



# THE DATASHEET OF CNX38US



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



Parameters	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
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
<b>EMITTER</b>				
Continuous Reverse Voltage	$V_R$	All	5	V
Continuous Forward Current	$I_F$	All	100	mA
Forward Current - Peak (10 $\mu$ s pulse, $\delta = 0.01$ )	$I_F(pk)$	All	3.0	A
Total Power Dissipation up to 25°C Ambient Derate Linearly from 25°C	$P_D$	All	200	mW
		All	2.0	mW/°C
<b>DETECTOR</b>				
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 Derate Linearly from 25°C	$P_D$	All	200	mW
		All	2.0	mW/°C

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**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

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

**ISOLATION CHARACTERISTICS**

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

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<b>TRANSFER CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.)							
<b>DC Characteristics</b>	<b>Test Conditions</b>	<b>Symbol</b>	<b>Device</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>
Output/Input Current Transfer Ratio	$I_F = 10\text{ mA}, V_{CE} = 0.4\text{ V}$	CTR	CNX35U	40		160	%
			CNX39U	60		100	
	CNX36U		80		200		
	CNX38U		70		210		
			50				
$I_F = 2\text{ mA}, V_{CE} = 5\text{ V}$	All	15					
Collector-Emitter Saturation Voltage	$I_F = 10\text{ mA}, I_C = 2\text{ mA}$	$V_{CE(SAT)}$	CNX35U, CNX39U		0.15	0.4	V
	$I_F = 10\text{ mA}, I_C = 4\text{ mA}$		CNX36U		0.19	0.4	
	$I_F = 16\text{ mA}, I_C = 2\text{ mA}$		CNX38U		0.2	0.4	
<b>AC Characteristics</b>	<b>Test Conditions</b>	<b>Symbol</b>	<b>Device</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>
Non-Saturated Switching Times Turn-On Time See Fig. 1 and Fig. 2	$R_L = 100\ \Omega, I_C = 2\text{ mA}, V_{CC} = 5\text{ V}$	$t_{on}$	CNX35U			20	$\mu\text{s}$
	$R_L = 100\ \Omega, I_C = 4\text{ mA}, V_{CC} = 5\text{ V}$		CNX39U			20	
CNX36U				20			
CNX38U		20					
Turn-Off Time See Fig. 1 and Fig. 2	$R_L = 100\ \Omega, I_C = 2\text{ mA}, V_{CC} = 5\text{ V}$	$t_{off}$	CNX35U			20	$\mu\text{s}$
	$R_L = 100\ \Omega, I_C = 4\text{ mA}, V_{CC} = 5\text{ V}$		CNX39U			20	
CNX36U				20			
CNX38U		20					
Saturated Switching Times Turn-On Time See Fig. 1 and Fig. 2	$R_L = 1\text{ k}\Omega, I_C = 2\text{ mA}, V_{CC} = 5\text{ V}$	$t_{on}$	CNX35U			50	$\mu\text{s}$
	$R_L = 1\text{ k}\Omega, I_C = 4\text{ mA}, V_{CC} = 5\text{ V}$		CNX39U			50	
CNX36U				50			
CNX38U		50					
Turn-Off Time See Fig. 1 and Fig. 2	$R_L = 1\text{ k}\Omega, I_C = 2\text{ mA}, V_{CC} = 5\text{ V}$	$t_{off}$	CNX35U			50	$\mu\text{s}$
	$R_L = 1\text{ k}\Omega, I_C = 4\text{ mA}, V_{CC} = 5\text{ V}$		CNX39U			50	
CNX36U				50			
CNX38U		50					

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Fig. 1 Switching Test Circuit

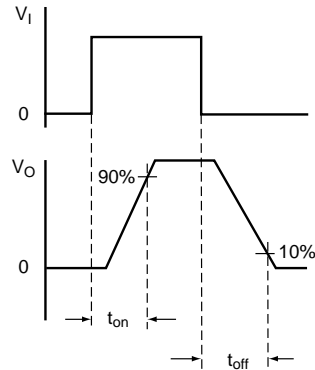


Fig. 2 Switching Test Waveforms

Fig. 3 LED Forward Voltage vs. Forward Current



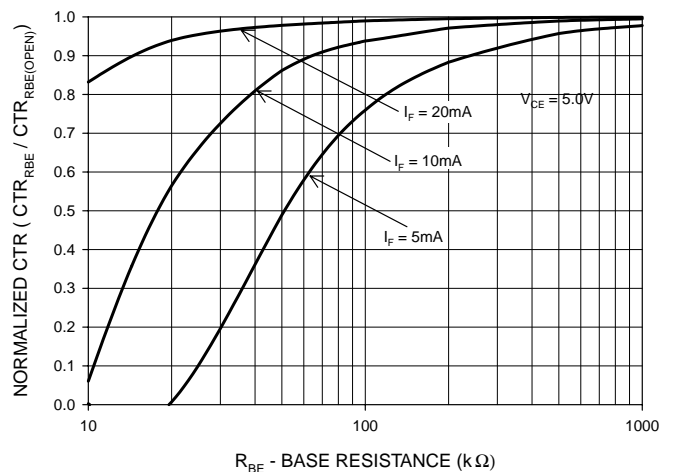
Fig. 4 Normalized CTR vs. Forward Current



Fig. 5 Normalized CTR vs. Temperature



Fig. 6 CTR vs. R\_BE (Unsaturated)



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**Fig. 7 CTR vs. R<sub>BE</sub> (Saturated)**



**Fig. 8 Normalized t<sub>on</sub> vs. R<sub>BE</sub>**



**Fig. 9 Normalized t<sub>off</sub> vs. R<sub>BE</sub>**



**Fig. 10 Switching Speed vs. Load Resistor**



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





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**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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