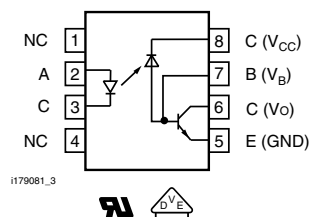
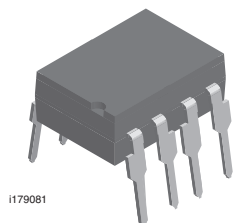




High Speed Optocoupler, 1 MBd, Photodiode with Transistor Output, 110 °C Rated



FEATURES

- Operating temperature from -55 °C to +110 °C
- Isolation test voltages: 5300 V_{RMS}
- TTL compatible
- High bit rates: 1 MBd
- Bandwidth 2 MHz
- Open-collector output
- External base wiring possible
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

DESCRIPTION

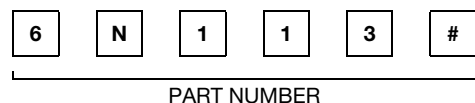
The 6N1135 and 6N1136 are 110 °C rated optocouplers with a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector which consists of a photo diode and a high-speed transistor in a DIP-8 plastic package.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz. The potential difference between the circuits to be coupled should not exceed the maximum permissible reference voltages.

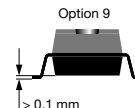
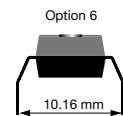
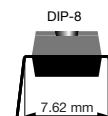
AGENCY APPROVALS

- UL1577 (pending)
- DIN EN 60747-5-5 (VDE 0884) (pending)
- cUL (pending)
- CQC (pending)

ORDERING INFORMATION



PACKAGE OPTION

TAPE
AND
REEL

AGENCY CERTIFIED/PACKAGE	CTR (%)	
UL	≥ 7	≥ 19
DIP-8	6N1135	6N1136
DIP-8, 400 mil, option 6	6N1135-X006	6N1136-X006
SMD-8, option 9	6N1135-X009T	6N1136-X009T

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V _R	5	V
Forward current		I _F	25	mA
Peak forward current	t = 1 ms, duty cycle 50 %	I _{FM}	50	mA
Maximum surge forward current	t ≤ 1 μs, 300 pulses/s	I _{FSM}	1	A
Thermal resistance		R _{th}	700	K/W
Power dissipation	T _{amb} = 70 °C	P _{diss}	45	mW
OUTPUT				
Supply voltage		V _{CC}	-0.5 to 15	V
Output voltage		V _O	-0.5 to 15	V
Emitter base voltage		V _{EBO}	5	V
Output current		I _O	8	mA
Maximum Output current			16	mA



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
OUTPUT				
Base current		I_B	5	mA
Thermal resistance			300	K/W
Power dissipation	$T_{amb} = 70\text{ }^{\circ}\text{C}$	P_{diss}	100	mW
COUPLER				
Isolation test voltage (between emitter and detector climate per DIN 50014 part 2, Nov. 74)	$t = 1\text{ min}$	V_{ISO}	5300	V_{RMS}
Storage temperature range		T_{stg}	-55 to +150	$^{\circ}\text{C}$
Ambient temperature range		T_{amb}	-55 to +100	$^{\circ}\text{C}$
Soldering temperature ⁽¹⁾	Max. $\leq 10\text{ s}$, dip soldering $\geq 0.5\text{ mm}$ from case bottom	T_{sld}	260	$^{\circ}\text{C}$

