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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

PHOTO SCR OPTOCOUPLERS

FAIRCHILD SEMICONDUCTOR™

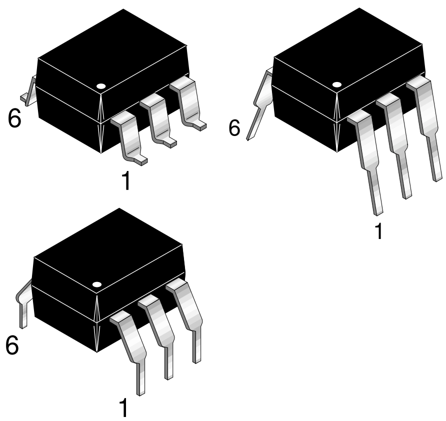
4N39 4N40

DESCRIPTION

The 4N39 and 4N40 have a gallium-arsenide infrared emitting diode optically coupled with a light activated silicon controlled rectifier in a dual in-line package.

FEATURES

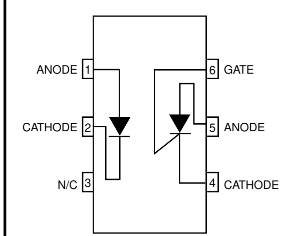
- 10 A, T2L compatible, solid state relay
- 25 W logic indicator lamp driver
- 400 V symmetrical transistor coupler
- Underwriters Laboratory (UL) recognized — File #E90700



APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.

SCHEMATIC



Parameter	Symbol	Device	Value	Units
TOTAL DEVICE				
*Storage Temperature	T_{STG}	All	-55 to +150	°C
*Operating Temperature	T_{OPR}	All	-55 to +100	°C
*Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
*Total Device Power Dissipation (-55°C to 50 °C)	P_D	All	450	mW
Derate above 50°C			9.0	mW/°C
EMITTER				
*Continuous Forward Current	I_F	All	60	mA
*Reverse Voltage	V_R	All	6	V
*Forward Current - Peak (300 µs, 2% Duty Cycle)	I_F(pk)	All	1.0	A
*LED Power Dissipation (-55°C to 50 °C)	P_D	All	100	mW
Derate above 50°C			2.0	mW/°C
DETECTOR				
*Off-State And Reverse Voltage		4N39	200	V
		4N40	400	V
*Peak Reverse Gate Voltage			6	V
*Direct On-State Current			300	mA
*Surge On-State Current (100 µs)			10	A
*Peak Gate Current			10	mA
*Detector Power Dissipation (-55°C to 50°C)	P_D	All	400	mW
Derate above 50°C			8.0	mW/°C

Note
* Indicates JEDEC Registered Data
** Typical values at T_A = 25°C

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

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
EMITTER							
Input Forward Voltage	I_F = 10 mA	V_F	All		1.1	1.5	V
Reverse Leakage Current	V_R = 3 V	I_R	All			10	µA
Capacitance	V_F = 0 V, f = 1.0 MHz	C_J	All		50		pF
DETECTOR							
Peak Off-State Voltage	R_{GK} = 10 kΩ, T_A=100 °C	V_{DM}	4N39	200			V
			4N40	400			
Peak Reverse Voltage	T_A=100 °C	V_{RM}	4N39	200			V
			4N40	400			
On-State Voltage	I_T = 300 mA	V_T	All			1.3	V
Off-State Current	V_{DM} = 200 V, T_A = 100 °C, I_F = 0 mA, R_{GK} = 10 kΩ	I_{DM}	4N39			50	µA
			4N40			150	
Reverse Current	V_R = 200 V, T_A=100 °C, I_F = 0 mA	I_R	4N39			50	µA
			4N40			150	
Holding Current	V_{Fx} = 50V, R_{GK} = 27 kΩ	I_H	All			1.0	mA

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

Characteristics	Test Conditions	Symbol	Device	Min	Typ**	Max	Units
*Input Current to Trigger	V_{AK} = 50 V, R_{GK} = 10 kΩ	I_{FT}	4N39			30	mA
	V_{AK} = 100 V, R_{GK} = 27 kΩ		4N40			14	
*Turn-On Time	V_{AK} = 50 V, I_F = 30 mA R_{GK} = 10 kΩ, RL = 200 Ω	t_{on}	ALL			50	µA
Package Capacitance (input to output)	f = 1 MHz Input to Output Voltage = 0	C_{I-O}	ALL			2	pF
Coupled dv/dt, input to output (figure 13)		dV/dt	ALL	500			V/µS

