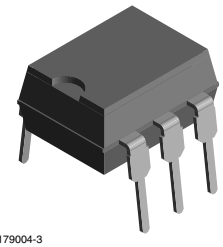
Optocoupler, Phototransistor Output, With Base Connection



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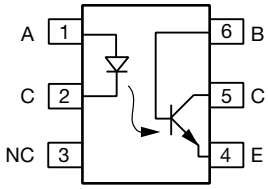


FEATURES

- Isolation test voltage (1.0 s), 5300 V_{RMS}
- V_{CEsat} = 0.25 (≤ 0.4) V, I_F = 10 mA, I_C = 2.5 mA
- Built to conform to VDE requirements
- High quality premium device
- Long term stability
- Storage temperature, -55 °C to +150 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

Product Page

DESCRIPTION

The SFH600 is an optocoupler with a GaAs LED emitter which is optically coupled with a silicon planar phototransistor detector. The component is packaged in a plastic plug-in case, 20 AB DIN 41866.

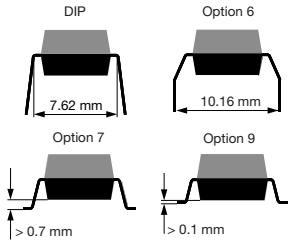
The coupler transmits signals between two electrically isolated circuits. The potential difference between the circuits to be coupled should not exceed the maximum permissible insulating voltage.

AGENCY APPROVALS

- UL 1577
- cUL
- DIN EN 60747-5-5 (VDE 0884), available with option 1
- CQC
- BSI
- FIMKO

ORDERING INFORMATION

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



AGENCY CERTIFIED / PACKAGE	CTR (%)		
UL, cUL, BSI, CQC	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	SFH600-1	SFH600-2	SFH600-3
DIP-6, 400 mil, option 6	-	SFH600-2X006	SFH600-3X006
SMD-6, option 7	SFH600-1X007T (1)	SFH600-2X007	SFH600-3X007
SMD-6, option 9	SFH600-1X009T	-	-
UL, cUL, BSI, CQC, VDE (Option 1)	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	-	SFH600-2X001	SFH600-3X001
DIP-6, 400 mil, option 6	-	SFH600-2X016	-

Notes

- Additional options may be possible, please contact sales office

(1) Also available in tubes; do not put T on the end

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6.0	V
DC forward current		I_F	60	mA
Surge forward current	$t_P \leq 10$ µs	I_{FSM}	2.5	A
Total power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter voltage		V_{CE}	70	V
Emitter base voltage		V_{EB}	7.0	V
Collector current		I_C	50	mA
	t = 1.0 ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Junction temperature	Max. 10 s, dip soldering	T_j	100	°C
Soldering temperature [1]	Max. 10 s, dip soldering: distance to seating plane ≥ 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

(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 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 60 mA		V_F	-	1.25	1.65	V
Breakdown voltage	I_R = 10 µA		V_{BR}	6	-	-	V
Reverse current	V_R = 6 V		I_R	-	0.01	10	µA
Capacitance	V_F = 0 V, f = 1 MHz		C_O	-	25	-	pF
Thermal resistance			R_{thja}	-	750	-	K/W
OUTPUT							
Collector emitter capacitance	f = 1 MHz, V_{CE} = 5 V		C_{CE}	-	5.2	-	pF
Collector base capacitance	f = 1 MHz, V_{CB} = 5 V		C_{CB}	-	6.5	-	pF
Emitter base capacitance	f = 1 MHz, V_{EB} = 5 V		C_{EB}	-	9.5	-	pF
Thermal resistance			R_{thja}	-	500	-	K/W
Collector emitter leakage current	V_{CE} = 10 V	SFH600-1	I_{CEO}	-	2	35	nA
		SFH600-2	I_{CEO}	-	2	35	nA
		SFH600-3	I_{CEO}	-	5	70	nA
COUPLER							
Saturation voltage collector emitter voltage	I_F = 10 mA, I_C = 2.5 mA		V_{CEsat}	-	0.25	0.4	V
Capacitance (input to output)			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
I_C/I_F at V_{CE} = 5.0 V	I_F = 10 mA	SFH600-1	CTR	63	-	125	%
		SFH600-2	CTR	100	-	200	%
		SFH600-3	CTR	160	-	320	%
	I_F = 1 mA	SFH600-1	CTR	22	45	-	%
		SFH600-2	CTR	34	70	-	%
		SFH600-3	CTR	56	90	-	%

