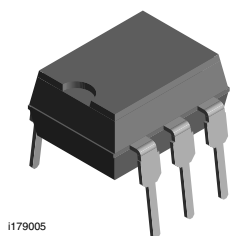
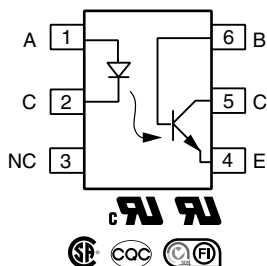


Optocoupler, Phototransistor Output, With Base Connection



H179005



FEATURES

- Current transfer ratio (see order information)
- Isolation test voltage 4420 V_{RMS}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

AGENCY APPROVALS

- [UL / cUL](#) 1577
- [CSA](#)
- [CQC GB4943.1-2011](#)
- [CQC GB8898-2011](#)
- [FIMKO](#)

LINKS TO ADDITIONAL RESOURCES



DESCRIPTION

The IL2 is an optically coupled isolated pairs employing GaAs infrared LEDs and silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the drive while maintaining a high degree of electrical isolation between input and output. The IL2 is especially designed for driving medium-speed logic and can be used to eliminate troublesome ground loop and noise problems. This coupler can be used also to replace relays and transformers in many digital interface applications such as CRT modulation.

ORDERING INFORMATION

I	L	2
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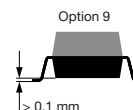
PART NUMBER

-	X	0	0	9
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PACKAGE OPTION

T

PACKAGE OPTION



AGENCY CERTIFIED / PACKAGE	CTR (%)
UL, cUL, CSA, CQC, FIMKO	> 100
SMD-6, option 9	IL2-X009T

Note

- Additional options may be possible, please contact sales office

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

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V _R	6	V
Forward current		I _F	60	mA
Surge current		I _{FSM}	2.5	A
Power dissipation		P _{diss}	100	mW
Derate linearly from 25 °C			1.33	mW/°C



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	70	V
Emitter base breakdown voltage		BV_{EBO}	7	V
Collector base breakdown voltage		BV_{CBO}	70	V
Collector current		I_C	50	mA
	$t < 1.0\text{ ms}$	I_C	400	mA
Power dissipation		P_{diss}	200	mW
Derate linearly from $25\text{ }^{\circ}\text{C}$			2.6	mW/ $^{\circ}\text{C}$
COUPLER				
Package power dissipation		P_{tot}	250	mW
Derate linearly from $25\text{ }^{\circ}\text{C}$			3.3	mW/ $^{\circ}\text{C}$
Storage temperature		T_{stg}	-40 to +150	$^{\circ}\text{C}$
Operating temperature		T_{amb}	-40 to +100	$^{\circ}\text{C}$
Junction temperature		T_j	125	$^{\circ}\text{C}$
Soldering temperature ⁽¹⁾	2.0 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	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	$I_F = 60\text{ mA}$	V_F	-	1.25	1.65	V
Breakdown voltage	$I_R = 10\text{ }\mu\text{A}$	V_{BR}	6	30	-	V
Reverse current	$V_R = 6.0\text{ V}$	I_R	-	0.01	10	μA
Capacitance	$V_R = 0\text{ V}$, $f = 1.0\text{ MHz}$	C_O	-	40	-	pF
Thermal resistance junction to lead		R_{thjl}	-	750	-	K/W
OUTPUT						
Collector emitter capacitance	$V_{CE} = 5.0\text{ V}$, $f = 1.0\text{ MHz}$	C_{CE}	-	6.8	-	pF
Collector base capacitance	$V_{CB} = 5.0\text{ V}$, $f = 1.0\text{ MHz}$	C_{CB}	-	8.5	-	pF
Emitter base capacitance	$V_{EB} = 5.0\text{ V}$, $f = 1.0\text{ MHz}$	C_{EB}	-	11	-	pF
Collector emitter leakage voltage	$V_{CE} = 10\text{ V}$	I_{CEO}	-	5	50	nA
Collector emitter saturation voltage	$I_{CE} = 1.0\text{ mA}$, $I_B = 20\text{ }\mu\text{A}$	V_{CEsat}	-	0.25	-	V
Base emitter voltage	$V_{CE} = 10\text{ V}$, $I_B = 20\text{ }\mu\text{A}$	V_{BE}	-	0.65	-	V
DC forward current gain	$V_{CE} = 10\text{ V}$, $I_B = 20\text{ }\mu\text{A}$	h_{FE}	200	650	1800	
DC forward current gain saturated	$V_{CE} = 0.4\text{ V}$, $I_B = 20\text{ }\mu\text{A}$	h_{FEsat}	120	400	600	
Thermal resistance junction to lead		R_{thjl}	-	500	-	K/W
COUPLER						
Capacitance (input to output)	$V_{I-O} = 0\text{ V}$, $f = 1.0\text{ MHz}$	C_{IO}	-	0.6	-	pF
Insulation resistance	$V_{I-O} = 500\text{ V}$	R_S	-	10^{14}	-	Ω

