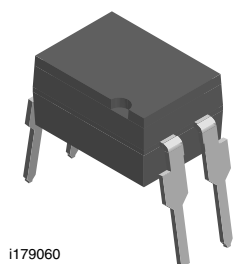
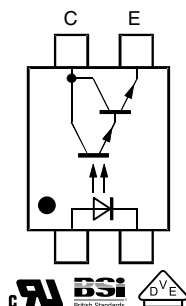




## Optocoupler, Photodarlington Output



i179060



### FEATURES

- High isolation test voltage 5300 V<sub>RMS</sub>
- Standard plastic DIP-4 package
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

RoHS  
COMPLIANT

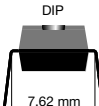
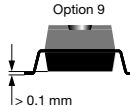
### AGENCY APPROVALS

- UL - file no. E52744 system code H, double protection
- DIN EN 60747-5-2 (VDE 0884), IEC 60747-5-5
- DIN EN 60747-5-5 (VDE 0884) pending
- BSI IEC 60950; IEC 60065

### DESCRIPTION

The SFH655A is optically coupled isolators with a gallium arsenide infrared LED and a silicon photodarlington detector. Switching can be achieved while maintaining a high degree of isolation between driving and load circuits.

This optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

ORDERING INFORMATION	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">S</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">F</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">H</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">6</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">A</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">-</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> </div> <p style="text-align: center;">PART NUMBER</p>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> </div> <p style="text-align: center;">PACKAGE OPTION</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <p>DIP 7.62 mm</p> </div> <div style="text-align: center;">  <p>Option 9 &gt; 0.1 mm</p> </div> </div>
<b>AGENCY CERTIFIED/PACKAGE</b>	<b>CTR (%)</b>
cUL, VDE	> 600
DIP-4	SFH655A
SMD-4, option 9	SFH655A-X009

#### Note

- For additional information on the available options refer to option information

ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Peak reverse voltage		V <sub>RM</sub>	6	V
Forward continuous current		I <sub>F</sub>	60	mA
Surge forward current	t <sub>p</sub> ≤ 10μs	I <sub>FSM</sub>	2.5	A
Derate linearly from 25 °C			1.33	mW/°C
Power dissipation		P <sub>diss</sub>	100	mW
<b>OUTPUT</b>				
Collector emitter breakdown voltage		BV <sub>CEO</sub>	55	V
Emitter collector breakdown voltage		BV <sub>ECO</sub>	6	V
Collector (load) current		I <sub>C</sub>	125	mA
Derate linearly from 25 °C			2	mW/°C
Power dissipation		P <sub>diss</sub>	150	mW



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Derate linearly from 25 °C			3.33	mW/°C
Total power dissipation		$P_{tot}$	250	mW
Storage temperature range		$T_{stg}$	-55 to +150	°C
Operating temperature range		$T_{amb}$	-55 to +100	°C
Soldering temperature <sup>(1)</sup>	max. 10 s, dip soldering distance to seating plane $\geq 1.5$ mm	$T_{sld}$	260	°C