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.
- ⁽¹⁾ Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	$I_F = 1.6\text{ mA}$		V_F	-	1.6	1.9	V
Breakdown voltage	$I_R = 10\text{ }\mu\text{A}$		V_{BR}	5	-	-	V
Reverse current	$V_R = 5\text{ V}$		I_R	-	0.5	10	μA
Capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$		C_I	-	125	-	pF
Temperature coefficient, forward voltage	$I_F = 1.6\text{ mA}$		$\Delta V_F / \Delta T_A$	-	- 1.7	-	mV/ $^{\circ}\text{C}$
OUTPUT							
Logic low supply current	$I_F = 1.6\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$		I_{CCL}	-	150	-	μA
Logic high supply current	$I_F = 0\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$		I_{CCH}	-	0.01	1	μA
Output voltage, output low	$I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 1.1\text{ mA}$	6N1135	V_{OL}	-	0.1	0.4	V
	$I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 2.4\text{ mA}$	6N1136	V_{OL}	-	0.1	0.4	V
Output current, output high	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 5.5\text{ V}$		I_{OH}	-	3	500	nA
	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$		I_{OH}	-	0.01	1	μA
COUPLER							
Capacitance (input to output)	$f = 1\text{ MHz}$		C_{IO}	-	0.6	-	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							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio	$I_F = 16\text{ mA}$, $V_O = 0.4\text{ V}$, $V_{CC} = 4.5\text{ V}$	6N1135	CTR	7	16	-	%
		6N1136	CTR	19	35	-	%
	$I_F = 16\text{ mA}$, $V_O = 0.5\text{ V}$, $V_{CC} = 4.5\text{ V}$	6N1135	CTR	5	-	-	%
		6N1136	CTR	15	-	-	%

**SWITCHING CHARACTERISTICS**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
High to low	$I_F = 16 \text{ mA}$, $V_{CC} = 5 \text{ V}$, $R_L = 4.1 \text{ k}\Omega$	6N1135	t_{PHL}	-	0.3	1.5	μs
	$I_F = 16 \text{ mA}$, $V_{CC} = 5 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	6N1136	t_{PHL}	-	0.2	0.8	μs
Low to high	$I_F = 16 \text{ mA}$, $V_{CC} = 5 \text{ V}$, $R_L = 4.1 \text{ k}\Omega$	6N1135	t_{PLH}	-	0.3	1.5	μs
	$I_F = 16 \text{ mA}$, $V_{CC} = 5 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	6N1136	t_{PLH}	-	0.2	0.8	μs

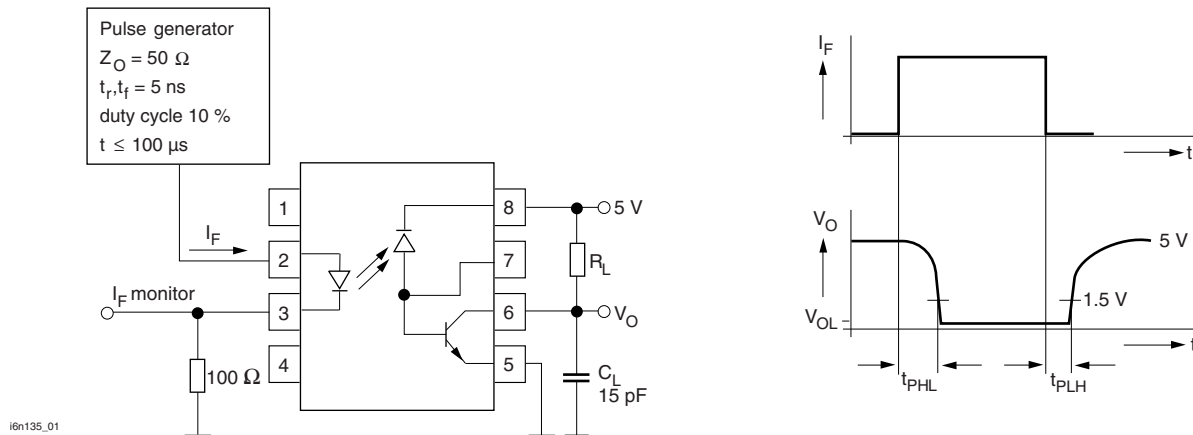


Fig. 1 - Switching Times

COMMON MODE TRANSIENT IMMUNITY

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
High	$I_F = 0 \text{ mA}$, $V_{CM} = 10 \text{ V}_{P-P}$, $V_{CC} = 5 \text{ V}$, $R_L = 4.1 \text{ k}\Omega$	6N1135	$ CM_H $	-	1000	-	$\text{V}/\mu\text{s}$
	$I_F = 0 \text{ mA}$, $V_{CM} = 10 \text{ V}_{P-P}$, $V_{CC} = 5 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	6N1136	$ CM_H $	-	1000	-	$\text{V}/\mu\text{s}$
Low	$I_F = 16 \text{ mA}$, $V_{CM} = 10 \text{ V}_{P-P}$, $V_{CC} = 5 \text{ V}$, $R_L = 4.1 \text{ k}\Omega$	6N1135	$ CM_L $	-	1000	-	$\text{V}/\mu\text{s}$
	$I_F = 16 \text{ mA}$, $V_{CM} = 10 \text{ V}_{P-P}$, $V_{CC} = 5 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	6N1136	$ CM_L $	-	1000	-	$\text{V}/\mu\text{s}$