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	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio (collector emitter saturated)	$I_F = 10 \text{ mA}$, $V_{CE} = 0.4 \text{ V}$	CTR_{CEsat}	-	170	-	%
Current transfer ratio (collector emitter)	$I_F = 10 \text{ mA}$, $V_{CE} = 10 \text{ V}$	CTR_{CE}	100	200	500	%
Current transfer ratio (collector base)	$I_F = 10 \text{ mA}$, $V_{CB} = 9.3 \text{ V}$	CTR_{CB}	-	0.25	-	%

SWITCHING CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
Current time	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	I_F	-	4	-	mA
Delay time	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_D	-	1.7	-	μs
Rise time	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_r	-	2.6	-	μs
Storage time	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_s	-	0.4	-	μs
Fall time	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_f	-	2.2	-	μs
Propagation H to L	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_{PHL}	-	1.2	-	μs
Propagation L to H	$V_{CE} = 5 \text{ V}$, $R_L = 75 \Omega$, t_p measured at 50 % of output	t_{PLH}	-	2.3	-	μs
SATURATED						
Current time	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	I_F	-	5	-	mA
Delay time	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_D	-	1	-	μs
Rise time	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_r	-	2	-	μs
Storage time	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_s	-	5.4	-	μs
SATURATED						
Fall time	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_f	-	13.5	-	μs
Propagation H to L	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_{PHL}	-	5.4	-	μs
Propagation L to H	$V_{CE} = 0.4 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$, $V_{CL} = 5 \text{ V}$, $V_{TH} = 1.5 \text{ V}$	t_{PLH}	-	7.4	-	μs

COMMON MODE TRANSIENT IMMUNITY

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode rejection output high	$V_{CM} = 50 \text{ V}_{P-P}$, $R_L = 1 \text{ k}\Omega$, $I_F = 10 \text{ mA}$	$ CM_H $	-	5000	-	V/ μs
Common mode rejection output low	$V_{CM} = 50 \text{ V}_{P-P}$, $R_L = 1 \text{ k}\Omega$, $I_F = 10 \text{ mA}$	$ CM_L $	-	5000	-	V/ μs
Common mode coupling capacitance		C_{CM}	-	0.01	-	pF



SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		40 / 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 _{peak}
Maximum repetitive peak isolation voltage		V _{IORM}	890	V _{peak}
Isolation resistance	V _{IO} = 500 V, T _{amb} = 25 °C	R _{IO}	≥ 10 ¹²	Ω
	V _{IO} = 500 V, T _{amb} = 100 °C	R _{IO}	≥ 10 ¹¹	Ω
Output safety power		P _{SO}	400	mW
Input safety current		I _{SI}	275	mA
Safety temperature		T _S	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

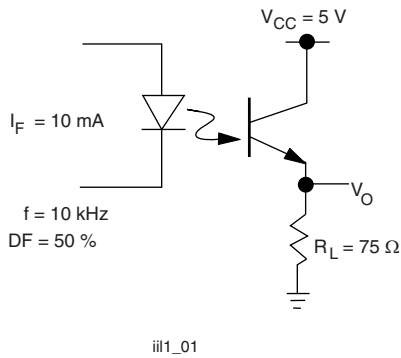
TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 1 - Non-Saturated Switching Schematic

