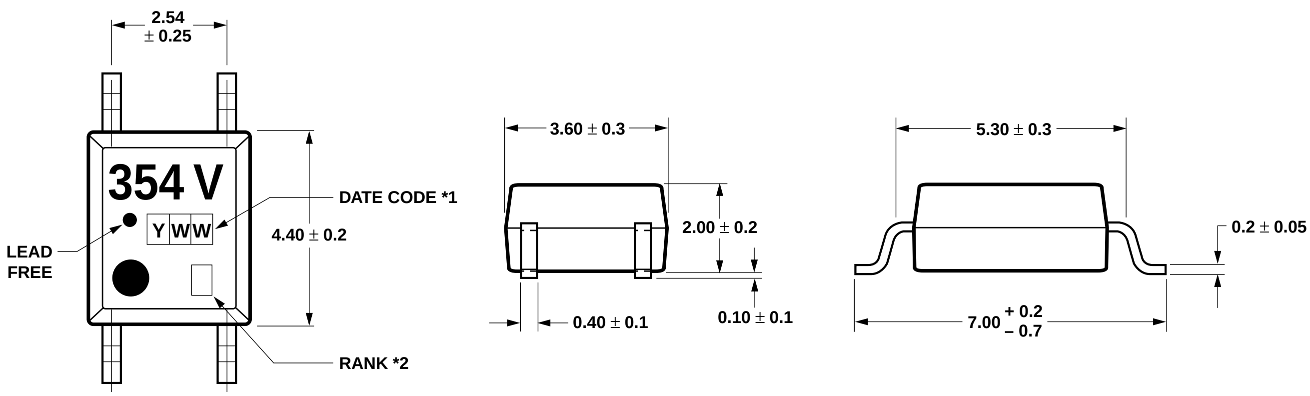
Package Outline Drawing

HCPL-354-000E



DIMENSIONS IN MILLIMETERS.

HCPL-354-060E

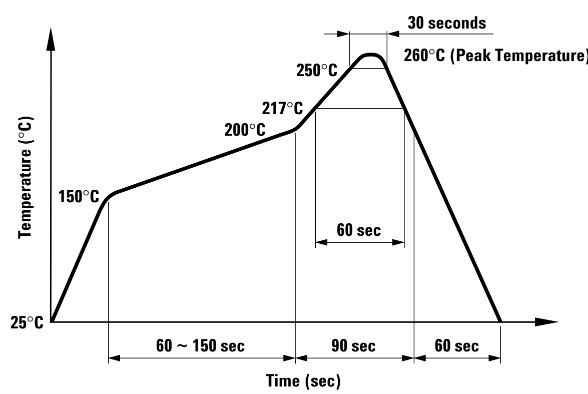


DIMENSIONS IN MILLIMETERS.

Solder Reflow Temperature Profile

1) One-time soldering reflow is recommended within the condition of temperature and time profile shown at right.

2) When using another soldering method such as infrared ray lamp, the temperature may rise partially in the mold of the device. Keep the temperature on the package of the device within the condition of (1) above.



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, R.H. = 40 ~ 60%)[1]	V_{iso}		3750	V_{rms}

Electrical Specifications (T_A = 25˚C)

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

Rank Mark	CTR (%)	Conditions
A	50 ~ 150	I_F = ±1 mA, V_{CE} = 5 V, T_A = 25˚C
No Mark	20 ~ 400	

Notes:

1. 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 shall be used.
   (c) The waveform of applied voltage shall be a sine wave.

2. $CTR = \frac{I_C}{I_F} \times 100\%$

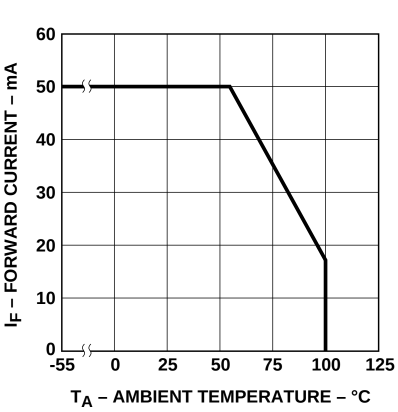


Figure 1. Forward current vs. ambient temperature.

