

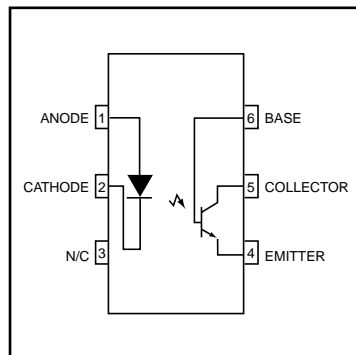
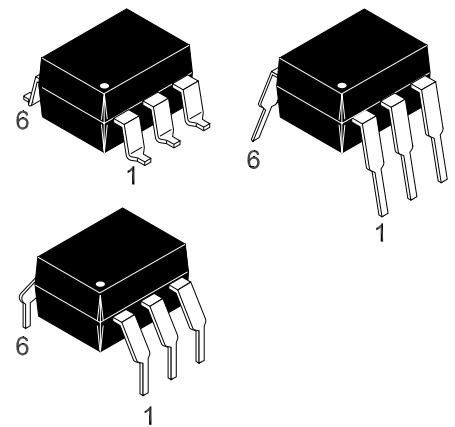
## DESCRIPTION

The H11DX and 4N38 are phototransistor-type optically coupled optoisolators. An infrared emitting diode manufactured from specially grown gallium arsenide is selectively coupled with a high voltage NPN silicon phototransistor. The device is supplied in a standard plastic six-pin dual-in-line package.

H11D1  
H11D2  
H11D3  
H11D4  
4N38

## FEATURES

- High Voltage
  - H11D1, H11D2,  $BV_{CER} = 300\text{ V}$
  - H11D3, H11D4,  $BV_{CER} = 200\text{ V}$
- High isolation voltage
  - 5300 VAC RMS - 1 minute
  - 7500 VAC PEAK - 1 minute
- Underwriters Laboratory (UL) recognized File# E90700



## APPLICATIONS

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

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	$T_{STG}$	-55 to +150	°C
Operating Temperature	$T_{OPR}$	-55 to +100	°C
Lead Solder Temperature	$T_{SOL}$	260 for 10 sec	°C
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	260	mW
Derate above $25^\circ\text{C}$		3.5	mW/°C
<b>EMITTER</b>			
*Forward DC Current	$I_F$	80	mA
*Reverse Input Voltage	$V_R$	6.0	V
*Forward Current - Peak (1 $\mu\text{s}$ pulse, 300pps)	$I_F(pk)$	3.0	A
*LED Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	150	mW
Derate above $25^\circ\text{C}$		1.41	mW/°C

**H11D1, H11D2, H11D3, H11D4, 4N38**

<b>ABSOLUTE MAXIMUM RATINGS (Cont.)</b>			
Parameter	Symbol	Value	Units
<b>DETECTOR</b>			
*Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	300	mW
Derate linearly above $25^\circ\text{C}$		4.0	mW/ $^\circ\text{C}$
*Collector to Emitter Voltage	$V_{CER}$	H11D1 - H11D2 300	V
		H11D3 - H11D4 200	
		4N38 80	
*Collector Base Voltage	$V_{CBO}$	H11D1 - H11D2 300	
		H11D3 - H11D4 200	
		4N38 80	
*Emitter to Collector Voltage	$V_{ECO}$	7	
Collector Current (Continuous)		100	mA

