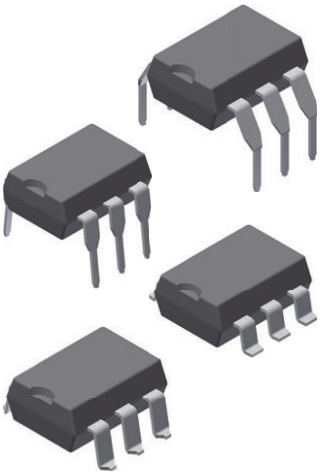
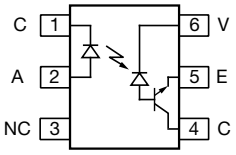
High Speed Optocoupler, Phototransistor Output, 1 MBd, 10 kV/µs CMR, Split Collector Transistor Output





FEATURES

- High CMR of 10 kV/µs
- High speed optocoupler without base connection
- GaAlAs emitter
- Integrated detector with photo diode and transistor
- TTL and CMOS compatible
- Open collector output
- Supply voltage up to 30 V
- High CTR
- Good CTR linearity relative to forward current
- Low coupling capacitance
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The SFH636 is an optocoupler with a GaAlAs infrared emitting diode, optically coupled to an integrated photo detector consisting of a photo diode and a high speed transistor in a DIP-6 plastic package. The device is functionally similar to 6N136 except there is no base connection and the foot print is different. Noise and common mode rejection performance is enhanced by not bringing out the base connection.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2.0 MHz.

APPLICATIONS

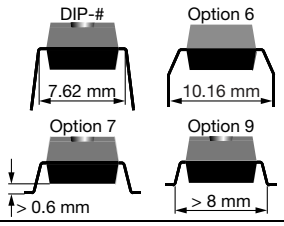
- IGBT drivers and MOSFET driver stages
- Data communications
- Programmable controllers
- IPM drivers

AGENCY APPROVALS

- UL1577, file no. E52744, double protection
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1

ORDERING INFORMATION

S	F	H	6	3	6	-	X	0	#	#	T
PART NUMBER							PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)
UL	**≥ 19**
DIP-6	SFH636
SMD-6, option 7	SFH636-X007, SFH636-X007T
SMD-6, option 9	SFH636-X009
VDE, UL	**≥ 19**
DIP-6	SFH636-X001
DIP-6, option 6	SFH636-X016
SMD-6, option 7	SFH636-X017, SFH636-X017T

Note

- Additional options may be possible, please contact sales office

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	3.0	V
DC forward current		I_F	25	mA
Surge forward current	$t_P \leq 1.0$ µs, 300 pulses/s	I_{FSM}	1.0	A
Power dissipation		P_{diss}	45	mW
OUTPUT				
Supply voltage		V_S	-0.5 to +30	V
Output voltage		V_O	-0.5 to +20	V
Output current		I_O	8	mA
Power dissipation		P_{diss}	100	mW
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Junction temperature		T_j	100	°C
Soldering temperature	Max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm	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} = 0 °C to 70 °C unless otherwise specified, typ. values T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
input						
Forward voltage	I_F = 16 mA	V_F	-	1.5	1.8	V
Reverse current	V_R = 3 V	I_R	-	0.5	10	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_O	-	125	-	pF
Thermal resistance		R_{thja}	-	700	-	K/W
output						
Logic high supply current	I_F = 0 V, V_O (open), V_{CC} = 15 V, T_{amb} = 25 °C	I_{CCH}	-	0.01	1	µA
	I_F = 0 V, V_O (open), V_{CC} = 15 V	I_{CCH}	-	0.01	2	µA
Output current, output high	I_F = 0 V, V_O (open), V_{CC} = 5.5 V, T_{amb} = 25 °C	I_{OH}	-	0.003	0.5	µA
	I_F = 0 V, V_O (open), V_{CC} =15 V, T_{amb} = 25 °C	I_{OH}	-	0.01	1	µA
	I_F = 0 V, V_O (open), V_{CC} =15 V	I_{OH}	-		50	µA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}	-	3	-	pF
Thermal resistance		R_{thja}	-	300	-	K/W
coupler						
Coupling capacitance		C_C	-	0.6	-	pF
Collector emitter saturation voltage	I_F = 16 mA, I_O = 2.4 mA, V_{CC} = 4.5 V; T_{amb} = 25 °C	V_{OL}	-	0.1	0.4	V
Supply current, logic low	I_F = 16 mA, V_O open, V_{CC} = 15 V	I_{DD}	-	80	-	

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.

