Agilent HCPL-814
AC Input Phototransistor Optocoupler High Density Mounting Type

Data Sheet

Description

The HCPL-814 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 DIP package and available in wide-lead spacing option and lead bend SMD option. Input-output isolation voltage is 5000 V_{rms}. Response time, t_r, is typically 4 µs and minimum CTR is 20% at input current of ± 1 mA.

Ordering Information

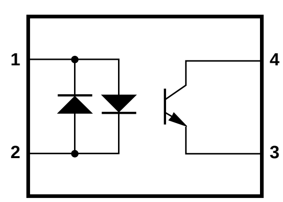
Specify Part Number followed by Option Number (if desired).

HCPL-814-XXXE

- E = Lead Free
- XXX = Option Number

000 = No Options
060 = IEC/EN/DIN EN 60747-5-2 Option
W00 = 0.4" Lead Spacing Option
300 = Lead Bend SMD Option
500 = Tape and Reel Packaging Option
00A = Rank Mark A

Functional Diagram



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

Features

- **AC input response**
- **High input-output isolation voltage (V_{iso} = 5,000 V_{rms})**
- **Low collector dark current (I_{CEO}: max. 10^{-7} A at V_{CE} = 20 V)**
- **Current transfer ratio (CTR: min. 20% at I_F = ±1 mA, V_{CE} = 5 V)**
- **Response time (t_r: typ. 4 µs at V_{CE} = 2 V, I_C = 2 mA, R_L = 100 Ω)**
- **Compact dual-in-line package**
- **UL approved**
- **CSA approved**
- **IEC/EN/DIN EN 60747-5-2 approved**
- **Options available:**
  - **Leads with 0.4" (10.16 mm) spacing (W00)**
  - **Leads bend for surface mounting (300)**
  - **Tape and reel for SMD (500)**
  - **IEC/EN/DIN EN 60747-5-2 approvals (060)**