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ**	Max	Units
*Input-Output Isolation Voltage	(I_{I-0} ≤ 1 µA, Vrms, t = 1 min.)	V_{ISO}	5300			Vac(rms)
*Isolation Resistance	(V_{I-O} = 500 VDC)	R_{ISO}	10^{11}			Ω
Isolation Capacitance	(V_{I-O} = ∅, f = 1 MHz)	C_{ISO}		0.8		pf

Note
* Indicates JEDEC Registered Data
** Typical values at T_A = 25°C

Figure 1. Input Current To Trigger vs. Anode-Cathode Voltage

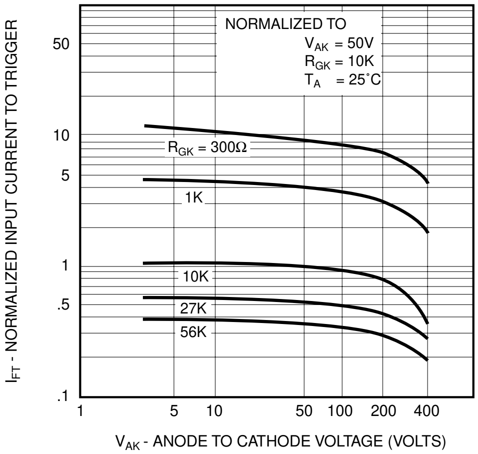


Figure 2. Input Current To Trigger vs. Temperature