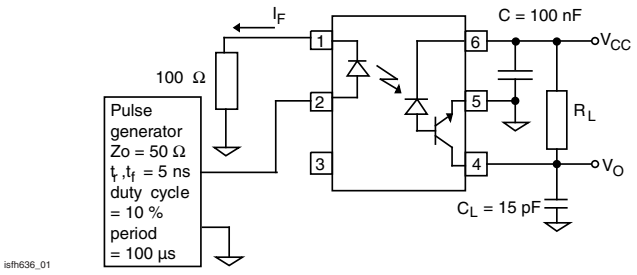


Fig. 1 - Test Setup

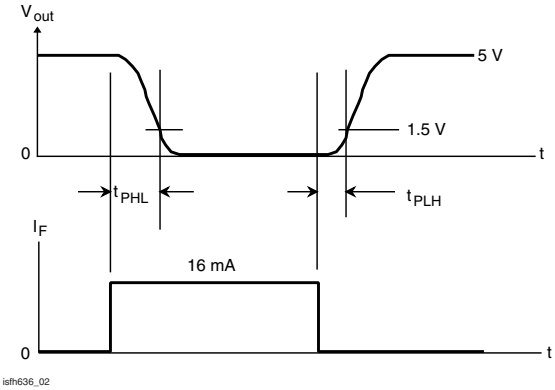


Fig. 2 - Switching Time Measurement

CURRENT TRANSFER RATIO (T_{amb} = 0 °C to 70 °C unless otherwise specified, typ. values T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V, T_{amb} = 25 °C	CTR	19	30	-	%
	I_F = 16 mA, V_O = 0.5 V, V_{CC} = 4.5 V	CTR	15	-	-	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time (high to low)	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	t_{PHL}	-	0.3	0.8	µs
Propagation delay time (low to low)	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	t_{PLH}	-	0.3	0.8	µs

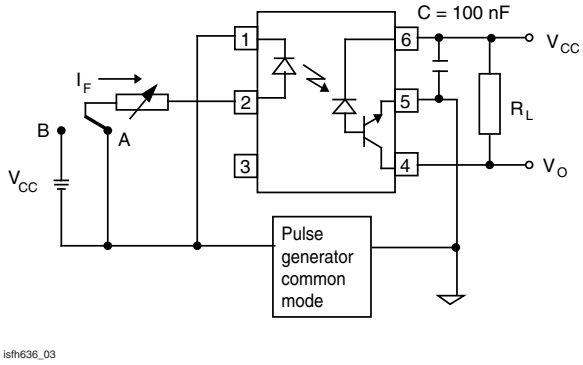


Fig. 3 - Common Mode Transient Test

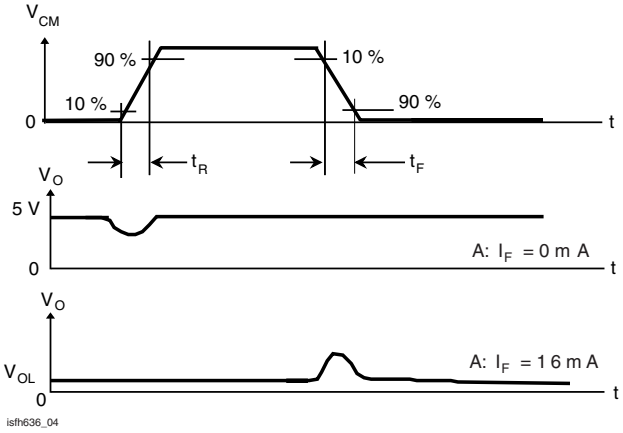


Fig. 4 - Measurement Waveform of CMR

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = 25 °C unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity (high)	I_O = 0 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5.0 V	$\|CM_H\|$	-	10 000	-	V/µs
Common mode transient immunity (low)	I_O = 16 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5.0 V	$\|CM_L\|$	-	10 000	-	V/µs

SAFETY AND INSULATION RATINGS				
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}	4420	V_{RMS}
Tested withstanding isolation voltage	According to UL1577, t = 1 s	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
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Input safety temperature		T_S	175	°C
Creepage distance	DIP-6		≥ 7	mm
Clearance distance	DIP-6		≥ 7	mm
Creepage distance	DIP-6, option 6		≥ 8	mm
Clearance distance	DIP-6, option 6		≥ 8	mm
Creepage distance	SMD-6, option 7		≥ 7	mm
Clearance distance	SMD-6, option 7		≥ 7	mm
Creepage distance	SMD-6, option 9		≥ 7	mm
Clearance distance	SMD-6, option 9		≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm

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.