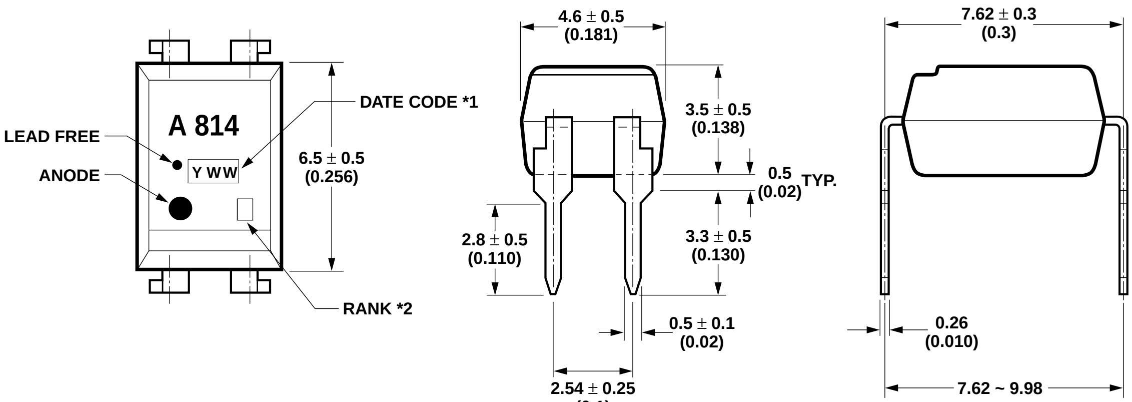
Applications

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

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.*

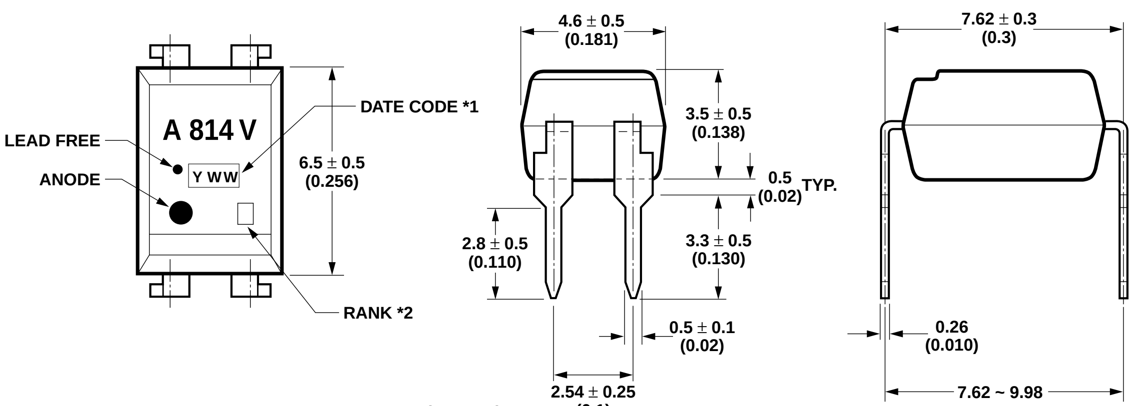
Package Outline Drawings

HCPL-814-000E



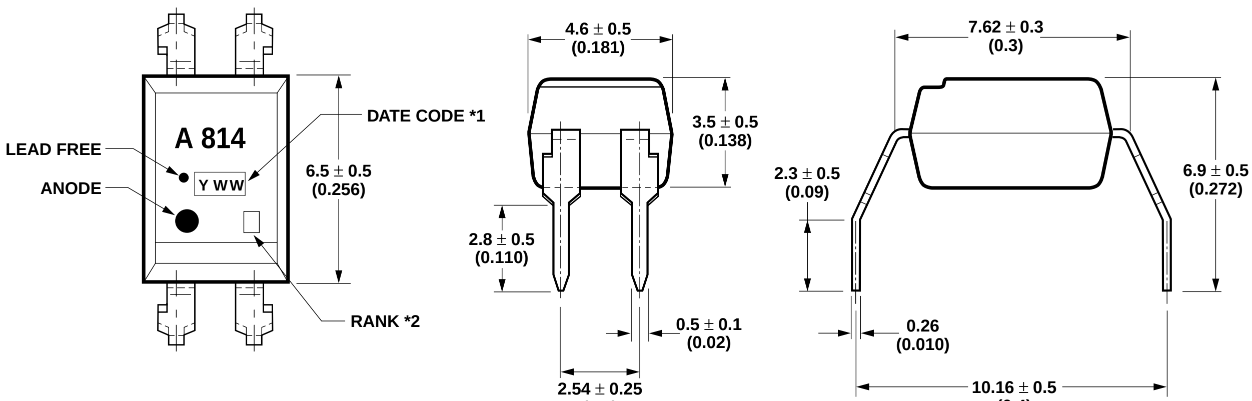
DIMENSIONS IN MILLIMETERS AND (INCHES)

HCPL-814-060E



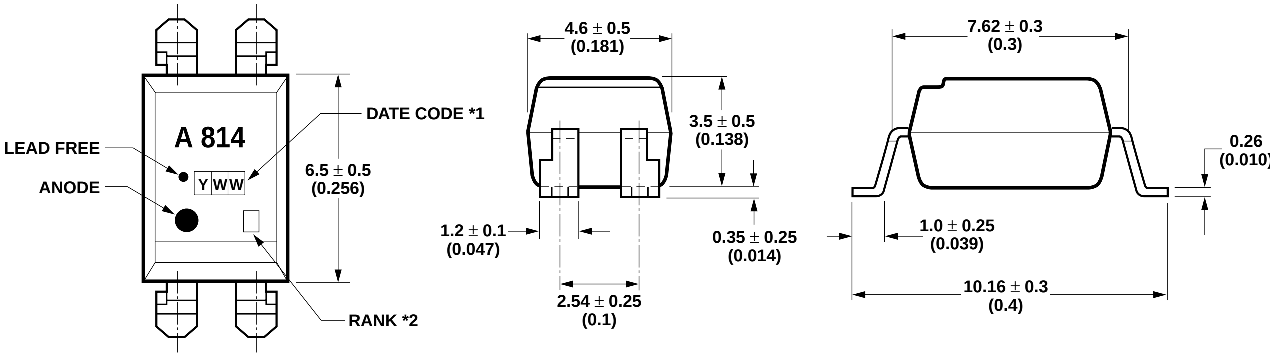
DIMENSIONS IN MILLIMETERS AND (INCHES)