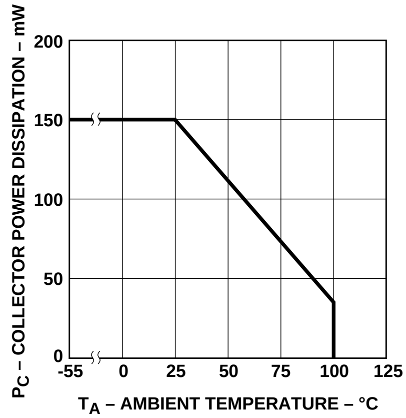


Figure 2. Collector power dissipation vs. ambient temperature.

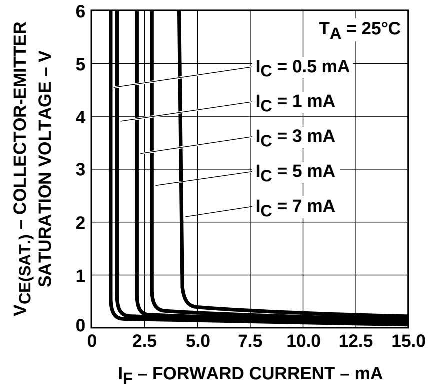


Figure 3. Collector-emitter saturation voltage vs. forward current.

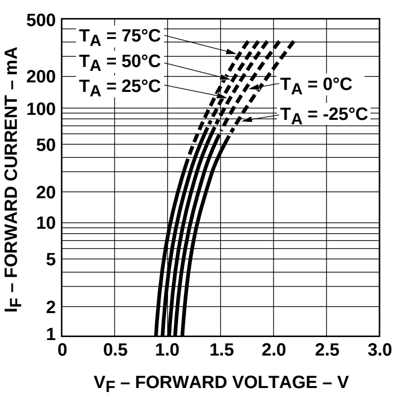


Figure 4. Forward current vs. forward voltage.

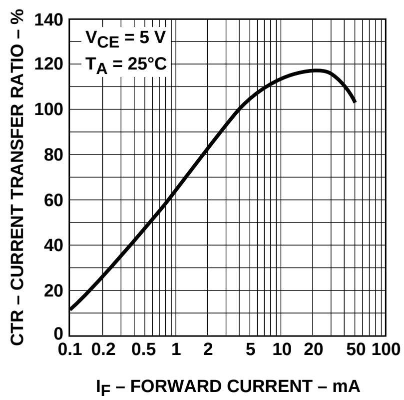


Figure 5. Current transfer ratio vs. forward current.

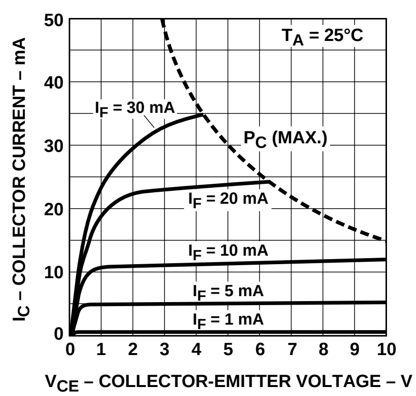


Figure 6. Collector current vs. collector-emitter voltage.

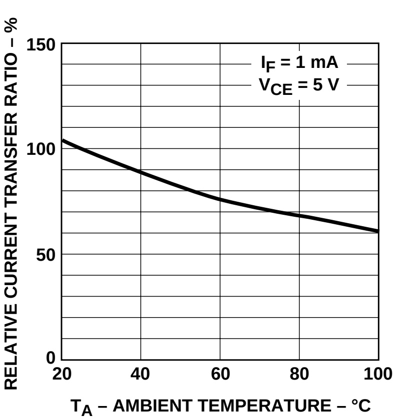


Figure 7. Relative current transfer ratio vs. ambient temperature.