**Notes**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

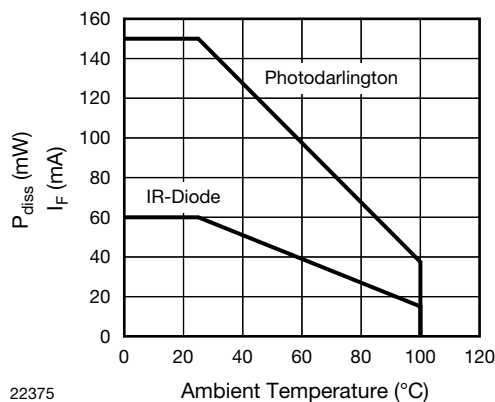


Fig. 1 - Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	$I_F = 10\text{ mA}$		$V_F$	-	1.15	1.5	V
Reverse current	$V_R = 6\text{ V}$		$I_R$	-	0.02	10	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_O$	-	50	-	pF
<b>OUTPUT</b>							
Collector emitter breakdown voltage	$I_{CE} = 100\text{ }\mu\text{A}$		$BV_{CEO}$	55	-	-	V
Emitter collector breakdown voltage	$I_{EC} = 10\text{ }\mu\text{A}$		$BV_{ECO}$	6	-	-	V
Collector emitter dark current	$V_{CE} = 40\text{ V}$		$I_{CEO}$	-	12	400	nA
Collector emitter capacitance	$V_{CE} = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_{CE}$	-	13.5	-	pF
<b>COUPLER</b>							
Collector emitter saturation voltage	$I_F = 20\text{ mA}$ , $I_C = 5\text{ mA}$	SFH655A	$V_{CEsat}$	-	-	1	V
Coupling capacitance	$V_{I-O} = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_C$	-	0.45	-	pF

**Note**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements

**CURRENT TRANSFER RATIO** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio	$I_F = 1\text{ mA}$ , $V_{CE} = 2\text{ V}$	SFH655A	CTR	600	-	-	%

**SAFETY AND INSULATION RATINGS**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	$t = 1\text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	V
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	V
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 150\text{ }^{\circ}\text{C}$ (construction test only)	$R_{IO}$	$\geq 10^9$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Input safety temperature		$T_{SI}$	175	$^{\circ}\text{C}$
Creepage distance	Standard DIP-4		$\geq 7$	mm
Clearance distance	Standard DIP-4		$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	mm
Partial discharge test voltage - routine test	100 %, $t_{test} = 1\text{ s}$	$V_{pd}$	1.669	kV
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60\text{ s}$ , $t_{test} = 10\text{ s}$ , (see fig. 2)	$V_{pd}$	1.424	kV

**Note**

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits

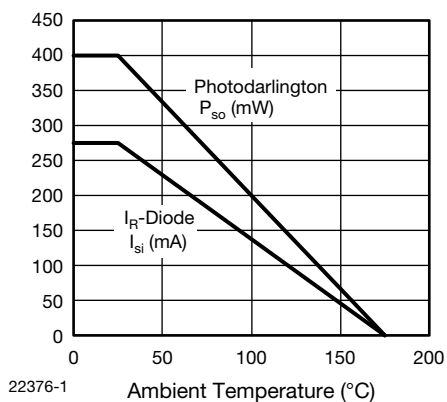


Fig. 2 - Derating Diagram

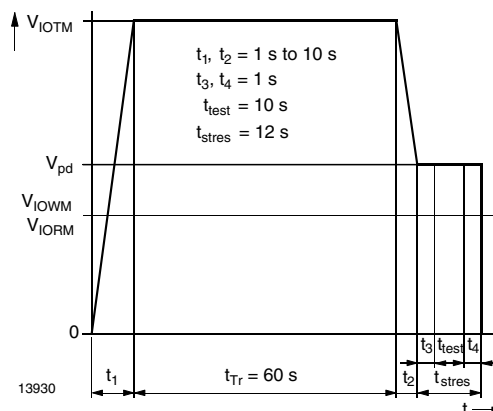


Fig. 3 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5



SWITCHING CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time (fig. 10, test circuit 1)	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω	SFH612A	t <sub>on</sub>		16		μs
Turn-off time (fig. 10, test circuit 1)	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω	SFH612A	t <sub>off</sub>		15		μs
Rise time (fig. 10, test circuit 1)	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω	SFH612A	t <sub>r</sub>		14		μs
Fall time (fig. 10, test circuit 1)	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω	SFH612A	t <sub>f</sub>		14		μs
Turn-on time (fig. 11, test circuit 2)	V <sub>CC</sub> = 2 V, I <sub>C</sub> = 10 mA, R <sub>L</sub> = 100 Ω	SFH655A	t <sub>on</sub>		31		μs
Turn-off time (fig. 11, test circuit 2)	V <sub>CC</sub> = 2 V, I <sub>C</sub> = 10 mA, R <sub>L</sub> = 100 Ω	SFH655A	t <sub>off</sub>		55		μs
Rise time (fig. 11, test circuit 2)	V <sub>CC</sub> = 2 V, I <sub>C</sub> = 10 mA, R <sub>L</sub> = 100 Ω	SFH655A	t <sub>r</sub>		27	250	μs
Fall time (fig. 11, test circuit 2)	V <sub>CC</sub> = 2 V, I <sub>C</sub> = 10 mA, R <sub>L</sub> = 100 Ω	SFH655A	t <sub>f</sub>		56	200	μs