SWITCHING CHARACTERISTICS

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED							
Current	V_{CC} = 5 V, R_L = 75 Ω		I_F	-	10	-	mA
Rise time	V_{CC} = 5 V, R_L = 75 Ω		t_r	-	2	-	µs
Fall time	V_{CC} = 5 V, R_L = 75 Ω		t_f	-	2.5	-	µs
Turn-on time	V_{CC} = 5 V, R_L = 75 Ω		t_{on}	-	3.2	-	µs
Turn-off time	V_{CC} = 5 V, R_L = 75 Ω		t_{off}	-	3	-	µs
Cut-off frequency	V_{CC} = 5 V, R_L = 75 Ω		F_{CO}	-	250	-	kHz
SATURATED							
Current		SFH600-1	I_F	-	10	-	mA
		SFH600-2	I_F	-	10	-	mA
		SFH600-3	I_F	-	5	-	mA
Rise time		SFH600-1	t_r	-	3	-	µs
		SFH600-2	t_r	-	3	-	µs
		SFH600-3	t_r	-	4	-	µs
Fall time		SFH600-1	t_f	-	12	-	µs
		SFH600-2	t_f	-	12	-	µs
		SFH600-3	t_f	-	14	-	µs
Turn-on time		SFH600-1	t_{on}	-	4.5	-	µs
		SFH600-2	t_{on}	-	4.5	-	µs
		SFH600-3	t_{on}	-	5.8	-	µs
Turn-off time		SFH600-1	t_{off}	-	21	-	µs
		SFH600-2	t_{off}	-	21	-	µs
		SFH600-3	t_{off}	-	24	-	µs

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 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 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Input safety temperature		T_{SI}	175	°C
Creepage distance			≥ 7	mm
Clearance distance			≥ 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)

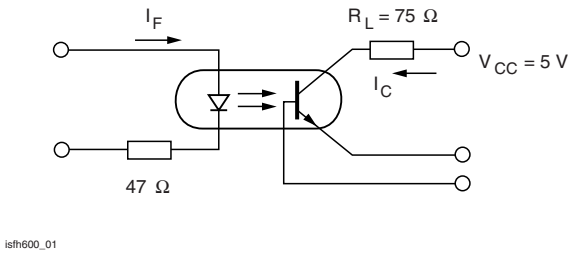


Fig. 1 - Linear Operation (without saturation)

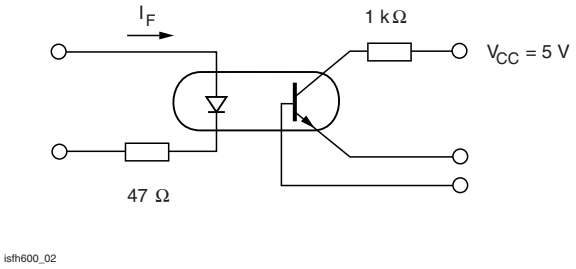


Fig. 2 - Switching Operation (with saturation)