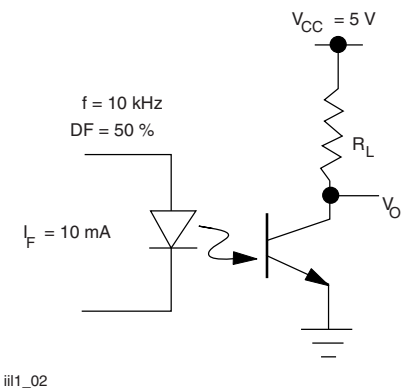


Fig. 2 - Saturated Switching Schematic

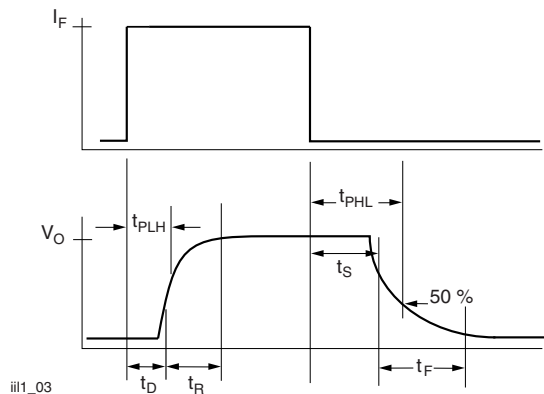


Fig. 3 - Non-Saturated Switching Timing

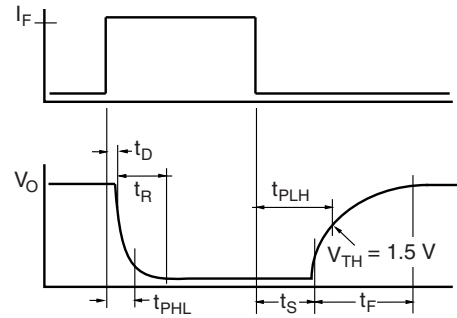


Fig. 4 - Saturated Switching Timing

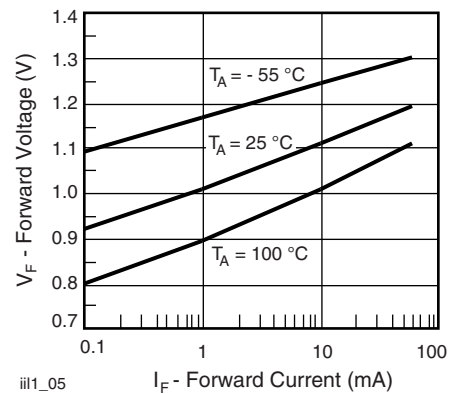


Fig. 5 - Forward Voltage vs. Forward Current

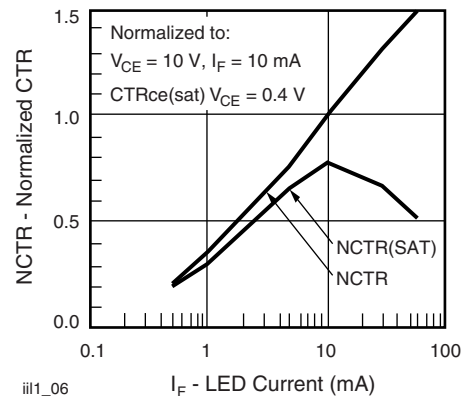


Fig. 6 - Normalized Non-Saturated and Saturated CTR vs. LED Current

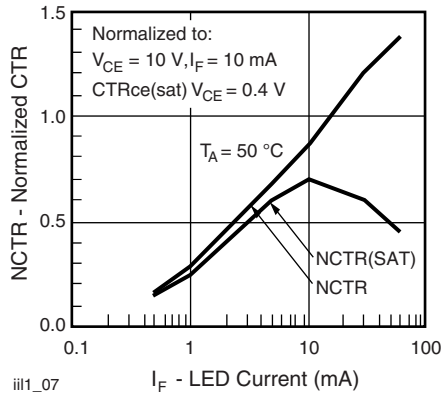