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

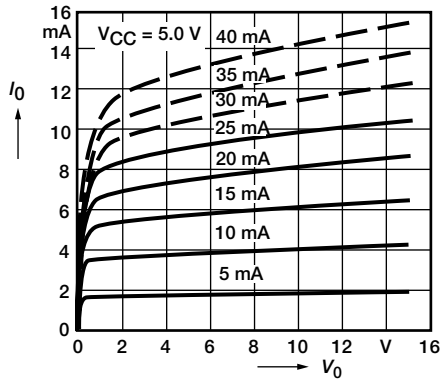


Fig. 5 - Output Characteristics-Output Current vs. Output Voltage

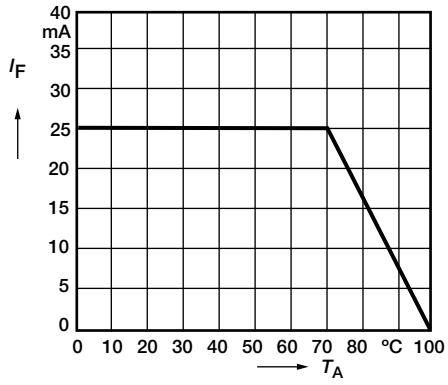


Fig. 6 - Permissible Forward Current of Emitting Diode vs. Ambient Temperature

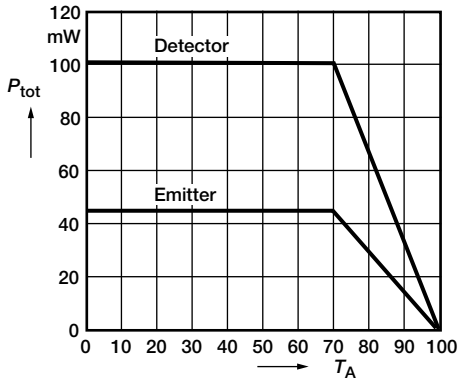


Fig. 7 - Permissible Total Power Dissipation vs. Ambient Temperature

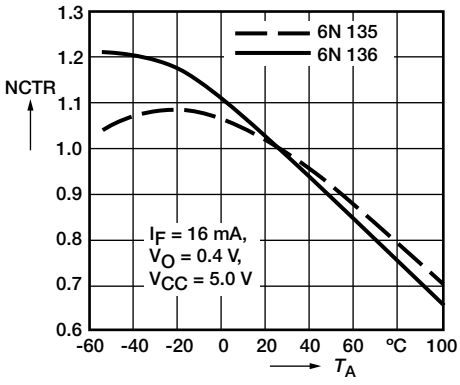


Fig. 10 - Current Transfer Ratio (Normalized) vs. Ambient Temperature