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

<b>INDIVIDUAL COMPONENT CHARACTERISTICS</b>							
Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
<b>EMITTER</b>							
*Forward Voltage	( $I_F = 10\text{ mA}$ )	$V_F$	ALL		1.15	1.5	V
Forward Voltage Temp. Coefficient		$\frac{\Delta V_F}{\Delta T_A}$	ALL		-1.8		mV/ $^\circ\text{C}$
Reverse Breakdown Voltage	( $I_R = 10\ \mu\text{A}$ )	$BV_R$	ALL	6	25		V
Junction Capacitance	( $V_F = 0\text{ V}, f = 1\text{ MHz}$ )	$C_J$	ALL		50		pF
	( $V_F = 1\text{ V}, f = 1\text{ MHz}$ )		ALL		65		pF
*Reverse Leakage Current	( $V_R = 6\text{ V}$ )	$I_R$	ALL		0.05	10	$\mu\text{A}$
<b>DETECTOR</b>							
*Breakdown Voltage Collector to Emitter	( $R_{BE} = 1\text{ M}\Omega$ )	$BV_{CER}$	H11D1/2	300			V
	( $I_C = 1.0\text{ mA}, I_F = 0$ )		H11D3/4	200			
	(No $R_{BE}$ ) ( $I_C = 1.0\text{ mA}$ )	$BV_{CEO}$	4N38	80			
*Collector to Base	( $I_C = 100\ \mu\text{A}, I_F = 0$ )	$BV_{CBO}$	H11D1/2	300			
			H11D3/4	200			
			4N38	80			
Emitter to Base		$BV_{EBO}$	4N38	7			
Emitter to Collector	( $I_E = 100\ \mu\text{A}, I_F = 0$ )	$BV_{ECO}$	ALL	7	10		
*Leakage Current Collector to Emitter ( $R_{BE} = 1\text{ M}\Omega$ )	( $V_{CE} = 200\text{ V}, I_F = 0, T_A = 25^\circ\text{C}$ )	$I_{CER}$	H11D1/2			100	nA
	( $V_{CE} = 200\text{ V}, I_F = 0, T_A = 100^\circ\text{C}$ )					250	$\mu\text{A}$
	( $V_{CE} = 100\text{ V}, I_F = 0, T_A = 25^\circ\text{C}$ )		H11D3/4			100	nA
	( $V_{CE} = 100\text{ V}, I_F = 0, T_A = 100^\circ\text{C}$ )					250	$\mu\text{A}$
	(No $R_{BE}$ ) ( $V_{CE} = 60\text{ V}, I_F = 0, T_A = 25^\circ\text{C}$ )			$I_{CEO}$	4N38		

**Notes**

\* Parameters meet or exceed JEDEC registered data (for 4N38 only)

 \*\* All typical values at  $T_A = 25^\circ\text{C}$

**H11D1, H11D2, H11D3, H11D4, 4N38**

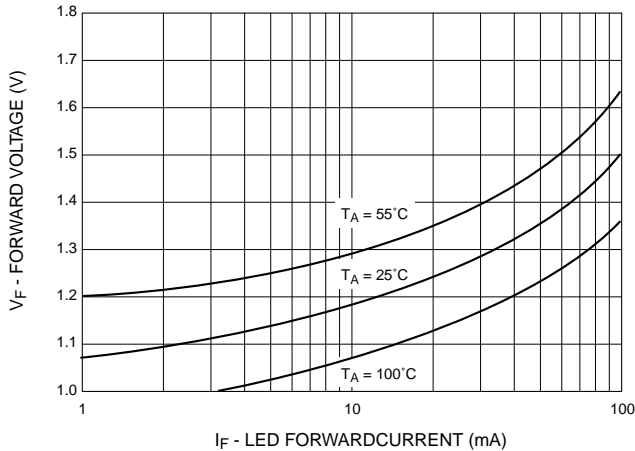
TRANSFER CHARACTERISTICS							
DC Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
<b>EMITTER</b>							
Current Transfer Ratio Collector to Emitter	$(I_F = 10 \text{ mA}, V_{CE} = 10 \text{ V})$ $(R_{BE} = 1 \text{ M}\Omega)$	CTR	H11D1	2 (20)			mA (%)
			H11D2				
			H11D3				
			H11D4	1 (10)			
			4N38	2 (20)			
*Saturation Voltage	$(I_F = 10 \text{ mA}, I_C = 0.5 \text{ mA})$ $(R_{BE} = 1 \text{ M}\Omega)$	$V_{CE(SAT)}$	H11D1/2/3/4		0.1	0.40	V
			4N38			1.0	
	$(I_F = 20 \text{ mA}, I_C = 4 \text{ mA})$						