**TYPICAL CHARACTERISTICS** (T<sub>amb</sub> = 25 °C, unless otherwise specified)

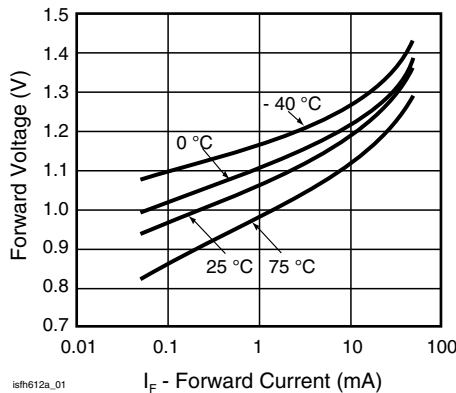


Fig. 4 - Forward Voltage vs. Forward Current

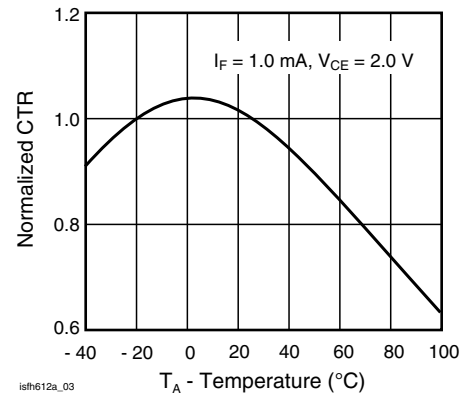


Fig. 6 - Normalized CTR vs. Temperature

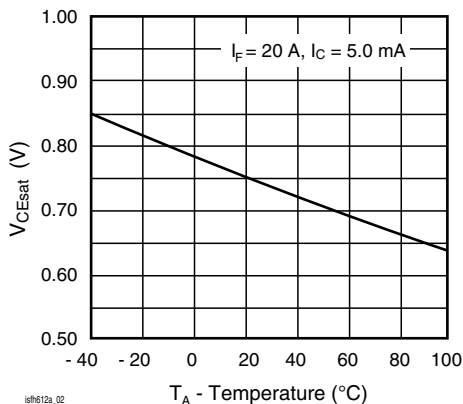


Fig. 5 - Collector Emitter Saturation Voltage vs. Temperature

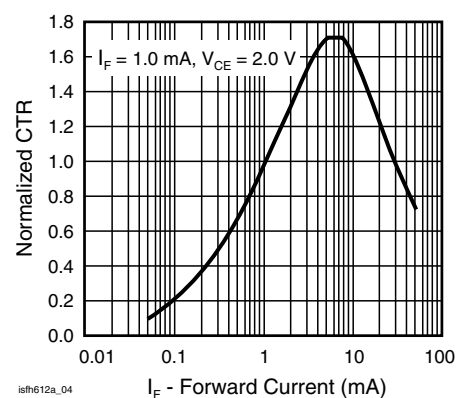


Fig. 7 - Normalized CTR vs. Forward Current

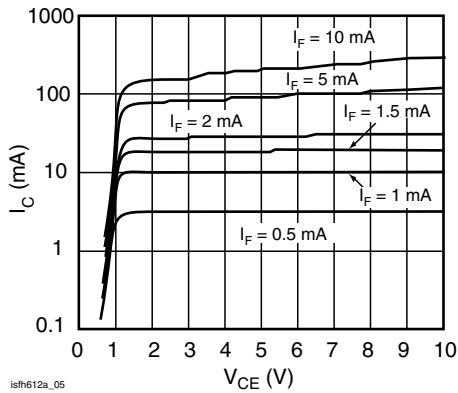