HCPL-814-W00E



DIMENSIONS IN MILLIMETERS AND (INCHES)

HCPL-814-300E

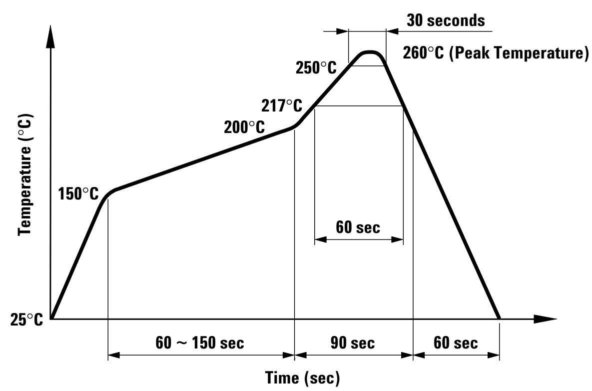


DIMENSIONS IN MILLIMETERS AND (INCHES)

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	125	˚C
Ambient Operating Temperature	T_A	–30	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}		200	mW
Isolation Voltage (AC for 1 minute, R.H. = 40 ~ 60%)[1]	V_{iso}		5000	V_{rms}

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

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F	–	1.2	1.4	V	$I_F = \pm 20$ mA
Terminal Capacitance	C_t	–	50	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	–	3	mA	$I_F = \pm 1$ mA,
Current Transfer Ratio[2]	CTR	20	–	300	%	$V_{CE} = 5$ V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	–	0.1	0.2	V	$I_F = \pm 20$ mA, $I_C = 1$ mA
Isolation Resistance	R_{iso}	5×10^{10}	1×10^{11}	–	Ω	DC 500 V 40 ~ 60% R.H.
Floating Capacitance	C_f	–	0.6	1	pF	V = 0, f = 1 MHz
Cut-off Frequency	f_c	15	80	–	kHz	$V_{CE} = 5$ V, $I_C = 2$ mA $R_L = 100\ \Omega$, -3 dB
Response Time (Rise)	t_r	–	4	18	μs	$V_{CE} = 2$ V, $I_C = 2$ mA,
Response Time (Fall)	t_f	–	3	18	μs	$R_L = 100\ \Omega$

Rank Mark	CTR (%)	Conditions
A	50 ~ 150	$I_F = \pm 1$ mA,
No Mark	20 ~ 300	$V_{CE} = 5$ V, $T_A = 25^\circ C$

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

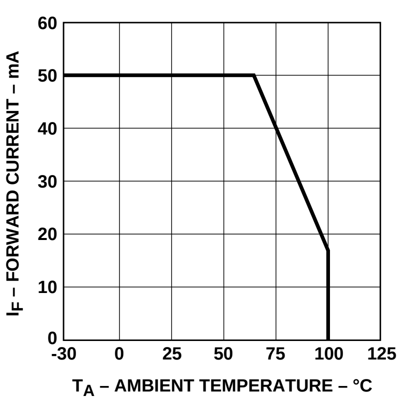


Figure 1. Forward current vs. temperature.