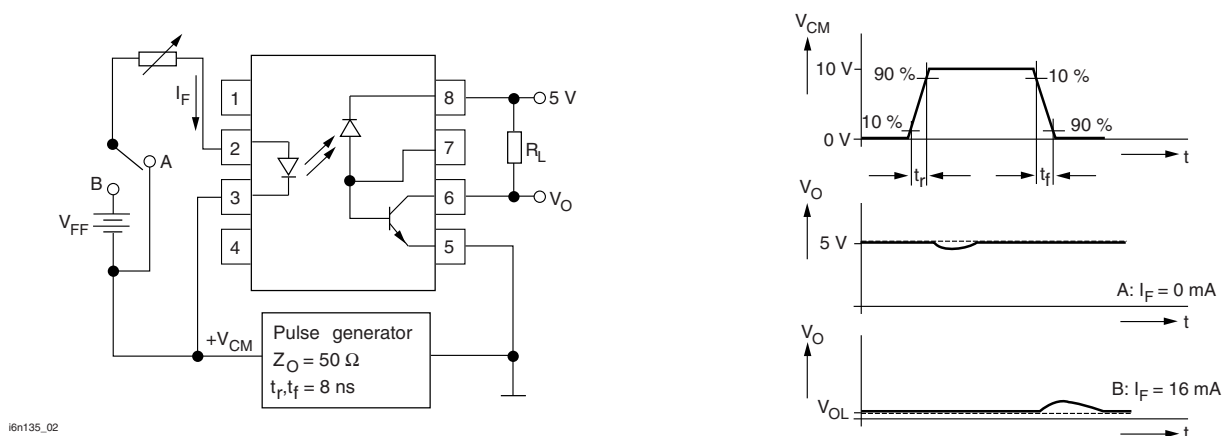


Fig. 2 - Common-Mode Interference Immunity



SAFETY AND INSULATION RATINGS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification	According to IEC 68 part 1		-	55 / 110 / 21	-	
Pollution degree (DIN VDE 0109)			-	2	-	
Comparative tracking index per DIN IEC112/VDE 0303 part 1, group IIIa per DIN VDE 6110		CTI	175	-	399	
V_{IOTM}		V_{IOTM}	8000	-	-	V
V_{IORM}		V_{IORM}	630	-	-	V
Isolation resistance	$V_{IO} = 500 \text{ V}, T_{amb} = 25^\circ \text{C}$	R_{IO}	10^{12}	-	-	Ω
	$V_{IO} = 500 \text{ V}, T_{amb} = 100^\circ \text{C}$	R_{IO}	10^{11}	-	-	Ω
P_{SI}		P_{SI}	-	-	500	mA
I_{SI}		I_{SI}	-	-	300	mW
T_{SI}		T_{SI}	-	-	175	$^\circ \text{C}$
Creepage distance			8	-	-	mm
Clearance distance			7	-	-	mm
Insulation thickness			0.4	-	-	mm

Note

- As per IEC 60747-5-5, §7.4.3.8.1, 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.

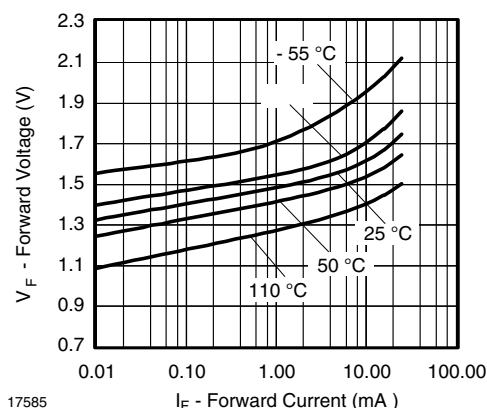
TYPICAL CHARACTERISTICS ($T_{amb} = 25^\circ \text{C}$, unless otherwise specified)