Fig. 7 - Normalized Non-Saturated and Saturated CTR vs. LED Current

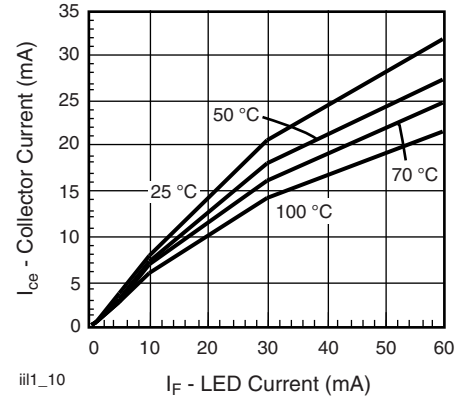


Fig. 10 - Collector Emitter Current vs. Temperature and LED Current

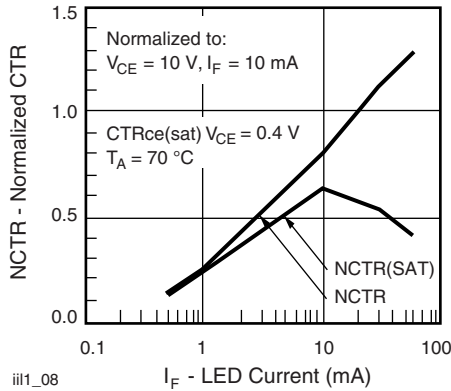


Fig. 8 - Normalized Non-Saturated and Saturated CTR vs. LED Current

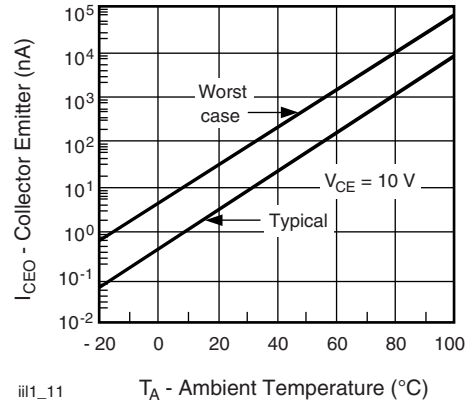


Fig. 11 - Collector Emitter Leakage Current vs. Temperature

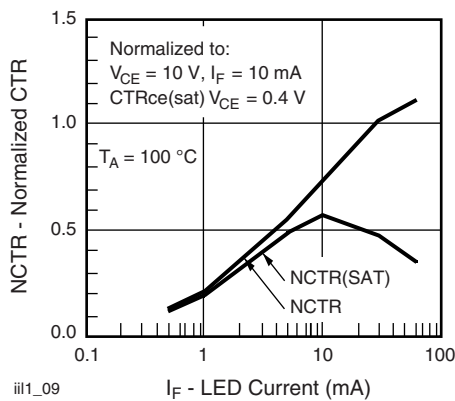


Fig. 9 - Normalized Non-Saturated and Saturated CTR, $T_{amb} = 100^\circ\text{C}$ vs. LED Current