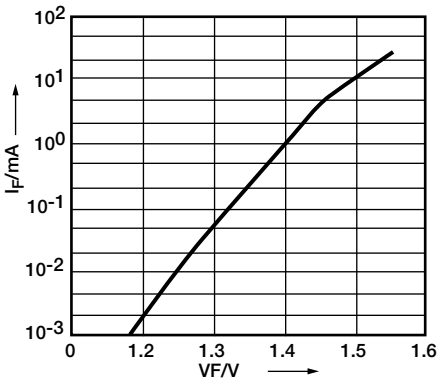


Fig. 8 - Forward Current of Emitting Diode vs. Forward Voltage

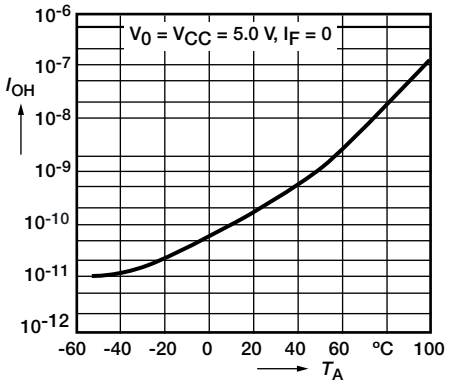


Fig. 11 - Output Current (High) vs. Ambient Temperature

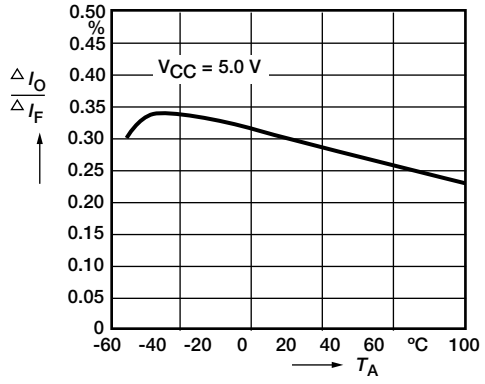


Fig. 9 - Small Signal Transfer Ratio vs. Forward Current

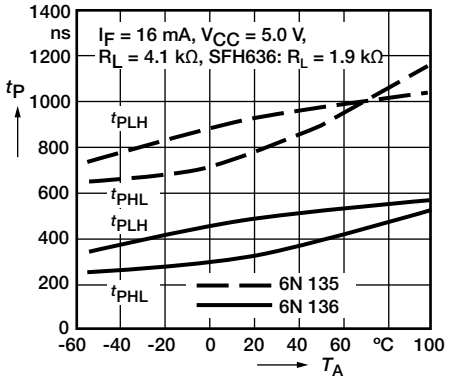


Fig. 12 - Delay Times vs. Ambient Temperature

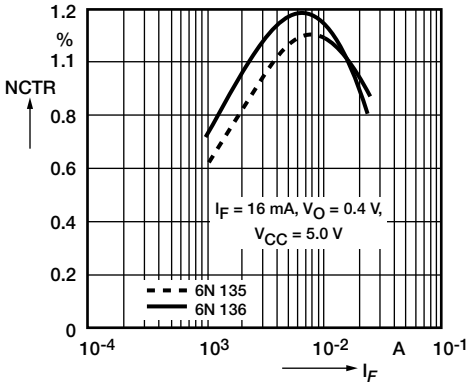
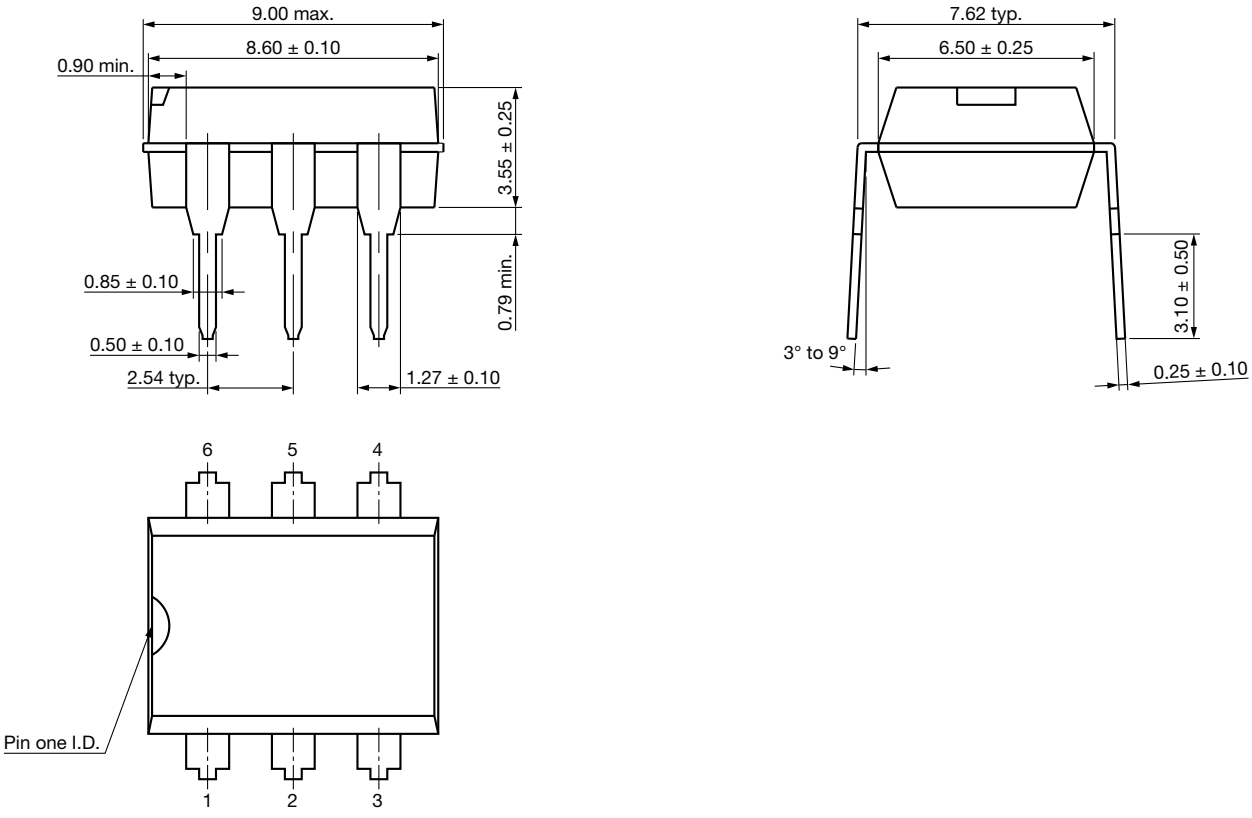