Fig. 3 - Forward Voltage vs. Forward Current

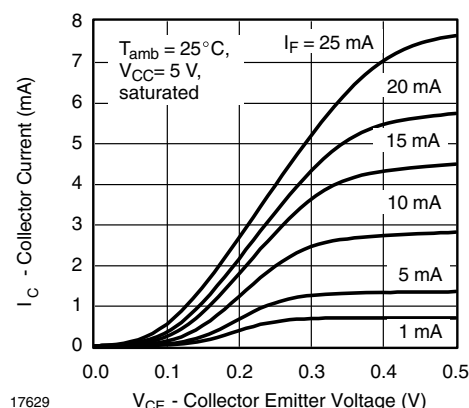


Fig. 5 - Collector Current vs. Collector Emitter Voltage

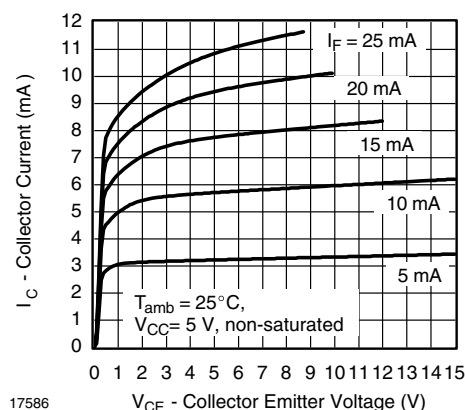


Fig. 4 - Collector Current vs. Collector Emitter Voltage

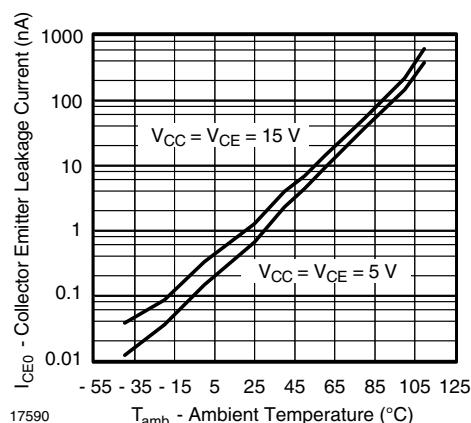


Fig. 6 - Collector Emitter Dark Current vs. Ambient Temperature

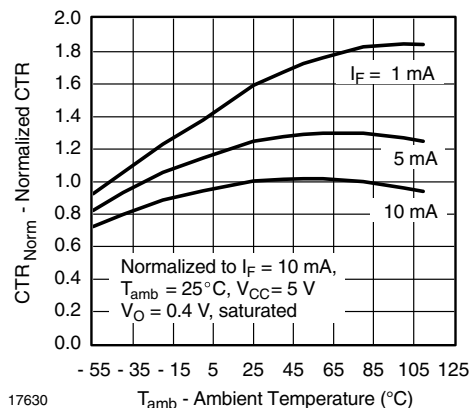


Fig. 7 - Normalized Current Transfer Ratio vs. Ambient Temperature

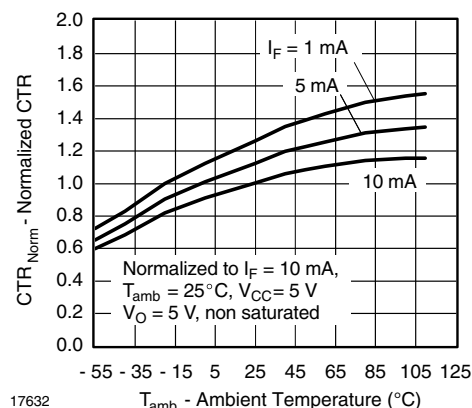


Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature

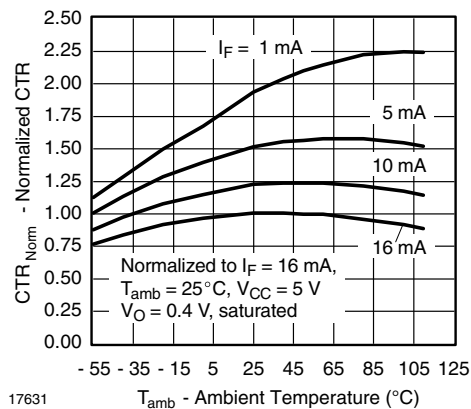


Fig. 8 - Normalized Current Transfer Ratio vs. Ambient Temperature

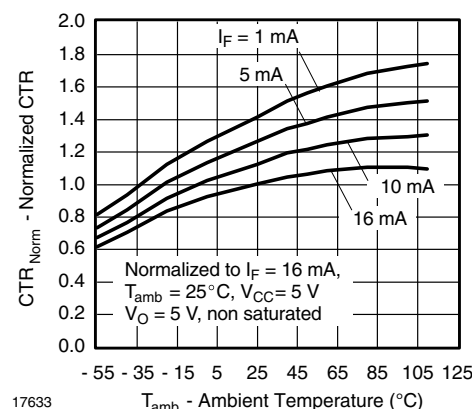


Fig. 11 - Normalized Current Transfer Ratio vs. Ambient Temperature

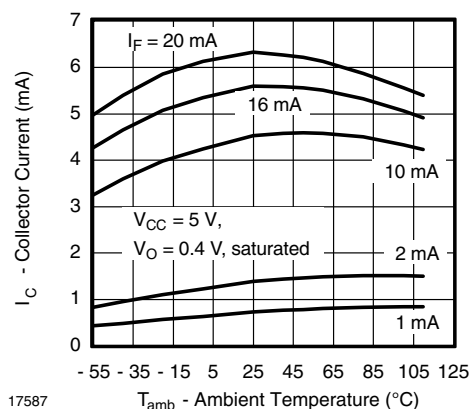
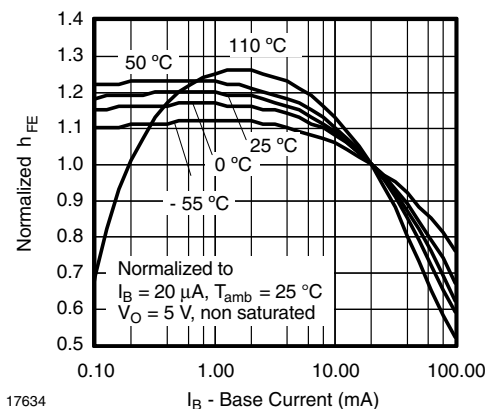


Fig. 9 - Output Current vs. Temperature

Fig. 12 - Normalized h_{FE} vs. Base Current

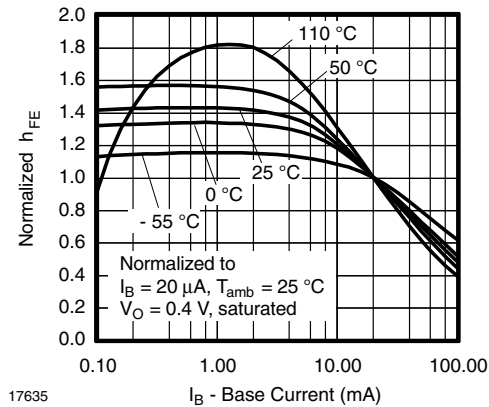
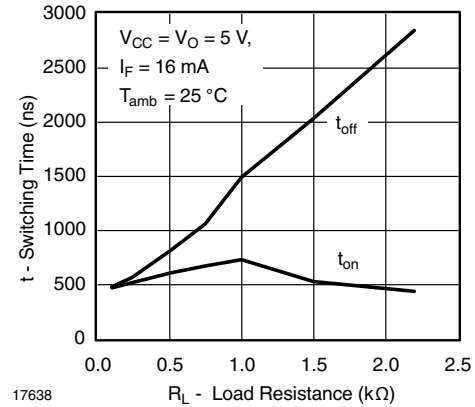
Fig. 13 - Normalized h_{FE} vs. Base Current

