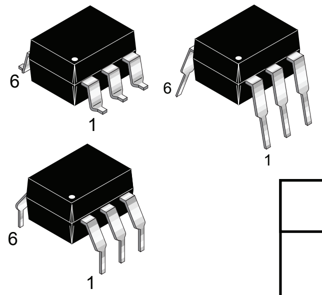
6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

CNX35U CNX36U CNX38U CNX39U

DESCRIPTION

The CNX35U, CNX36U CNX38U and CNX39U are optically coupled isolators consisting of an infrared emitting GaAs diode and a silicon NPN phototransistor with accessible base. These devices are housed in 6-pin dual-in-line packages (DIP).



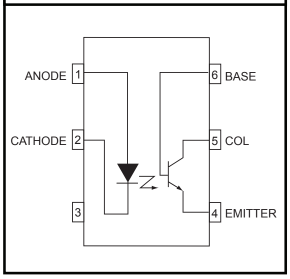
FEATURES

- High output/input DC current transfer ratio
- Low saturation voltage
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  -Ordering option ‘300’ (e.g. CNX35U.300)

APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

SCHEMATIC



Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-55 to +150	°C
Operating Temperature	T_{OPR}	All	-40 to +100	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
EMITTER				
Continuous Reverse Voltage	V_R	All	5	V
Continuous Forward Current	I_F	All	100	mA
Forward Current - Peak (10 µs pulse, δ = 0.01)	I_F(pk)	All	3.0	A
Total Power Dissipation up to 25°C Ambient	P_D	All	200	mW
Derate Linearly from 25°C		All	2.0	mW/°C
DETECTOR				
Collector to Emitter Voltage (open base)	V_{CEO}	CNX38U	80	V
		CNX35U, CNX36U, CNX39U	30	
Collector to Base Voltage (open emitter)	V_{CBO}	CNX38U	120	V
		CNX35U, CNX36U, CNX39U	70	
Emitter to Collector Voltage (open base)	V_{ECO}	All	7	V
DC Collector Current	I_C	All	100	mA
Detector Power Dissipation up to 25°C Ambient	P_D	All	200	mW
Derate Linearly from 25°C		All	2.0	mW/°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Device	Min	Typ	Max	Units
EMITTER							
Input Forward Voltage	I_F = 10 mA	V_F	All		1.15	1.5	V
Reverse Current	V_R = 5 V	I_R	All			10	µA
DETECTOR	V_{CE} = 10 V	I_{CEO}	CNX35U,CNX36U,CNX39U		2	50	nA
Leakage Current Collector to Emitter	V_{CE} = 50 V		CNX38U		2	50	nA
	V_{CE} = 10 V, T_A = 70°C		CNX35U,CNX36U,CNX39U			10	µA
	V_{CE} = 50 V, T_A = 70°C		CNX38U			10	µA
	V_{CE} = 10 V	I_{CBO}	All			20	nA
Breakdown Voltage							
Collector to Emitter	I_C = 1 mA, I_F = 0	BV_{CEO}	CNX35U,CNX36U,CNX39U	30			V
			CNX38U	80			
Collector to Base	I_C = 0.1 mA, I_F = 0	BV_{CBO}	CNX35U,CNX36U,CNX39U	70			V
			CNX38U	120			
Emitter to Collector	I_E = 0.1 mA, I_F = 0	BV_{ECO}	All	7			V

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Input-Output Isolation Voltage	t = 1 min.	V_{ISO}	5,300			V_{RMS}
Isolation Resistance	V_{I-O} = 500 VDC	R_{ISO}	1	10		TΩ
Isolation Capacitance	IF =0, V = 0V, f = 1 MHz	C_{ISO}		0.6	1.3	pF