Fig. 8 - Collector Current vs. Collector Emitter Voltage

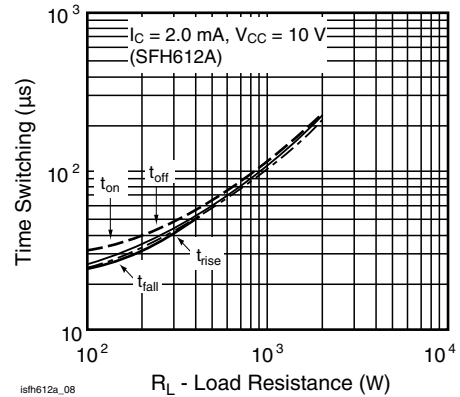


Fig. 11 - Switching Time vs. Load Resistor

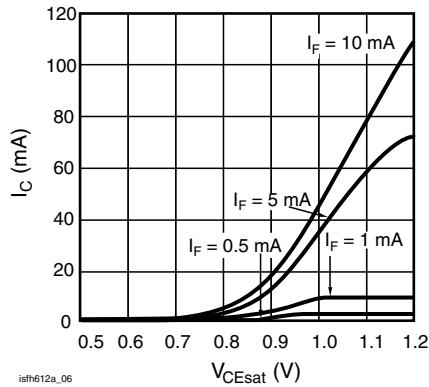


Fig. 9 - Collector Current vs. Collector Emitter Saturation Voltage

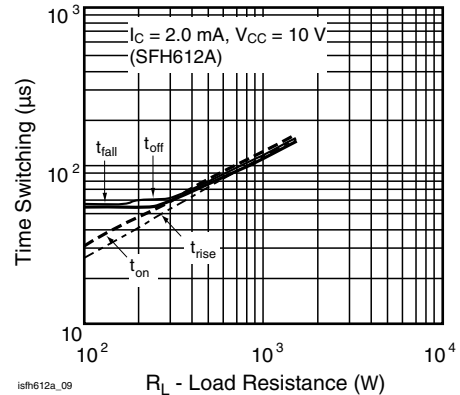


Fig. 12 - Switching Time vs. Load Resistor

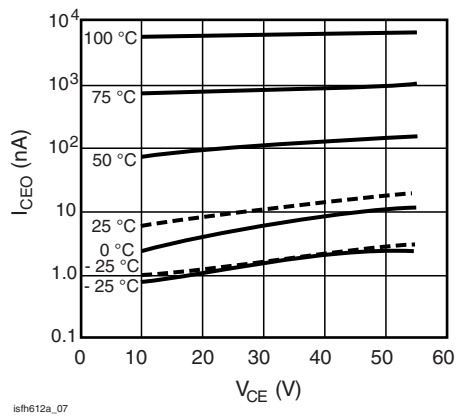
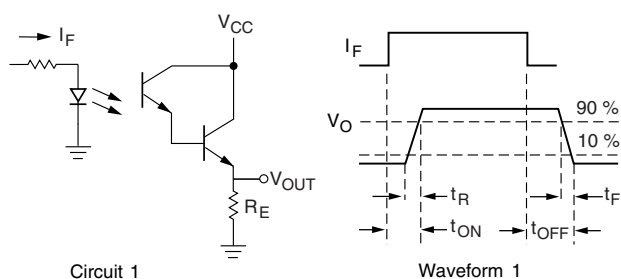


Fig. 10 - Collector Emitter Dark Current vs. Collector Emitter Voltage over Temperature