TRANSFER CHARACTERISTICS							
Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
<b>SWITCHING TIMES</b>							
Non-Saturated Turn-on Time	$(V_{CE} = 10 \text{ V}, I_{CE} = 2 \text{ mA})$	$t_{on}$	ALL		5		$\mu\text{s}$
Turn-off Time	$(R_L = 100 \Omega)$	$t_{off}$	ALL		5		

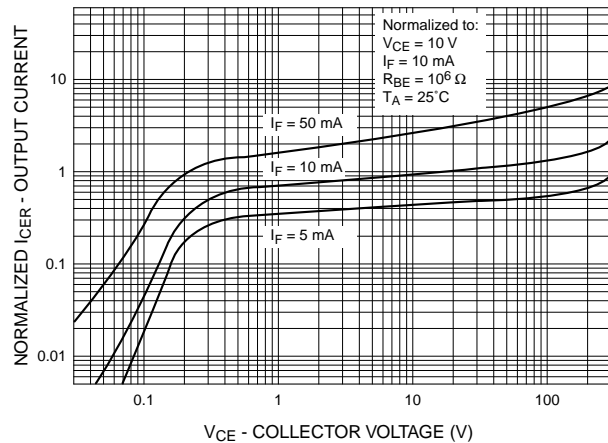
ISOLATION CHARACTERISTICS							
Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
Isolation Voltage	$(I_{I-O} \leq 1 \mu\text{A}, 1 \text{ min.})$	$V_{ISO}$	ALL	5300			$(V_{ACRMS})$
				7500			$(V_{ACPEAK})$
Isolation Resistance	$(V_{I-O} = 500 \text{ VDC})$	$R_{ISO}$	ALL	$10^{11}$			$\Omega$
Isolation Capacitance	$(f = 1 \text{ MHz})$	$C_{ISO}$	ALL		0.5		pF

Notes  
 \* Parameters meet or exceed JEDEC registered data (for 4N38 only)  
 \*\* All typical values at  $T_A = 25^\circ\text{C}$