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Output/Input Current Transfer Ratio	I_F = 10 mA, V_{CE} = 0.4 V	CTR	CNX35U	40		160	%
			CNX39U	60		100	
			CNX36U	80		200	
	I_F = 10 mA, V_{CE} = 10 V		CNX38U	70		210	
	I_F = 16 mA, V_{CE} = 0.4 V			50			
	I_F = 2 mA, V_{CE} = 5 V		All	15			
Collector-Emitter Saturation Voltage	I_F = 10 mA, I_C = 2 mA	$V_{CE(SAT)}$	CNX35U, CNX39U		0.15	0.4	V
	I_F = 10 mA, I_C = 4 mA		CNX36U		0.19	0.4	
	I_F = 16 mA, I_C = 2 mA		CNX38U		0.2	0.4	
AC Characteristics	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ**	**Max**	**Units**
Non-Saturated Switching Times Turn-On Time See Fig. 1 and Fig. 2	R_L = 100 Ω, I_C = 2 mA, V_{CC} = 5 V	t_{on}	CNX35U			20	µs
			CNX39U			20	
			CNX36U			20	
	R_L = 100 Ω, I_C = 4 mA, V_{CC} = 5 V		CNX38U			20	
Turn-Off Time See Fig. 1 and Fig. 2	R_L = 100 Ω, I_C = 2 mA, V_{CC} = 5 V	t_{off}	CNX35U			20	µs
			CNX39U			20	
			CNX36U			20	
	R_L = 100 Ω, I_C = 4 mA, V_{CC} = 5 V		CNX38U			20	
Saturated Switching Times Turn-On Time See Fig. 1 and Fig. 2	R_L = 1 kΩ, I_C = 2 mA, V_{CC} = 5 V	t_{on}	CNX35U			50	µs
			CNX39U			50	
			CNX36U			50	
	R_L = 1 kΩ, I_C = 4 mA, V_{CC} = 5 V		CNX38U			50	
Turn-Off Time See Fig. 1 and Fig. 2	R_L = 1 kΩ, I_C = 2 mA, V_{CC} = 5 V	t_{off}	CNX35U			50	µs
			CNX39U			50	
			CNX36U			50	
	R_L = 1 kΩ, I_C = 4 mA, V_{CC} = 5 V		CNX38U			50	