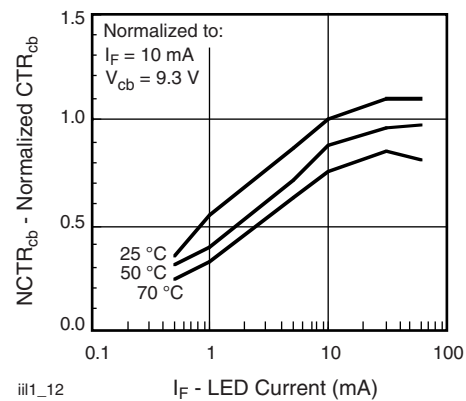


Fig. 12 - Normalized CTR_{cb} vs. LED Current and Temperature

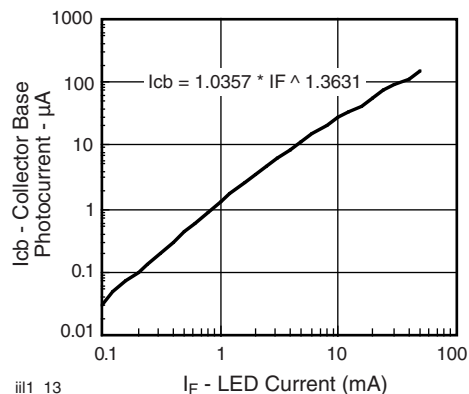


Fig. 13 - Collector Base Photocurrent vs. LED Current

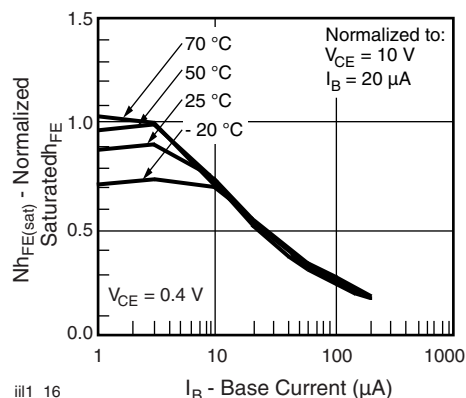


Fig. 16 - Normalized Saturated h_{FE} vs. Base Current and Temperature

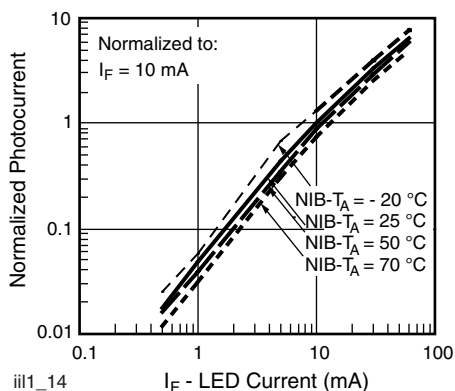


Fig. 14 - Normalized Photocurrent vs. I_F and Temperature

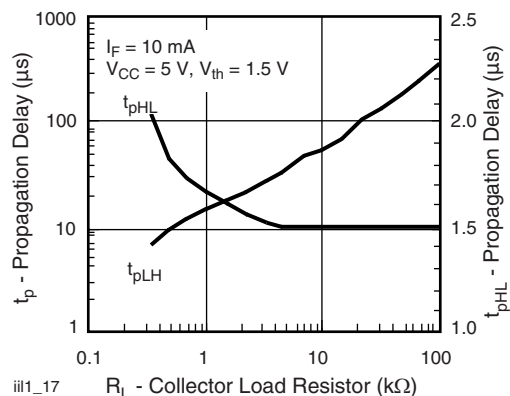


Fig. 17 - Propagation Delay vs. Collector Load Resistor

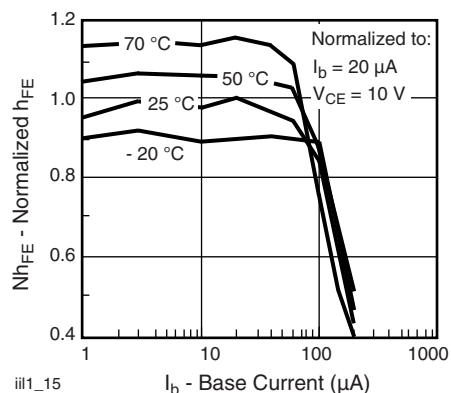
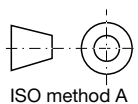
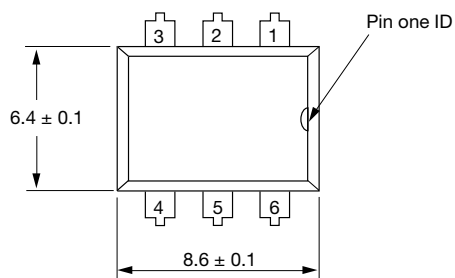
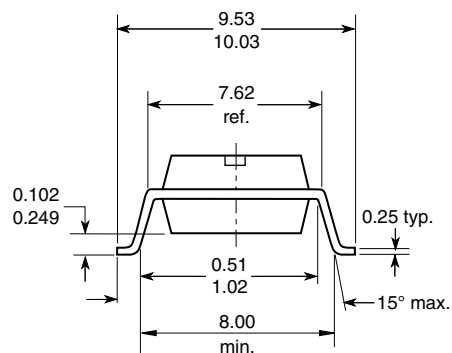


Fig. 15 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

PACKAGE DIMENSIONS in millimeters

Option 9




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