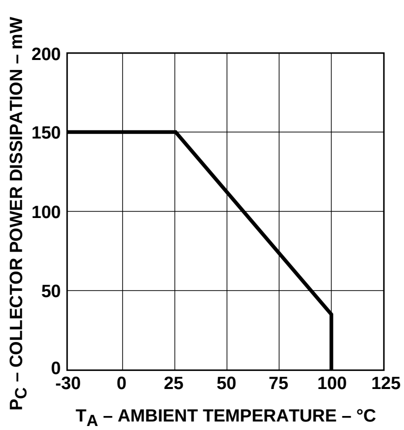


Figure 2. Collector power dissipation vs. temperature.

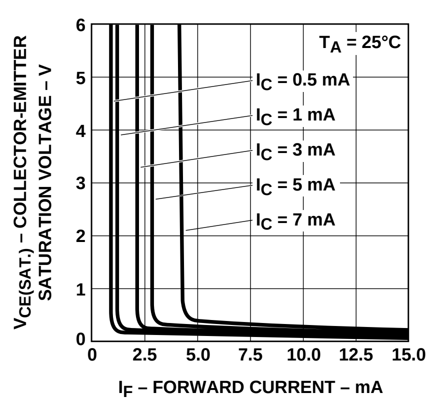


Figure 3. Collector-emitter saturation voltage vs. forward current.

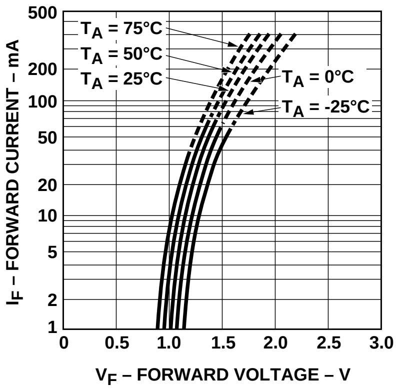


Figure 4. Forward current vs. forward voltage.

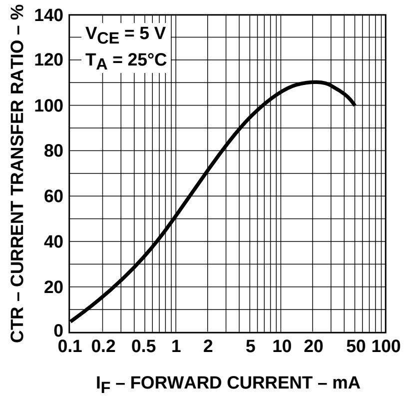


Figure 5. Current transfer ratio vs. forward current.

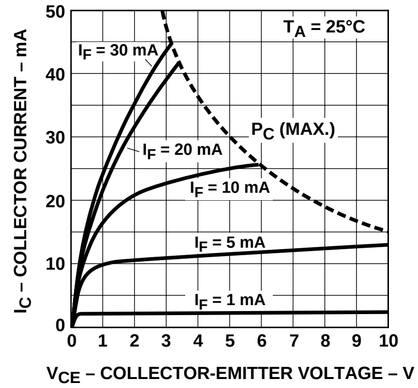


Figure 6. Collector current vs. collector-emitter voltage.

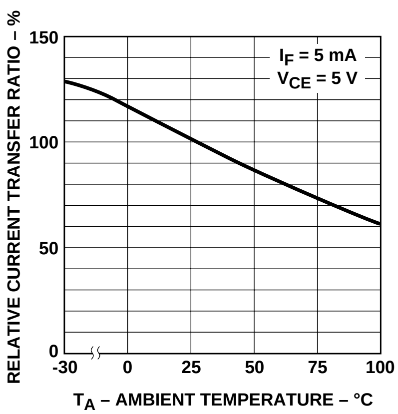


Figure 7. Relative current transfer ratio vs. temperature.

