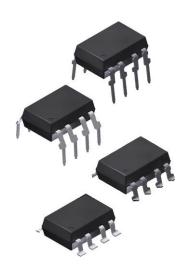
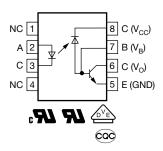


High Speed Optocoupler, 1 MBd, Photodiode With Transistor Output





DESCRIPTION

The 6N135 and 6N136 are 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.

FEATURES

- Isolation test voltages: 5300 V_{RMS}
- TTL compatible
- High bit rates: 1 Mbit/s
- High common-mode interference immunity
- 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
HALOGEN
FREE
GREEN

(5-2008)

AGENCY APPROVALS

- <u>UL</u>
- cUL
- DIN EN 60747-5-5 (VDE0884-5) available with option 1
- CQC

LINKS TO ADDITIONAL RESOURCES









ORDERING INFORMATION		
6 N 1 3 PART NUMBER	# - X 0 # # PACKAGE OPTION	TAPE AND REEL Option 7 Option 9
AGENCY CERTIFIED / PACKAGE	CTR	(%)
UL, cUL, CQC	≥ 7	≥ 19
DIP-8	6N135	6N136
DIP-8, 400 mil, option 6	-	6N136-X006
SMD-8, option 7	6N135-X007T ⁽¹⁾	6N136-X007T ⁽¹⁾
SMD-8, option 9	-	6N136-X009T ⁽¹⁾
UL, cUL, CQC, VDE (Option 1)	≥ 7	≥ 19
DIP-8	-	6N136-X001
SMD-8, option 7	6N135-X017T ⁽¹⁾	6N136-X017T
SMD-8, option 9	-	6N136-X019T

Note

 $^{^{(1)}}$ Also available in tubes; do not add T to end

ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	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 _{FSM}	50	mA				
Maximum surge forward current	t ≤ 1 µs, 300 pulses/s		1	Α				
Thermal resistance		R _{th}	700	K/W				
Power dissipation	T _{amb} = 70 °C	P _{diss}	45	mW				
ОUТРUТ								
Supply voltage		Vs	-0.5 to 15	V				
Output voltage		Vo	-0.5 to 15	V				
Emitter base voltage		V _{EBO}	5	V				
Output current		I _O	8	mA				
Maximum output current			16	mA				
Base current		I _B	5	mA				
Thermal resistance			300	K/W				
Power dissipation	T _{amb} = 70 °C	P _{diss}	100	mW				
COUPLER								
Storage temperature range		T _{stg}	-55 to +150	°C				
Ambient temperature range		T _{amb}	-55 to +100	°C				
Soldering temperature	Max. ≤ 10 s, dip soldering ≥ 0.5 mm from case bottom	T _{sld}	260	°C				

Note

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.



ELECTRICAL CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT								
Forward voltage	I _F = 16 mA		V_{F}	-	1.33	1.9	V	
Breakdown voltage	I _R = 10 μA		V_{BR}	5	-	-	V	
Reverse current	V _R = 5 V		I _R	-	0.5	10	μA	
Capacitance	$V_R = 0 V$, $f = 1 MHz$		Co	-	30	-	pF	
Temperature coefficient, forward voltage	I _F = 16 mA		$\Delta V_F / \Delta T_A$	-	-1.7	-	mV/°C	
OUTPUT								
Logic low supply current	$I_F = 16$ mA, $V_O = open$, $V_{CC} = 15$ V		I _{CCL}	ı	150	-	μA	
Logic high supply current	$I_F = 0$ mA, $V_O = open$, $V_{CC} = 15 V$		I _{CCH}	ı	0.01	1	μA	
Output voltage, output low	$I_F = 16 \text{ mA}, I_O = 1.1 \text{ mA}, V_{CC} = 4.5 \text{ V}$	6N135	V_{OL}	ı	0.1	0.4	V	
Output voltage, output low	$I_F = 16$ mA, $I_O = 3.0$ mA, $V_{CC} = 4.5$ V	6N136	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	
Output current, output night	$I_F = 0 \text{ mA}, V_O = V_{CC} = 15 \text{ V}$		I _{OH}	ı	0.01	1	μA	
COUPLER								
Capacitance (input to output)	f = 1 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 (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
	L 10 = A V 0 4 V V 4 5 V	6N135	CTR	7	16	-	%	
Current transfer	$I_F = 16 \text{ mA}, V_O = 0.4 \text{ V}, V_{CC} = 4.5 \text{ V}$	6N136	CTR	19	35	-	%	
ratio	1 16 m A V 0 5 V V 4 5 V	6N135	CTR	5	=	-	%	
	$I_F = 16 \text{ mA}, V_O = 0.5 \text{ V}, V_{CC} = 4.5 \text{ V}$	6N136	CTR	15	-	-	%	