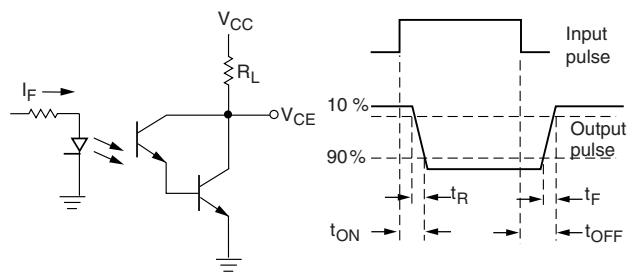


Circuit 1

Waveform 1

isfh612a\_10

Fig. 13 - Switching Time Test Circuit and Waveforms



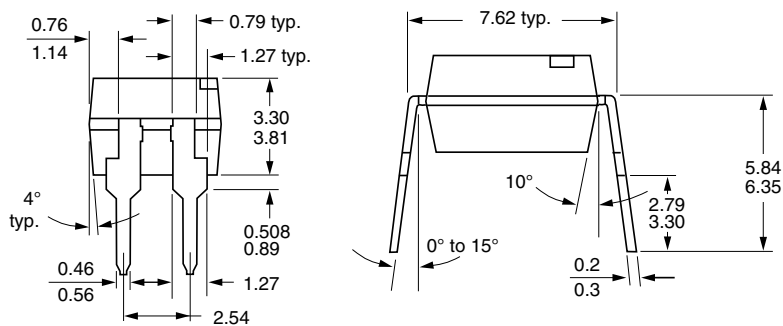
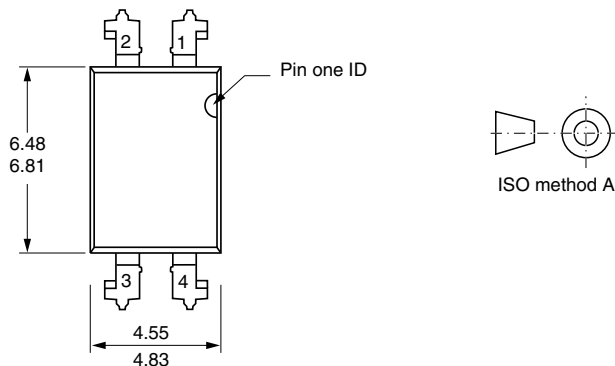
Circuit 2

Waveform 2

isfh612a\_11

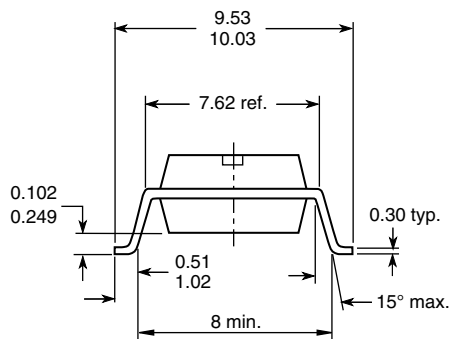
Fig. 14 - Switching Time Test Circuit and Waveforms

**PACKAGE DIMENSIONS** in millimeters



i178027

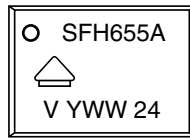
**Option 9**



18449



**PACKAGE MARKING**



**Note**

- VDE logo is only printed on option 1 parts. Option information is not marked on the part



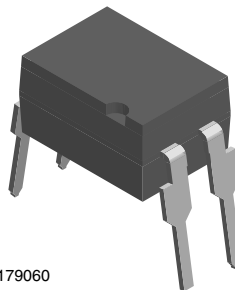
## Footprint and Schematic Information for SFH655A

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
SFH655A	<a href="http://www.snapeda.com/parts/SFH655A/Vishay/view-part">www.snapeda.com/parts/SFH655A/Vishay/view-part</a>
SFH655A-X009	<a href="http://www.snapeda.com/parts/SFH655A-X009/Vishay/view-part">www.snapeda.com/parts/SFH655A-X009/Vishay/view-part</a>

For technical issues and product support, please contact [optocoupleranswers@vishay.com](mailto:optocoupleranswers@vishay.com).







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