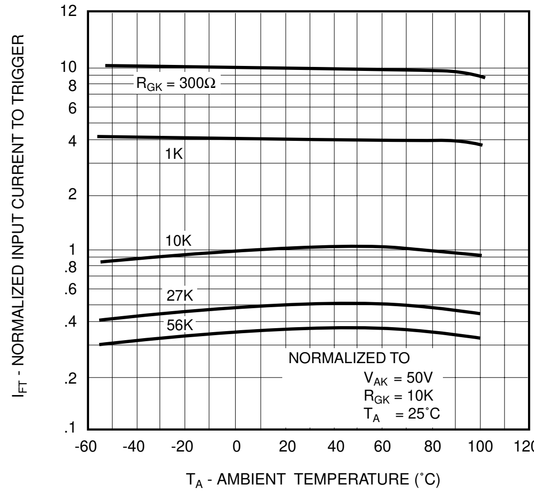


Figure 3. Input Current To Trigger Distribution vs. Temperature

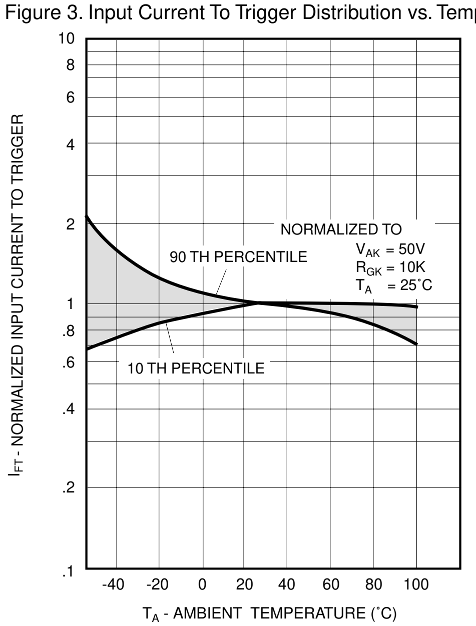


Figure 4. Input Current To Trigger vs. Pluse Width

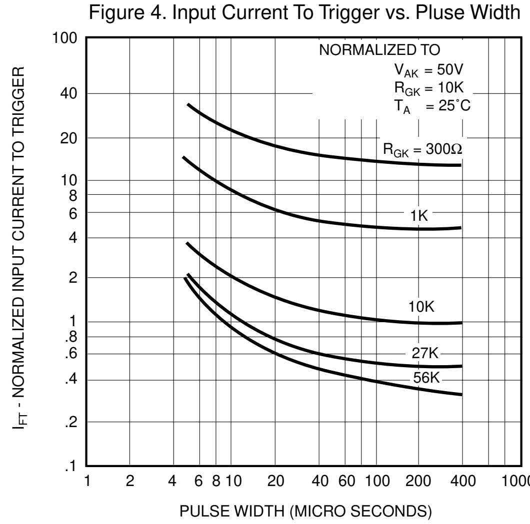


Figure 5. Turn-On Time vs. Input Current

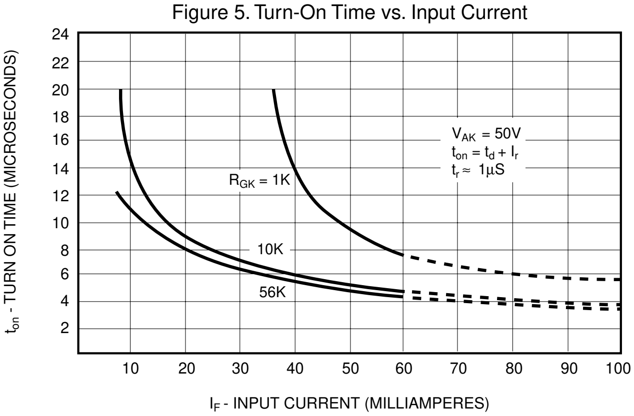


Figure 6. Input Characteristics I_F vs. V_F

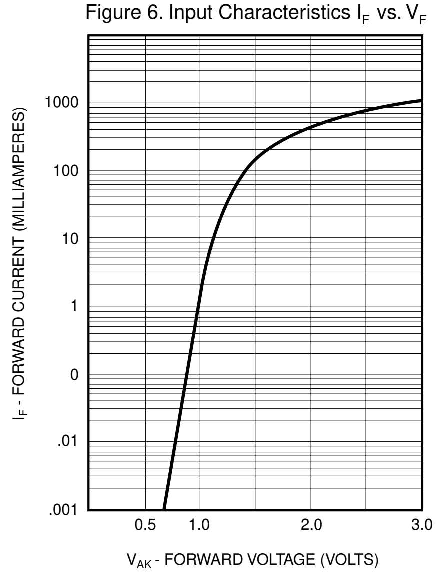


Figure 7. Holding Current vs. Temperature

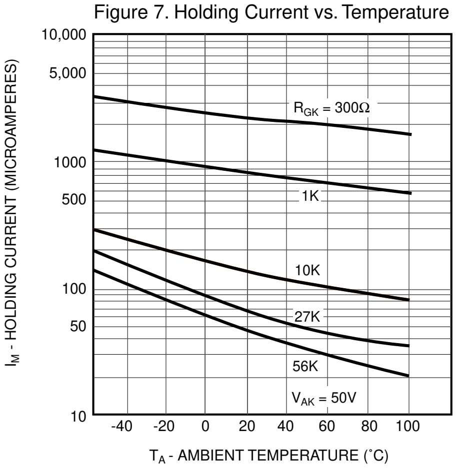