SWITCHING CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
High to low	$I_F = 16 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 4.1 \text{ k}\Omega$	6N135	t _{PHL}	-	0.3	1.5	μs	
High to low	$I_F = 16 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 1.9 \text{ k}\Omega$	6N136	t _{PHL}	-	0.2	0.8	μs	
Low to high	$I_F = 16 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 4.1 \text{ k}\Omega$	6N135	t _{PLH}	-	0.3	1.5	μs	
Low to night	$I_F = 16 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 1.9 \text{ k}\Omega$	6N136	t _{PLH}	-	0.2	0.8	μs	

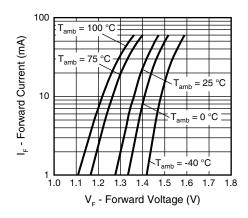
COMMON MODE TRANSIENT IMMUNITY (T _{amb} = 25 °C, unless otherwise specified)							
PARAMETER TEST CONDITION PART SYMBOL MIN. TYP. MAX. UN							
High	$I_F = 0 \text{ mA}, V_{CM} = 10 V_{P-P}, V_{CC} = 5 V, R_L = 4.1 \text{ k}\Omega$	6N135	CM _H	-	1000	00 - 00 -	V/µs
High	$I_F = 0 \text{ mA}, V_{CM} = 10 V_{P-P}, V_{CC} = 5 V, R_L = 1.9 k\Omega$	6N136	CM _H	-	1000		V/µs
Low	$I_F = 16 \text{ mA}, V_{CM} = 10 V_{P-P}, V_{CC} = 5 V, R_L = 4.1 \text{ k}\Omega$	6N135	CM _L	-	1000	-	V/µs
Low	$I_F = 16 \text{ mA}, V_{CM} = 10 V_{P-P}, V_{CC} = 5 V, R_L = 1.9 \text{ k}\Omega$	6N136	CM _L	-	1000	-	V/µs



PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V _{ISO}	5300	V _{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V _{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V _{IORM}	890	V _{peak}
Isolation resistance	T _{amb} = 25 °C, V _{IO} = 500 V	R _{IO}	≥ 10 ¹²	Ω
Isolation resistance	$T_{amb} = 100 ^{\circ}C, V_{IO} = 500 V$	R _{IO}	≥ 10 ¹¹	Ω
Output safety power		P _{SO}	500	mW
Input safety current		I _{SI}	300	mA
Input safety temperature		T _S	175	°C
Creepage distance	DIP-8		≥7	mm
Clearance distance	DIP-8		≥7	mm
Creepage distance	DIP-8, 400 mil, option 6		≥8	mm
Clearance distance	DIP-8, 400 mil, option 6		≥8	mm
Creepage distance	SMD-8, option 7		≥8	mm
Clearance distance	SMD-8, option 7		≥8	mm
Creepage distance	SMD-8, option 9		≥8	mm
Clearance distance	SMD-8, option 9		≥8	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)





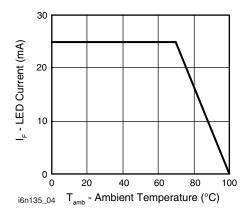


Fig. 2 - Permissible Forward LED Current vs. Temperature

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.