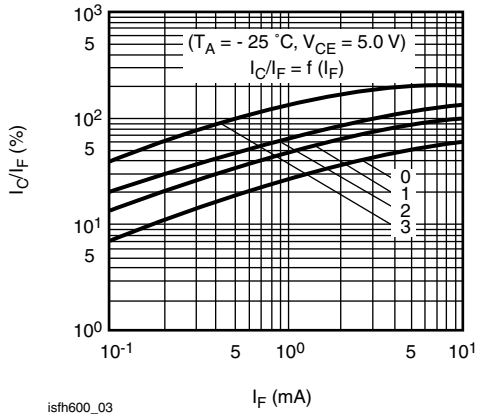


Fig. 3 - Current Transfer Ratio vs. Diode Current

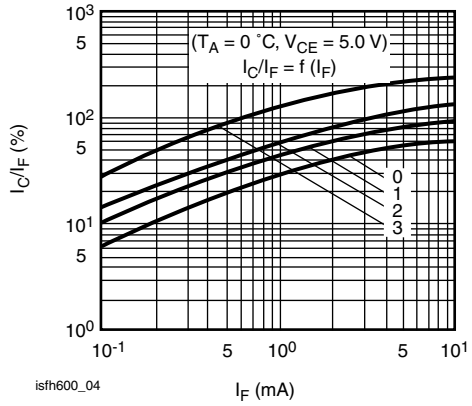


Fig. 4 - Current Transfer Ratio vs. Diode Current

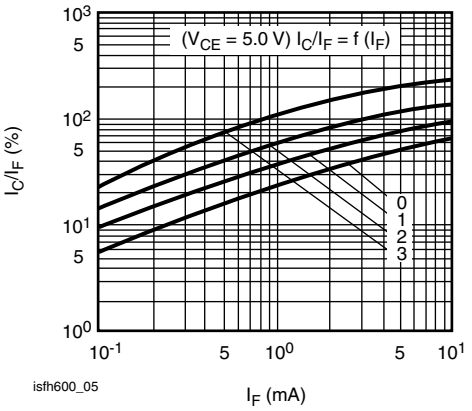


Fig. 5 - Current Transfer Ratio vs. Diode Current

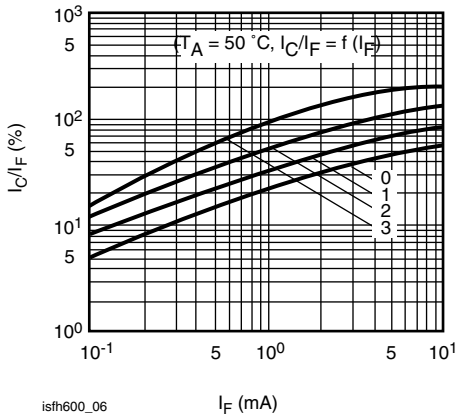


Fig. 6 - Current Transfer Ratio vs. Diode Current

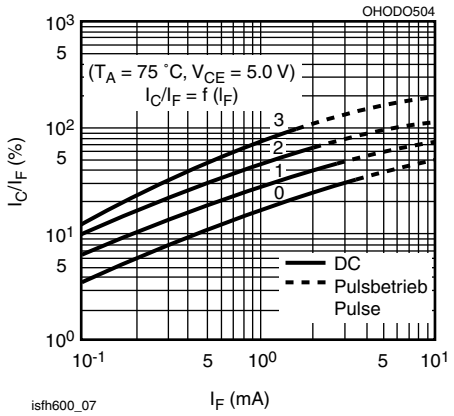


Fig. 7 - Current Transfer Ratio vs. Diode Current

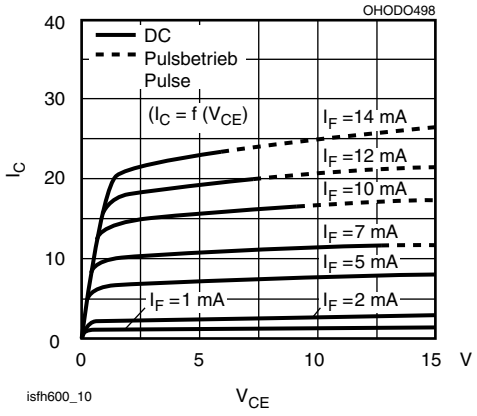


Fig. 10 - Output Characteristics SFH600-2, SFH600-3