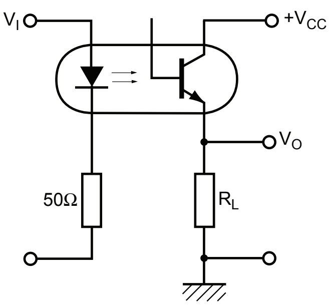


Fig. 1 Switching Test Circuit

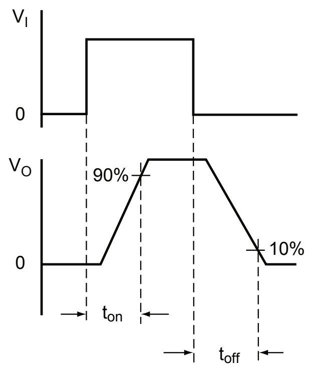


Fig. 2 Switching Test Waveforms

Fig. 3 LED Forward Voltage vs. Forward Current

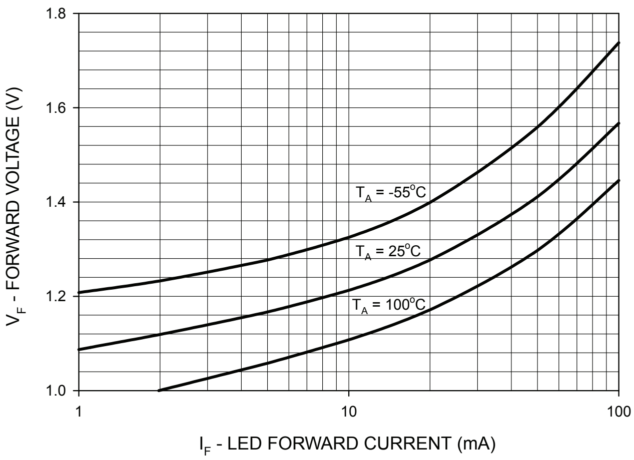


Fig. 4 Normalized CTR vs. Forward Current

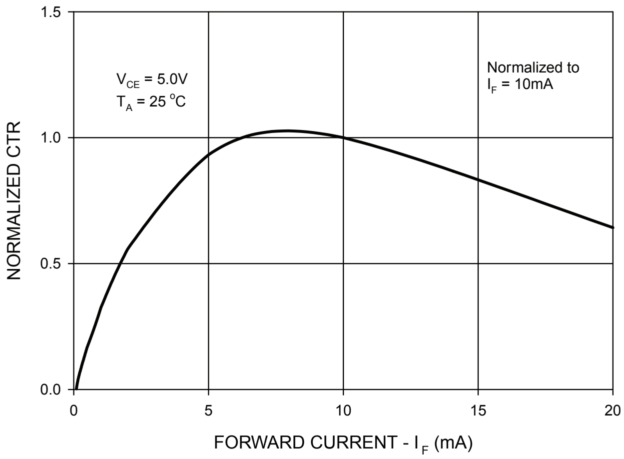


Fig. 5 Normalized CTR vs. Temperature

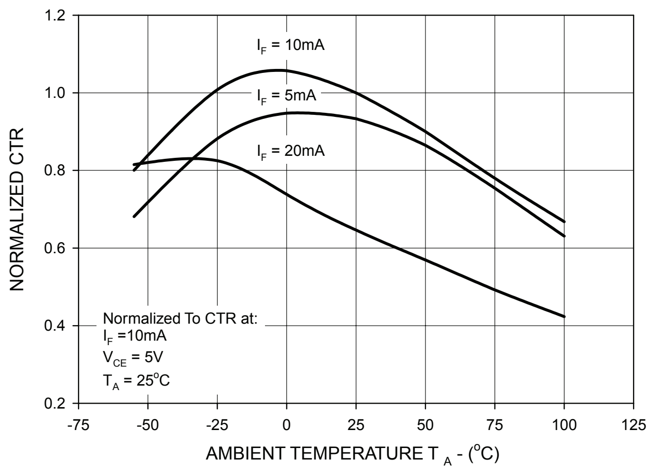


Fig. 6 CTR vs. RBE (Unsaturated)

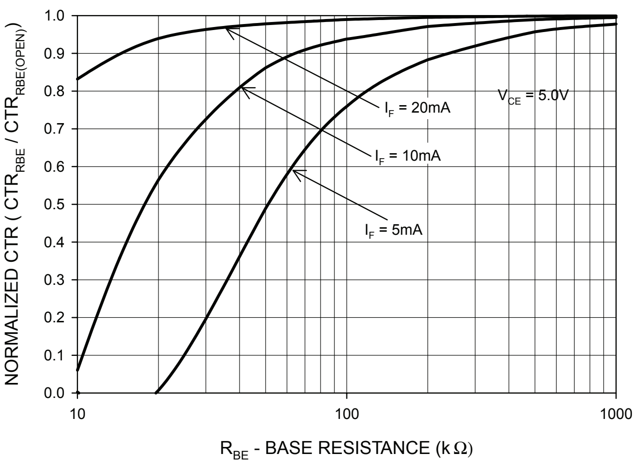


Fig. 7 CTR vs. RBE (Saturated)