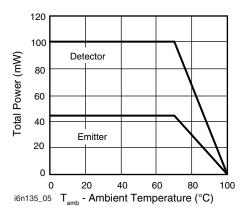


Fig. 3 - Permissible Power Dissipation vs. Temperature

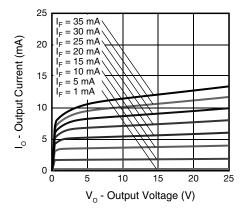


Fig. 4 - Output Current vs. Output Voltage

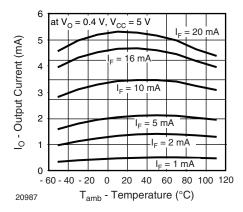


Fig. 5 - Output Current vs. Temperature

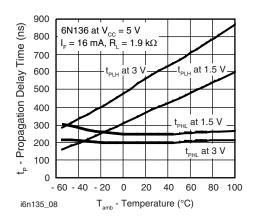


Fig. 6 - Propagation Delay vs. Ambient Temperature

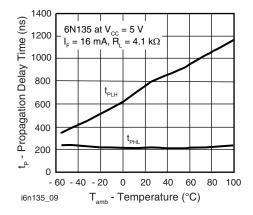


Fig. 7 - Propagation Delay vs. Ambient Temperature

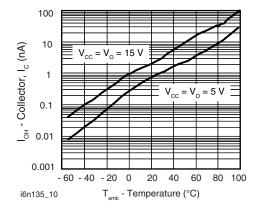


Fig. 8 - Logic High Output Current vs. Temperature



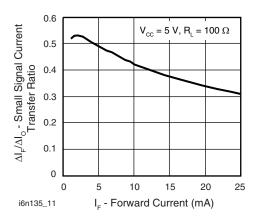


Fig. 9 - Small Signal Current Transfer Ratio vs. Quiescent Input Current

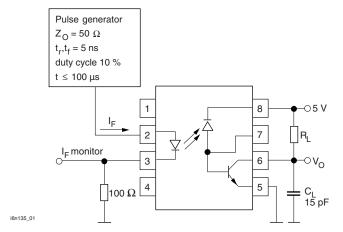
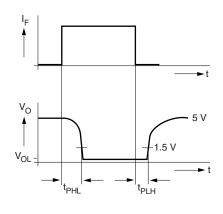
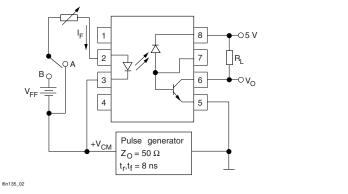


Fig. 10 - Switching Times





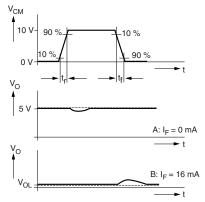
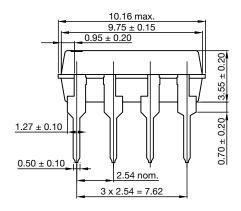
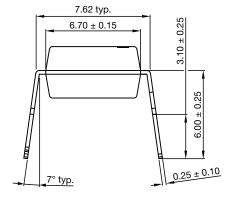


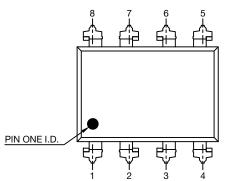
Fig. 11 - Common-Mode Interference Immunity

PACKAGE DIMENSIONS (in millimeters)

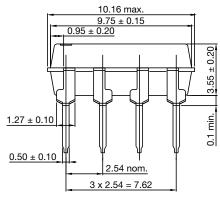
DIP-8, Standard

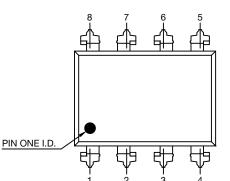


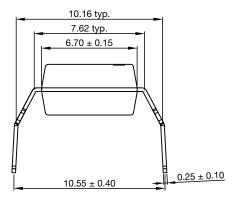




DIP-8, Option 6

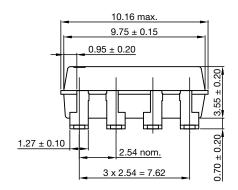


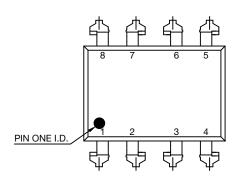




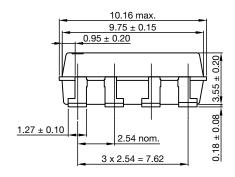


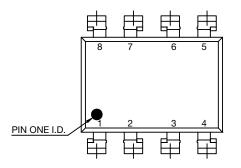
DIP-8, Option 7

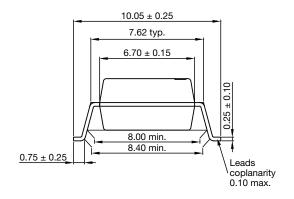




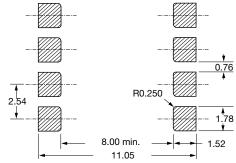
DIP-8, Option 9

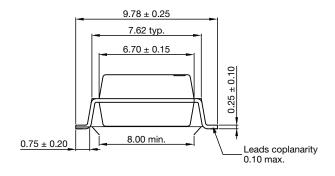




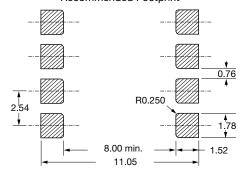


Recommended Footprint





Recommended Footprint





PACKAGE MARKING



Fig. 12 - 6N135

6N136 **91** <u>6</u> O V XXXX 68

Fig. 13 - 6N136

Notes

- XXXX = LMC (lot marking code)
- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

SOLDER PROFILES

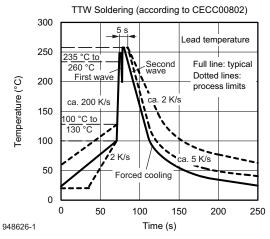


Fig. 14 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

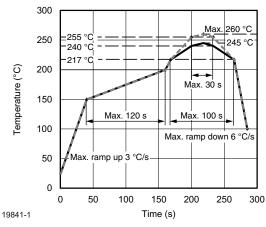


Fig. 15 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2 Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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