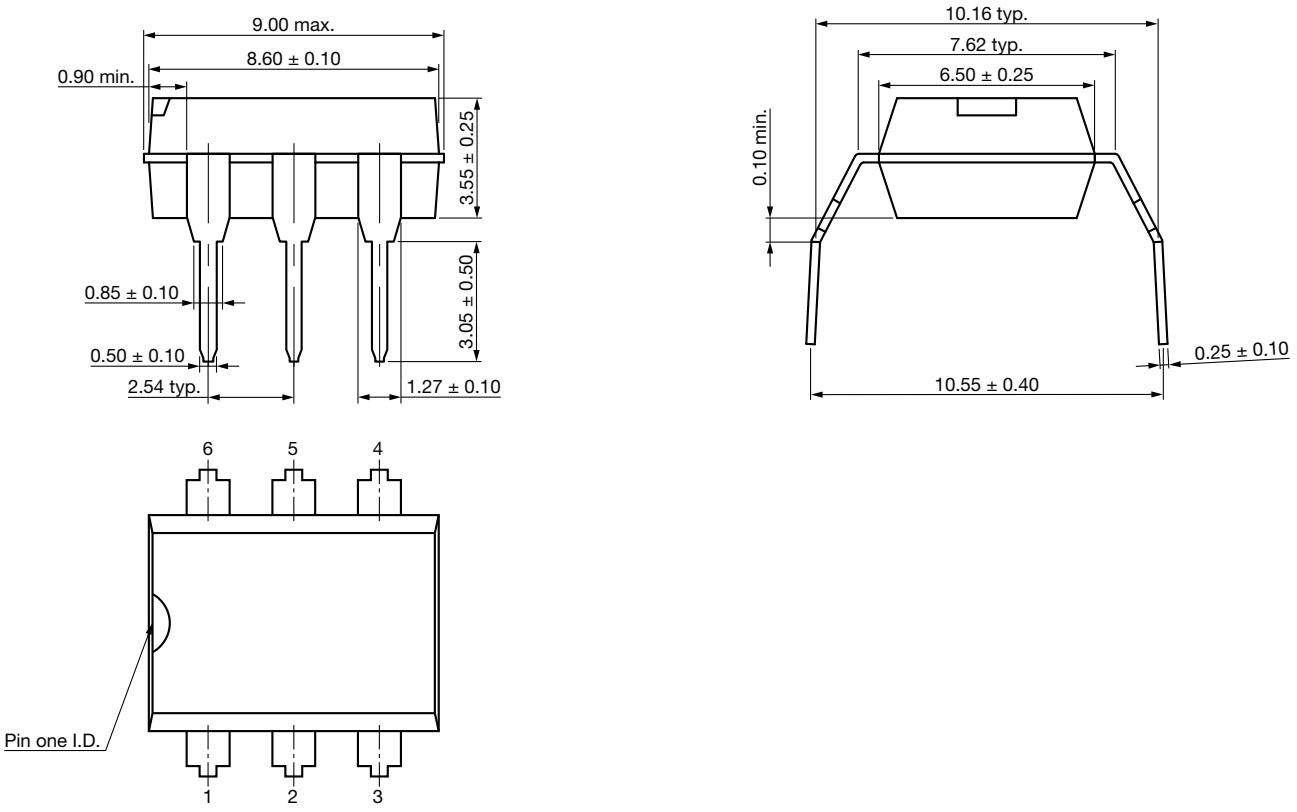
Fig. 13 - Current Transfer Ratio (Normalized) vs. Forward Current