Fig. 16 - Switching Time vs. Load Resistance

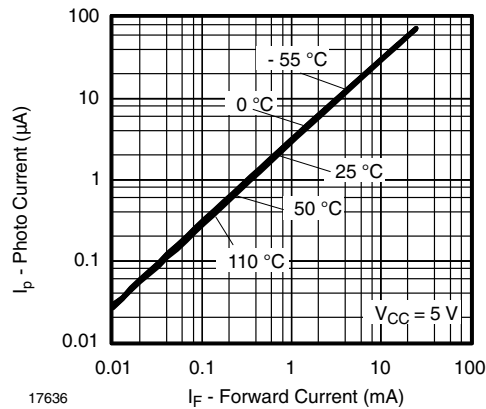


Fig. 14 - Photo Current vs. Forward Current

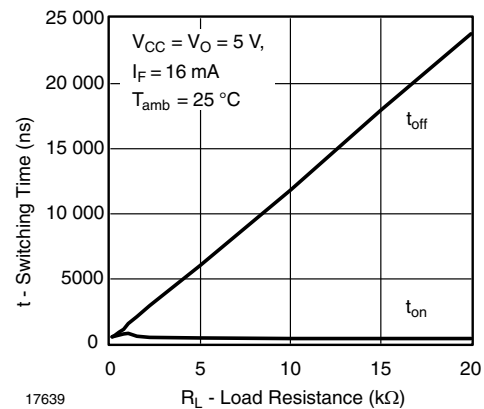


Fig. 17 - Switching Time vs. Load Resistance

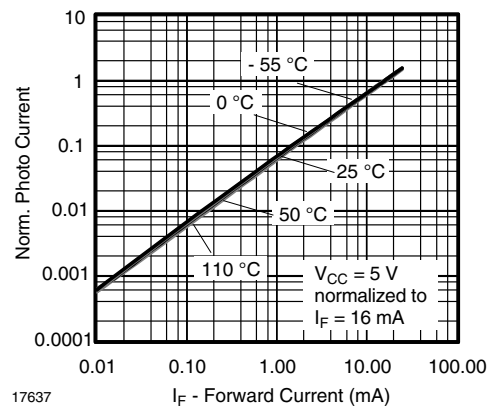


Fig. 15 - Photo Current vs. Forward Current

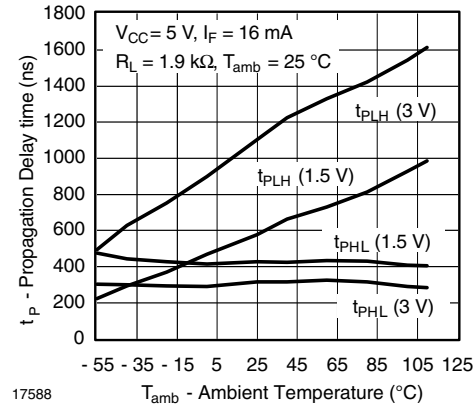


Fig. 18 - Propagation Delay vs. Ambient Temperature

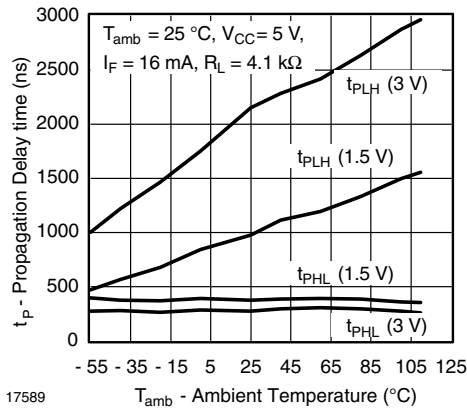


Fig. 19 - Propagation Delay vs. Ambient Temperature

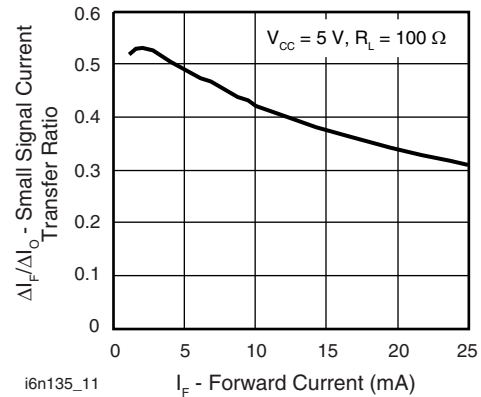


Fig. 21 - Small Signal Current Transfer Ratio vs. Quiescent Input Current

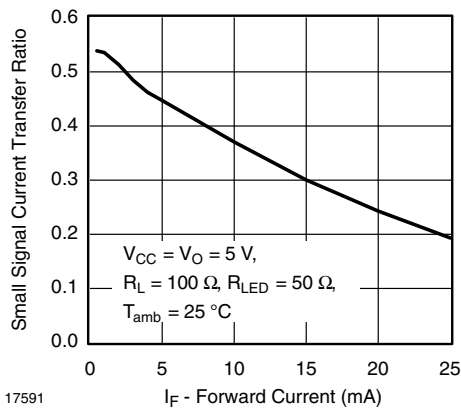
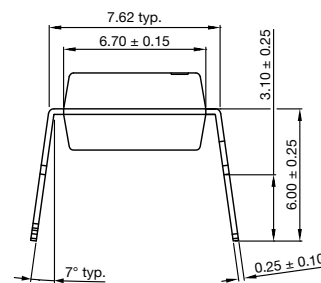
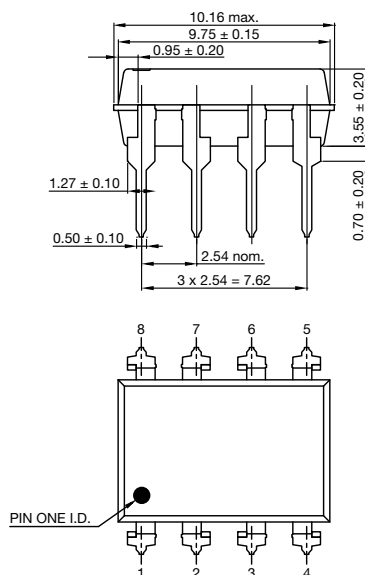


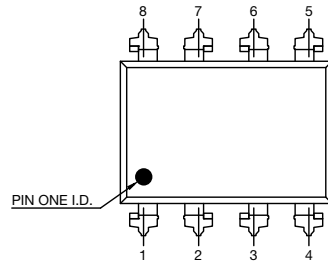
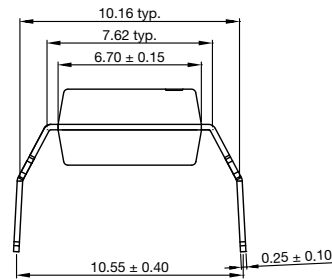
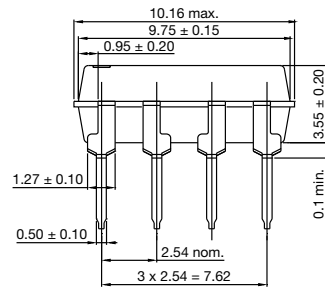