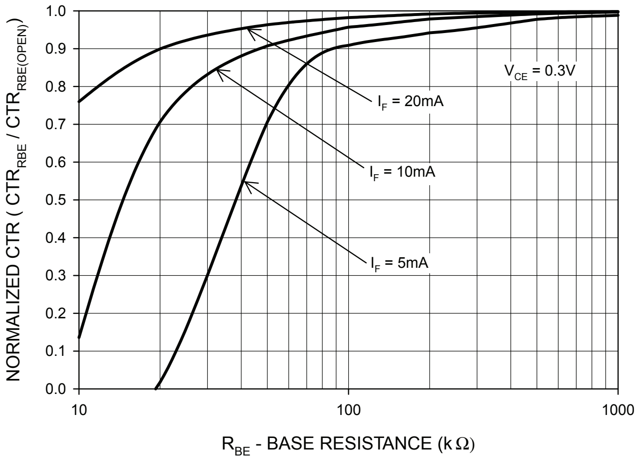


Fig. 8 Normalized t_{on} vs. R_{BE}

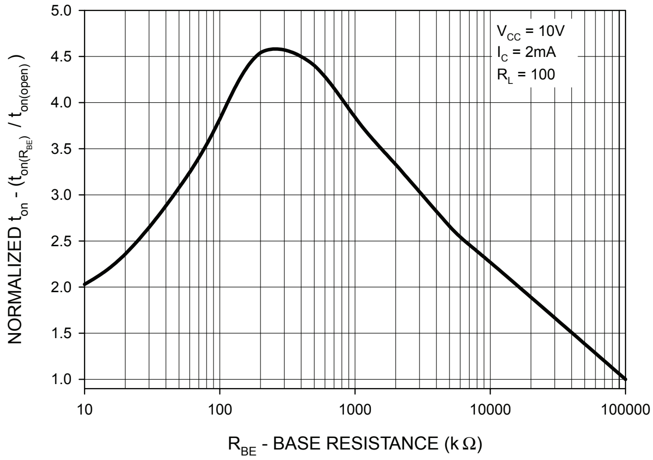


Fig. 9 Normalized t_{off} vs. R_{BE}

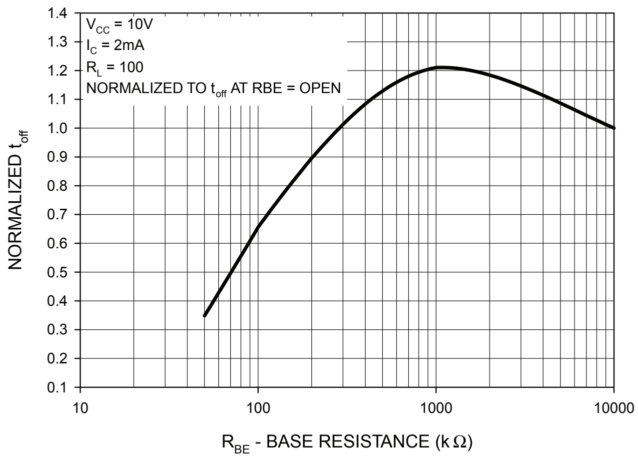


Fig. 10 Switching Speed vs. Load Resistor

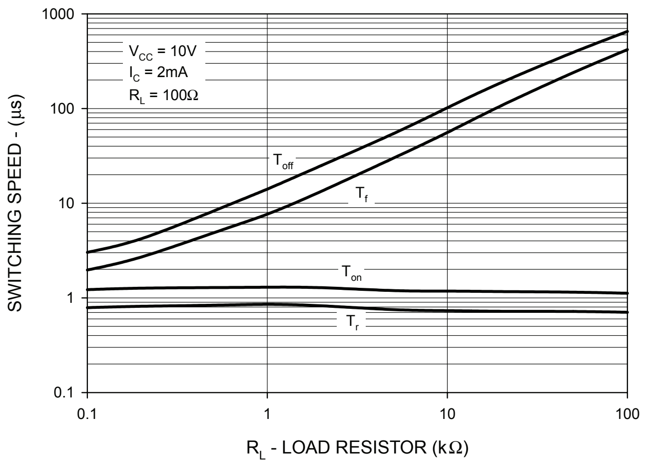
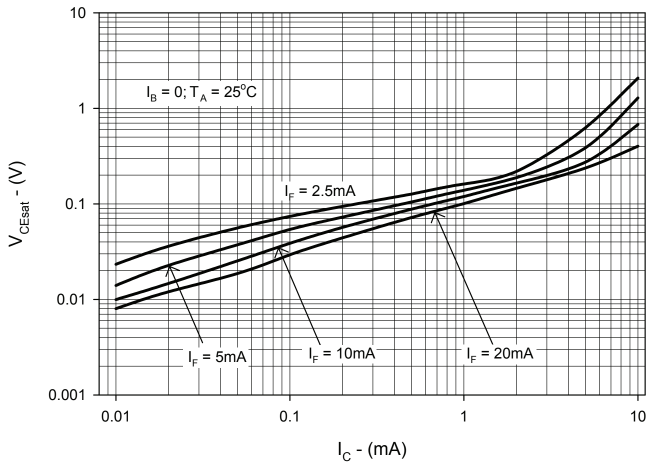
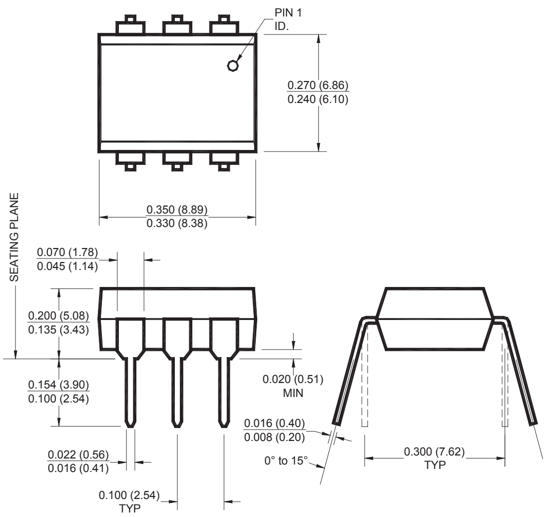