**Fig.1 LED Forward Voltage vs. Forward Current**

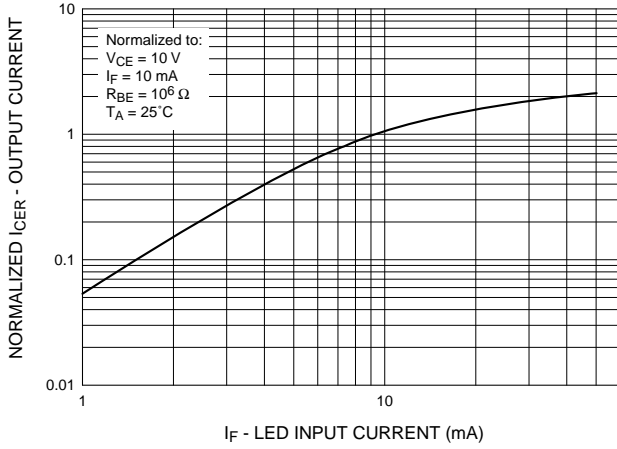


**Fig.2 Normalized Output Characteristics**

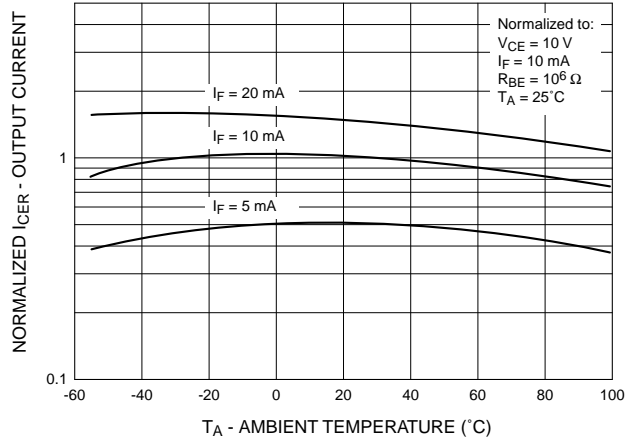


**H11D1, H11D2, H11D3, H11D4, 4N38**

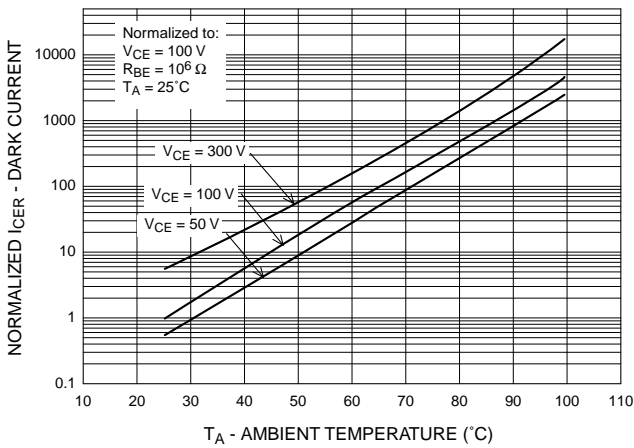
**Fig.3 Normalized Output Current vs. LED Input Current**



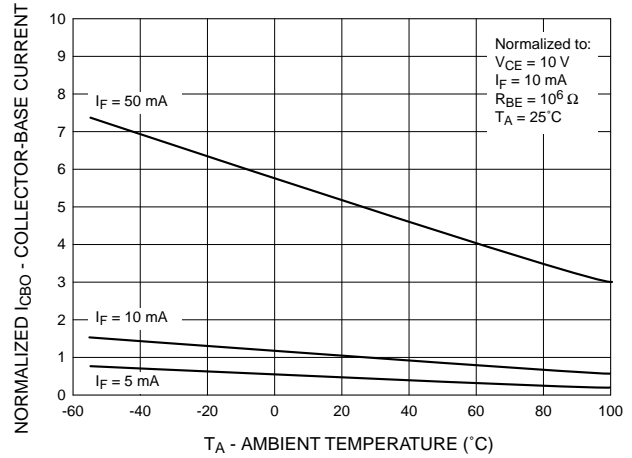
**Fig.4 Normalized Output Current vs. Temperature**



**Fig.5 Normalized Dark Current vs. Ambient Temperature**



**Normalized Collector-Base Current vs. Temperature**



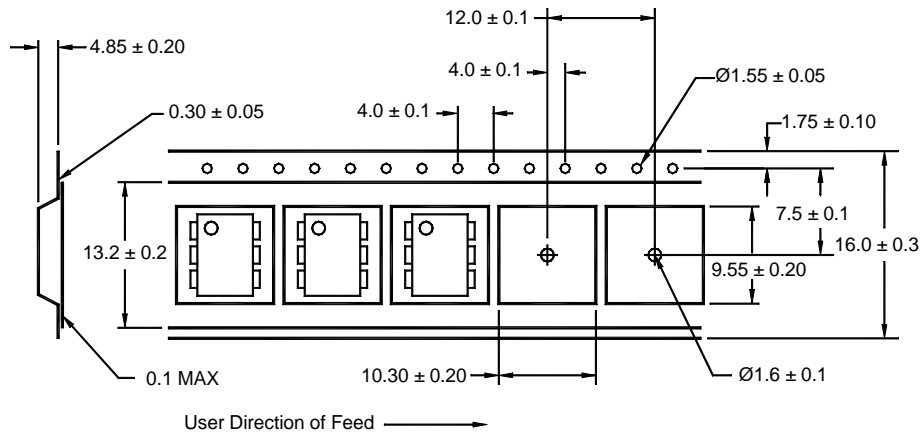


H11D1, H11D2, H11D3, H11D4, 4N38

## 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

## QT Carrier Tape Specifications ("D" Taping Orientation)



### NOTE

All dimensions are in millimeters

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