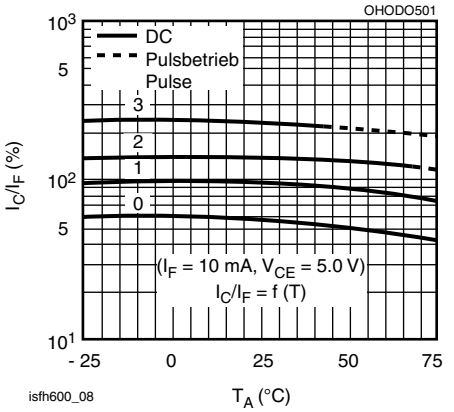


Fig. 8 - Current Transfer Ratio (CTR) vs. Temperature

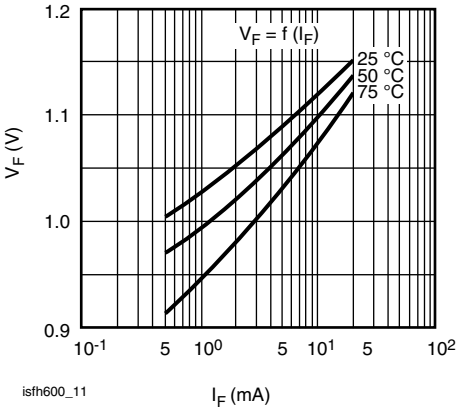


Fig. 11 - Forward Voltage

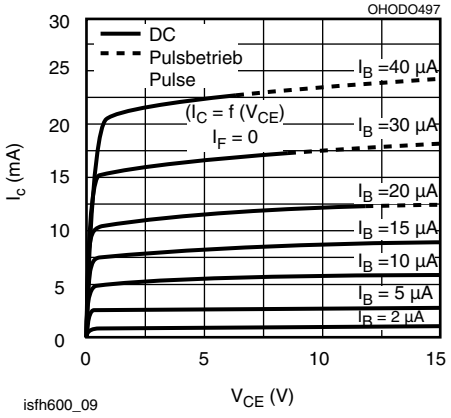


Fig. 9 - Transistor Characteristics SFH600-2, SFH600-3

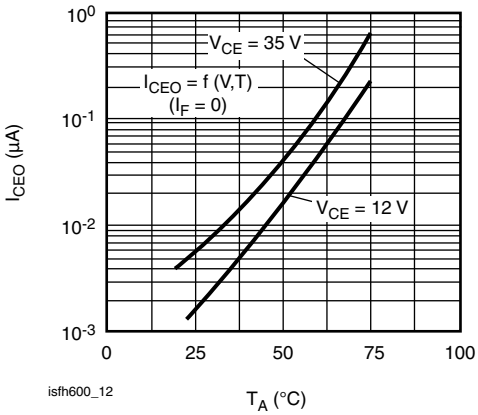


Fig. 12 - Collector Emitter Off-State Current

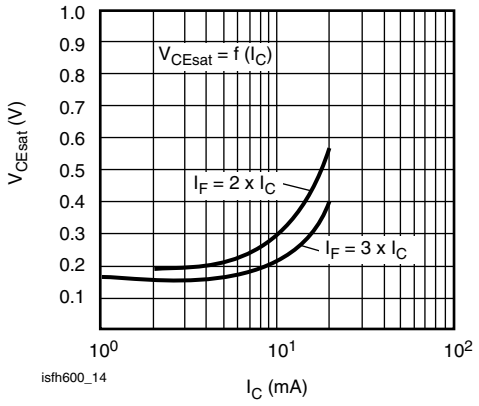


Fig. 13 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-1

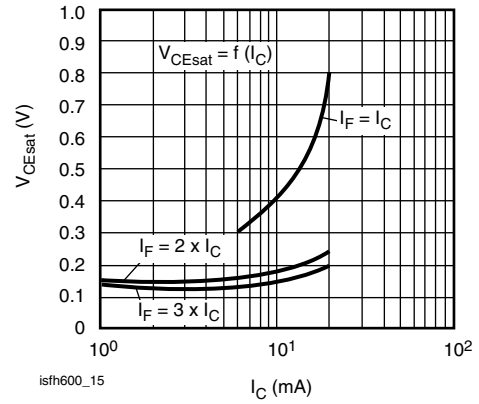