Fig. 20 - Small Signal CTR vs. Forward Current

PACKAGE DIMENSIONS in millimeters**Standard**

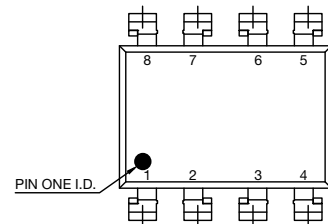
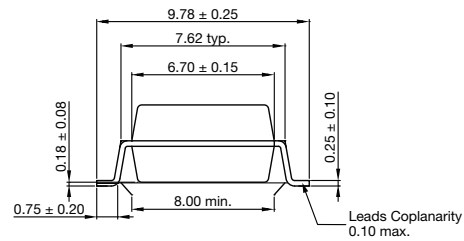
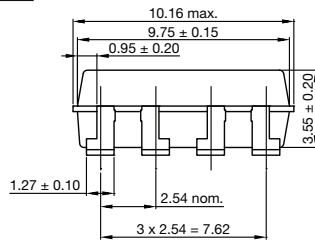
22672



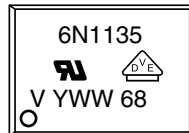
Option 6



Option 9



PACKAGE MARKING



21764-70

22675



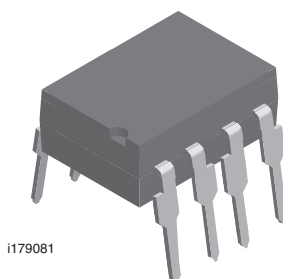
Footprint and Schematic Information for 6N1135, 6N1136

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
6N1135	www.snapeda.com/parts/6N1135/Vishay/view-part/
6N1135-X009T	www.snapeda.com/parts/6N1135-X009T/Vishay/view-part/
6N1136	www.snapeda.com/parts/6N1136/Vishay/view-part/
6N1136-X009T	www.snapeda.com/parts/6N1136-X009T/Vishay/view-part/

For technical issues and product support, please contact optocoupleranswers@vishay.com.





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