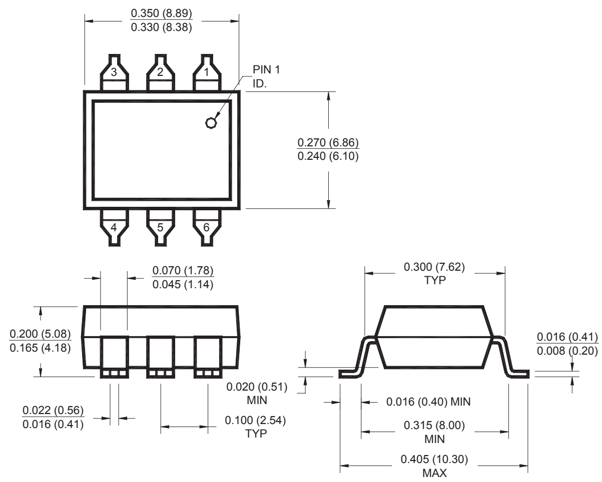
Fig. 11 Collector-Emitter Saturation Voltage as a Function of Collector Current



Package Dimensions (Through Hole)

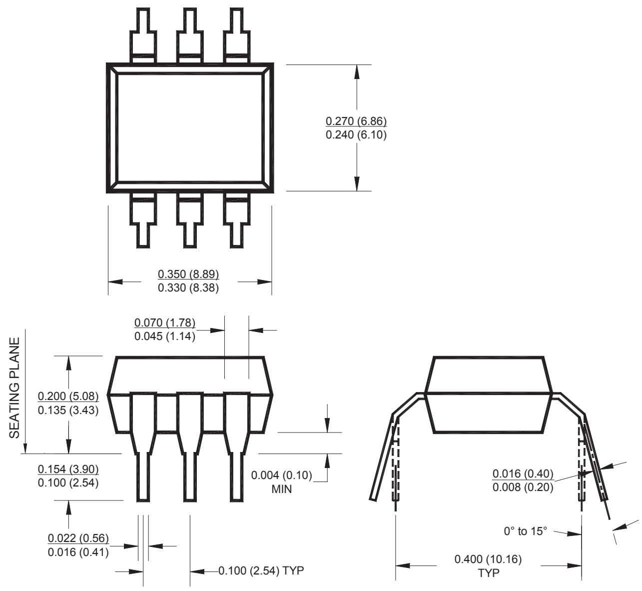


Package Dimensions (Surface Mount)

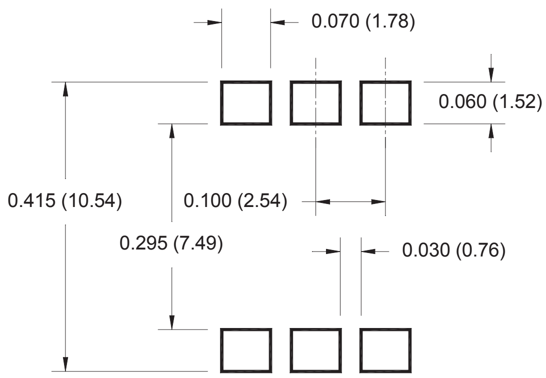


Lead Coplanarity : 0.004 (0.10) MAX

Package Dimensions (0.4"Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



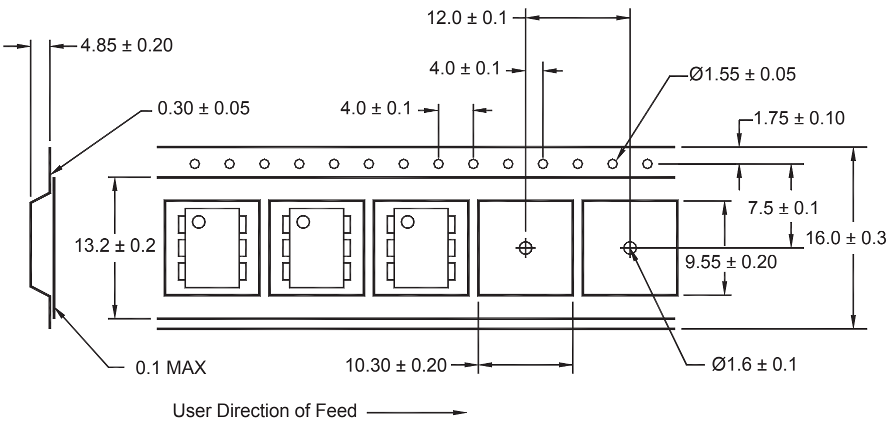
NOTE

All dimensions are in inches (millimeters)

ORDERING INFORMATION

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape & Reel

Carrier Tape Specifications ("D" Taping Orientation)



NOTE

All dimensions are in inches (millimeters)

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.