PACKAGE DIMENSIONS in inches (millimeters)

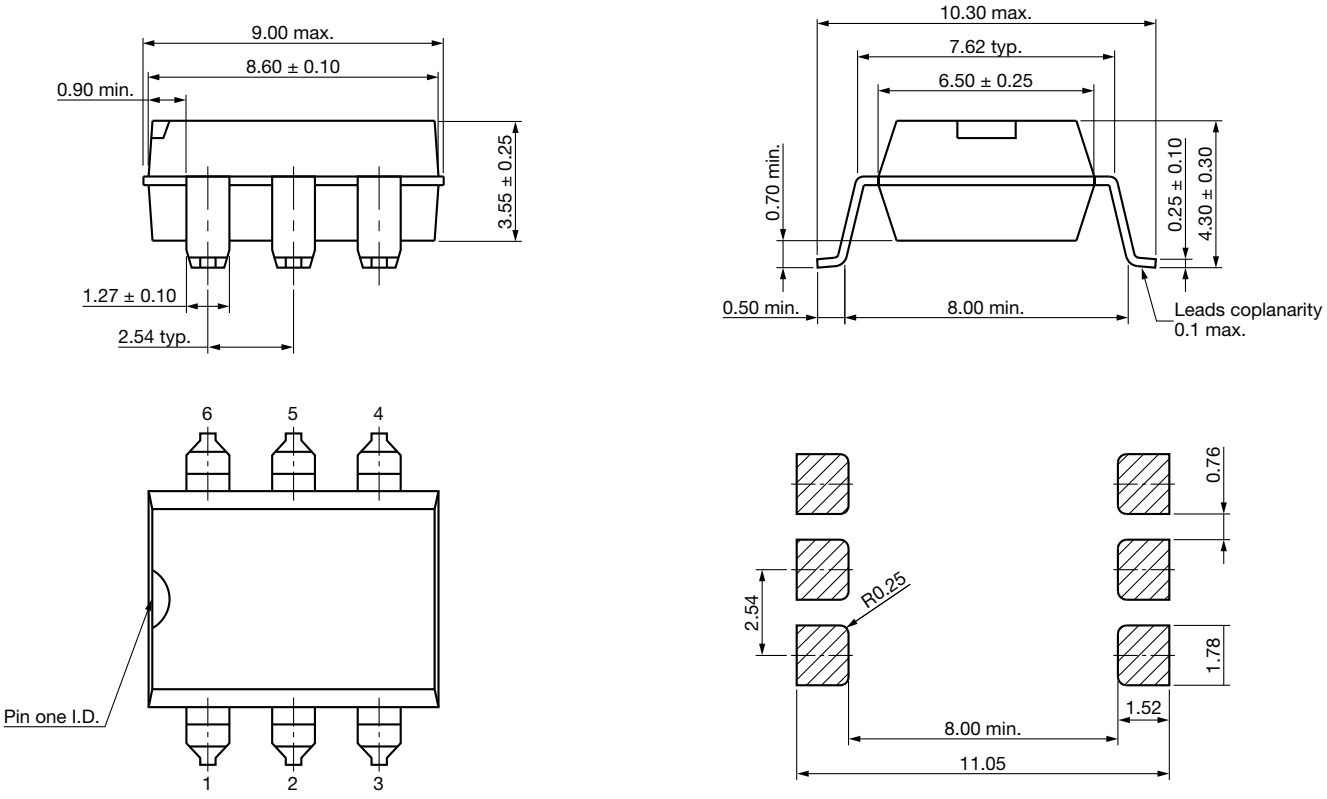
DIP-6



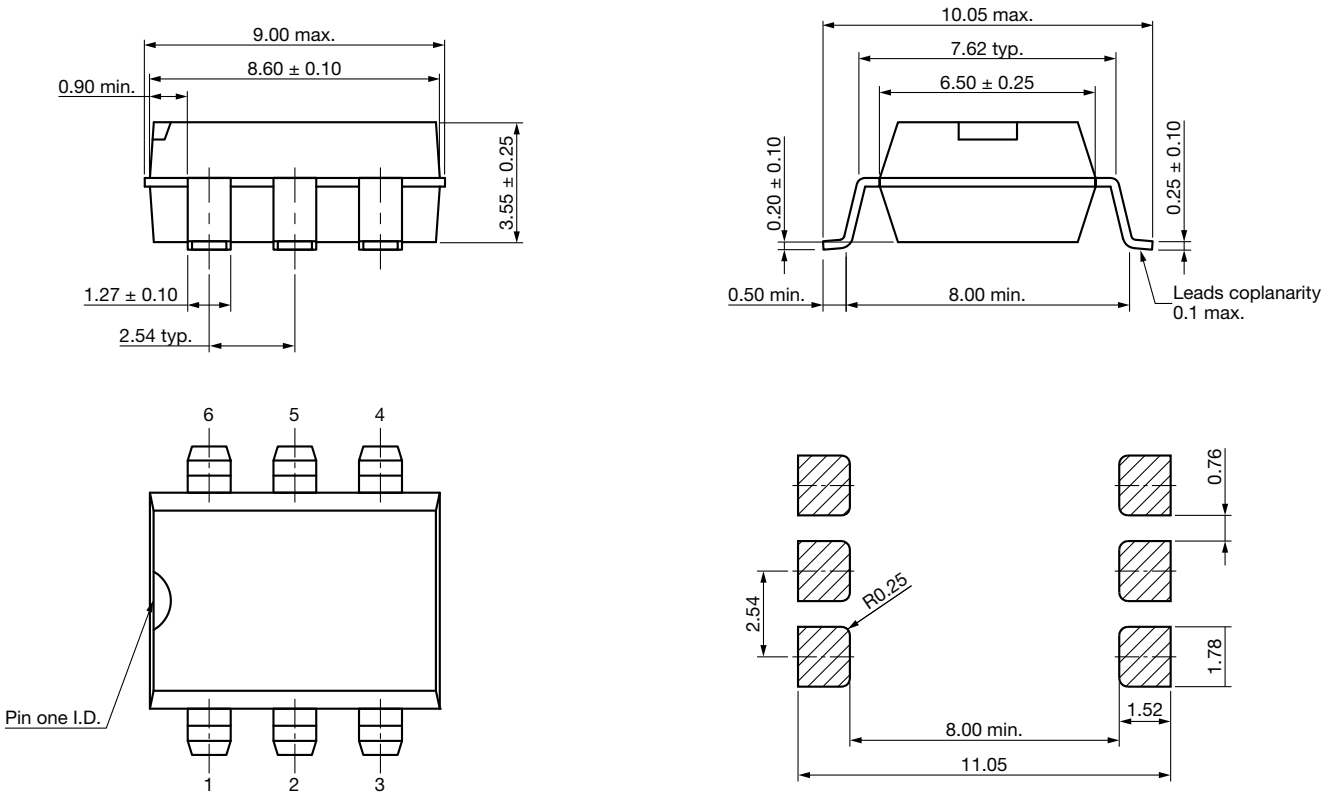
DIP-6, Option 6



SMD-6, Option 7



SMD-6, Option 9



SOLDER PROFILES

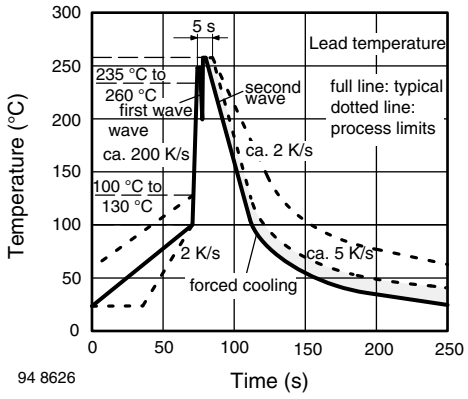


Fig. 14 - Wave Soldering Double Wave Profile According to J.STD-020 for DIP Devices

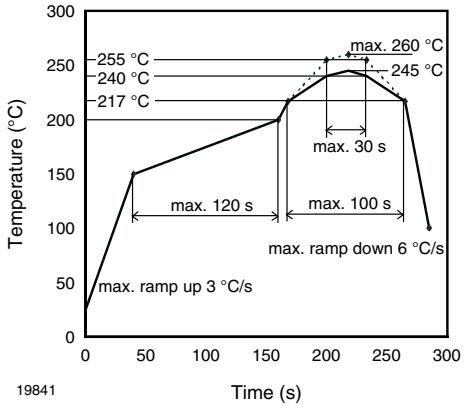


Fig. 15 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

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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