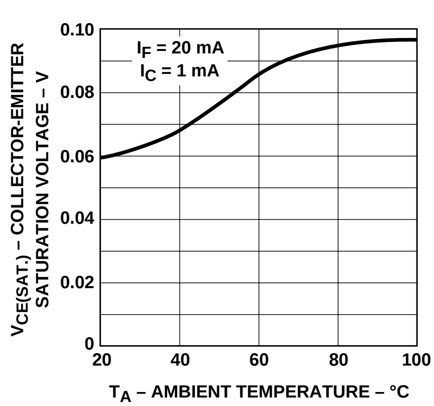


Figure 8. Collector-emitter saturation voltage vs. ambient temperature.

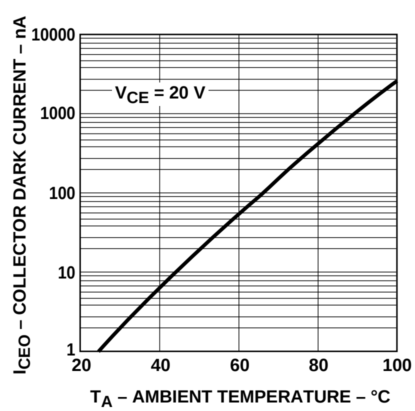


Figure 9. Collector dark current vs. ambient temperature.

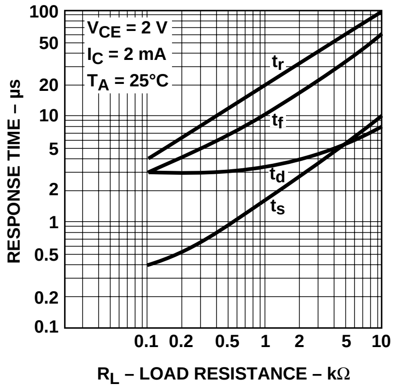


Figure 10. Response time vs. load resistance.

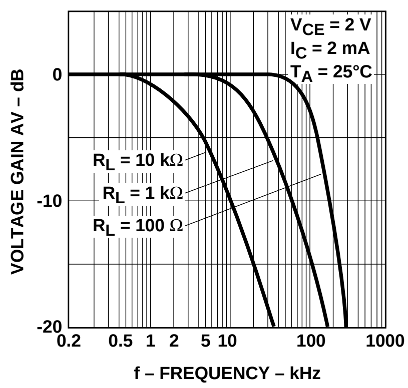


Figure 11. Frequency response.

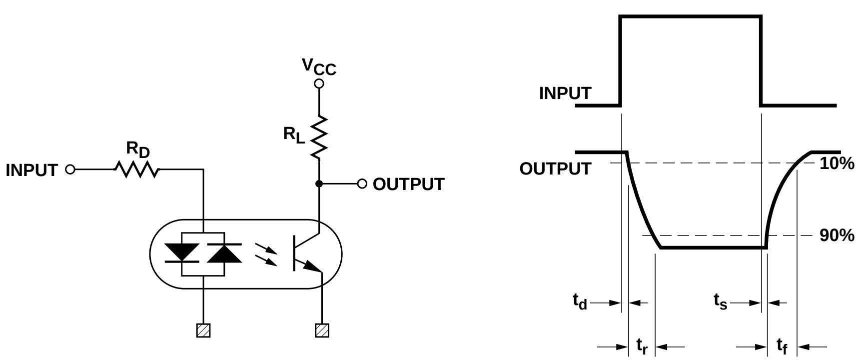


Figure 12. Test circuit for response time.

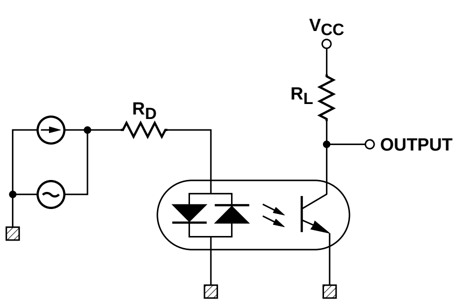


Figure 13. Test circuit for frequency response.

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Data subject to change.

Obsoletes 5989-0313EN
November 3, 2004
5989-1739EN

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