Fig. 14 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-2

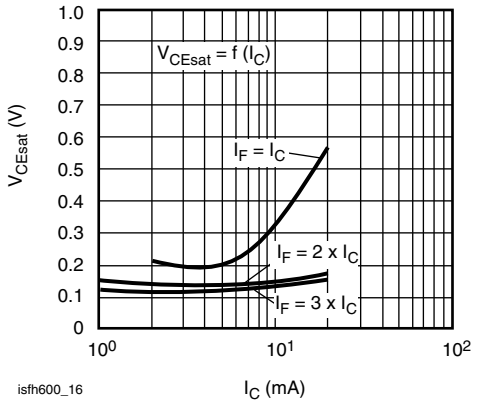


Fig. 15 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-3

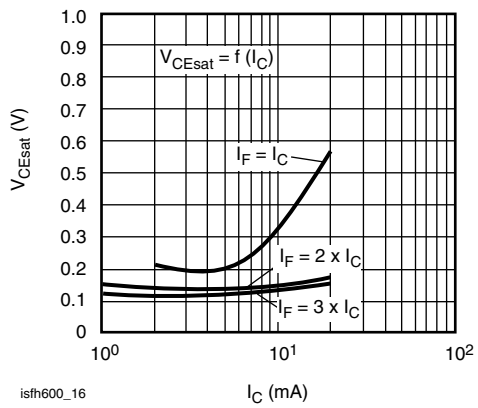


Fig. 16 - Permissible Pulse Load

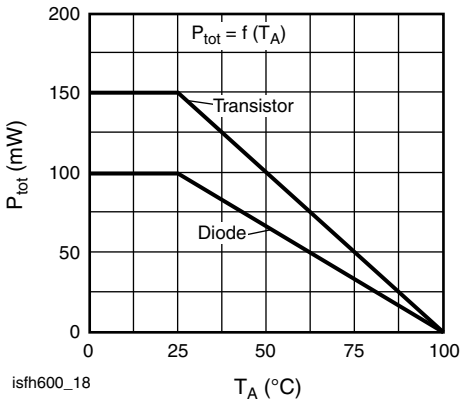


Fig. 17 - Permissible Power Dissipation for Transistor and Diode

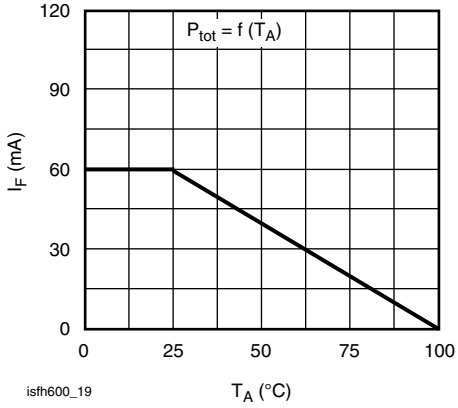


Fig. 18 - Permissible Forward Current Diode

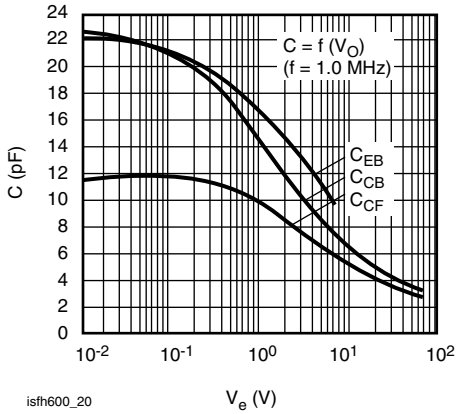
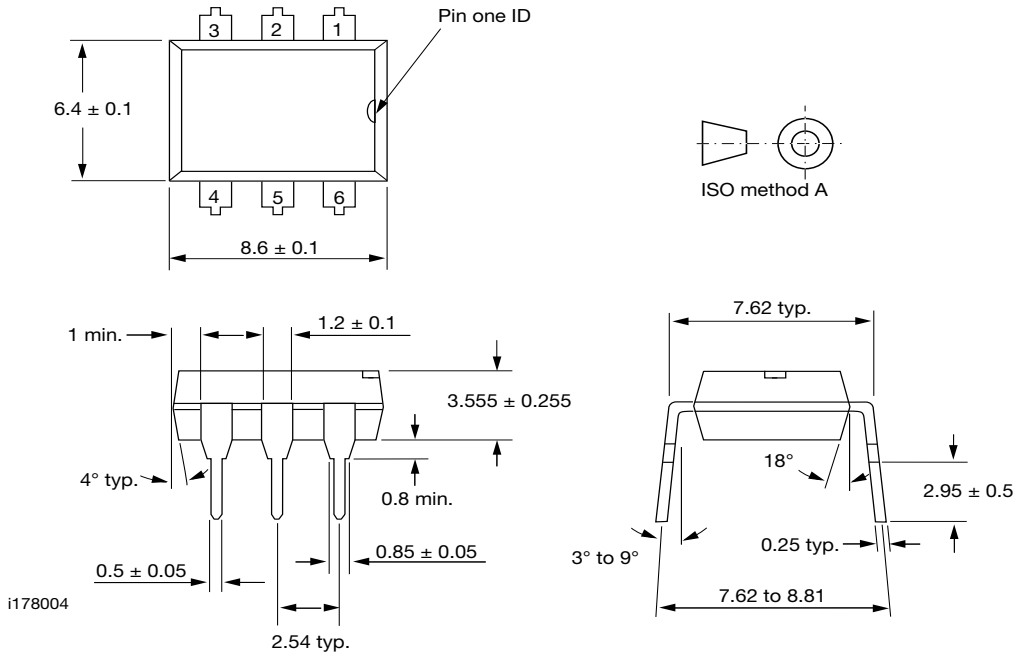
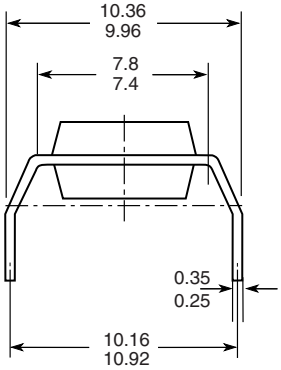