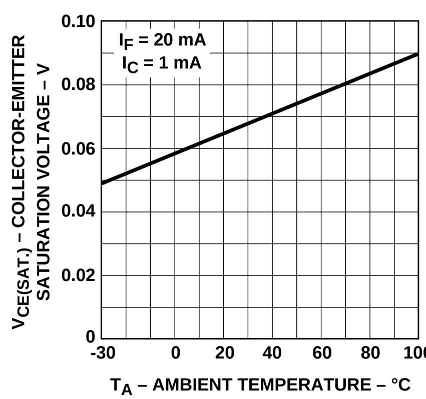


Figure 8. Collector-emitter saturation voltage vs. temperature.

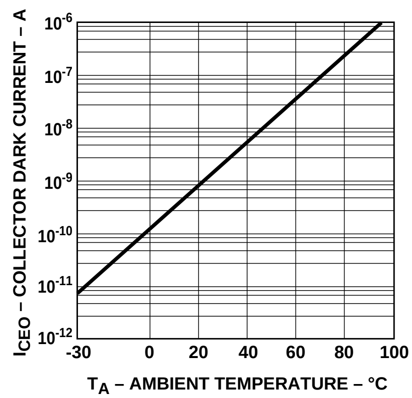


Figure 9. Collector dark current vs. temperature.

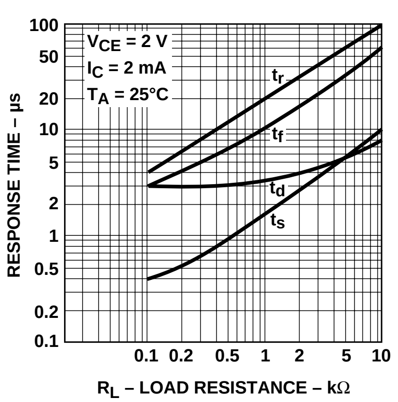


Figure 10. Response time vs. load resistance.

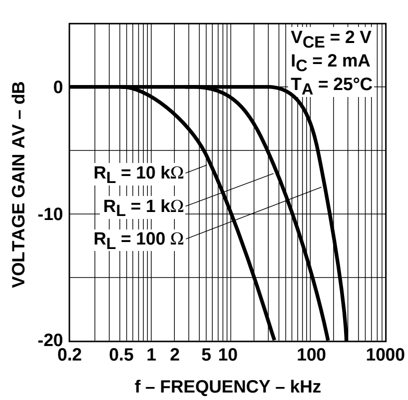


Figure 11. Frequency response.

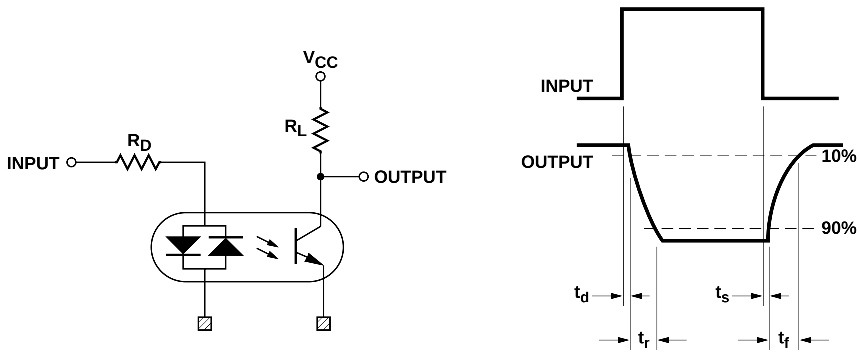


Figure 12. Test circuit for response time.

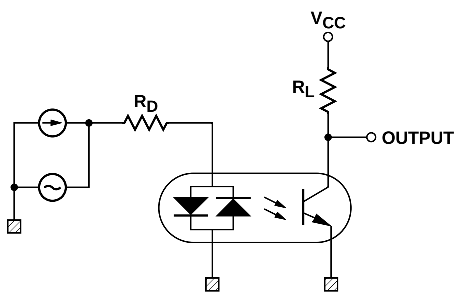


Figure 13. Test circuit for frequency response.

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Data subject to change.

Obsoletes 5989-0301EN
November 3, 2004
5989-1735EN

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