Fig. 19 - Transistor Capacitance

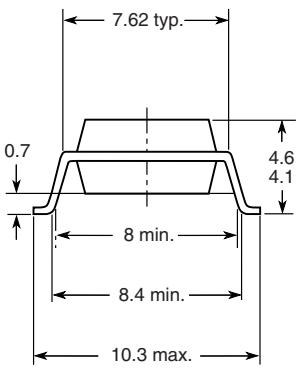
PACKAGE DIMENSIONS in inches (millimeters)



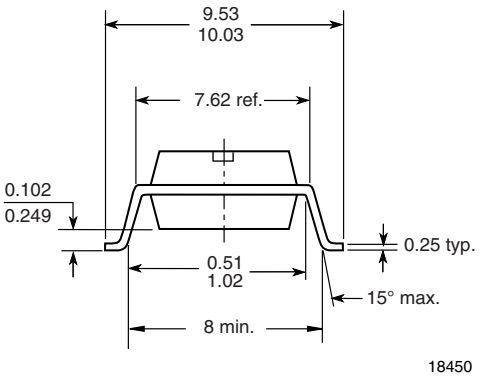
Option 6



Option 7



Option 9



PACKAGE MARKING (example)

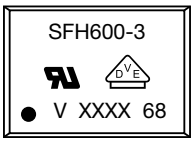


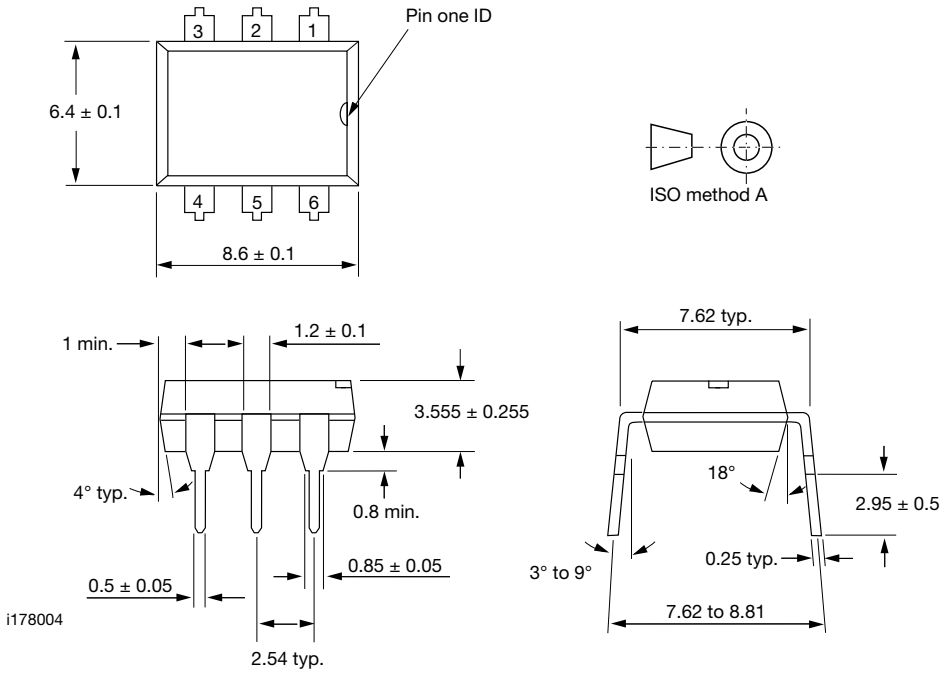
Fig. 20 - Example of SFH600-3X001

Notes

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

DIP-6A

PACKAGE DIMENSIONS in inches (millimeters)



Note

The information in this document provides generic information but for specific information on a product the appropriate product datasheet should be used.

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