Figure 8. Maximum Transient Thermal Impedance

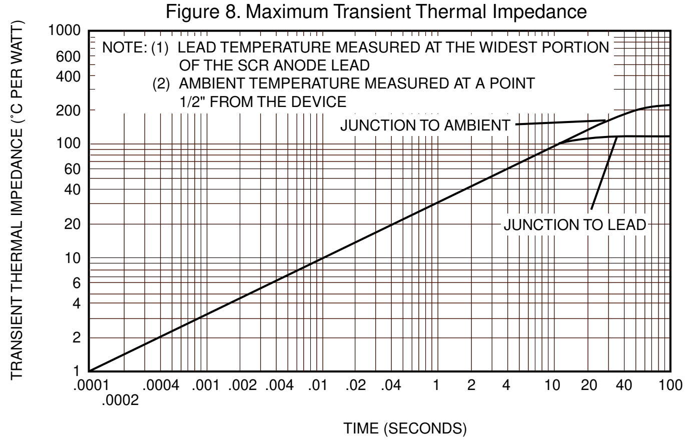


Figure 9. Off-State Forward Current vs. Temperature

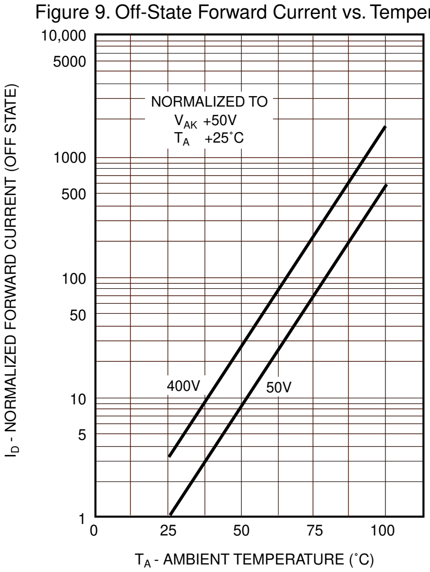


Figure 10. On-State Current vs. Maximum Allowable Temperature

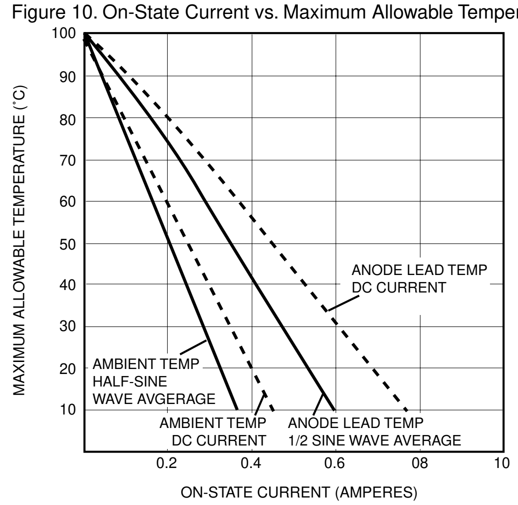


Figure 11. dv/dt vs. Temperature

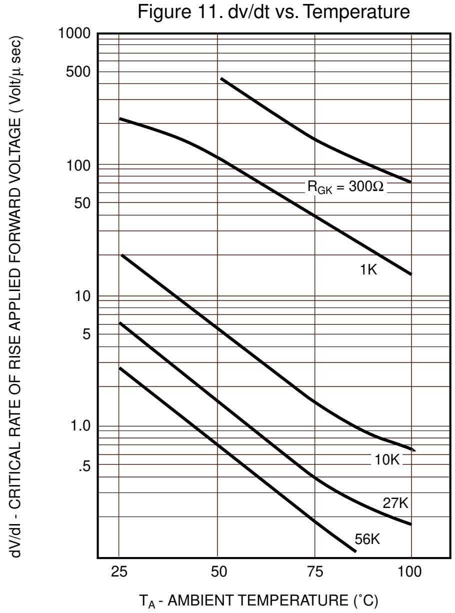
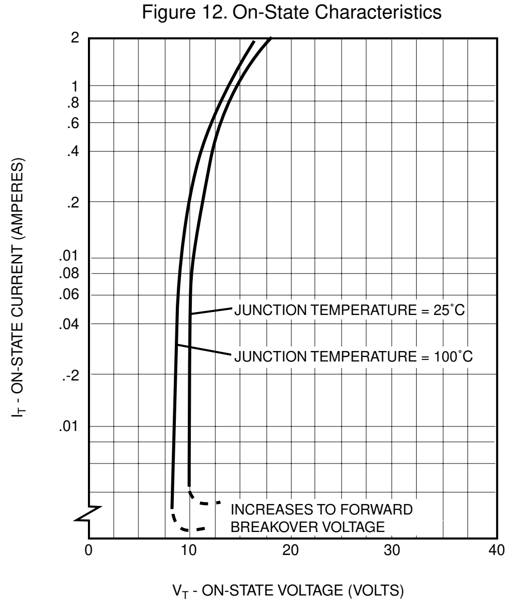


Figure 12. On-State Characteristics



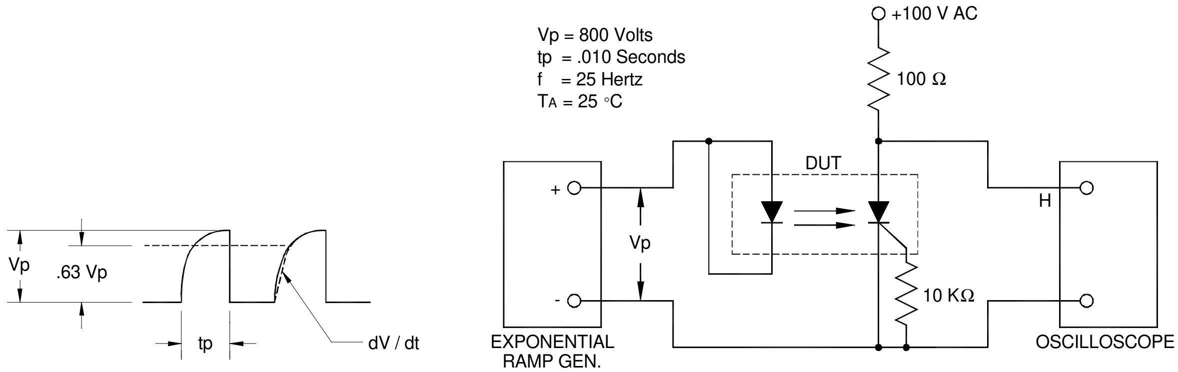
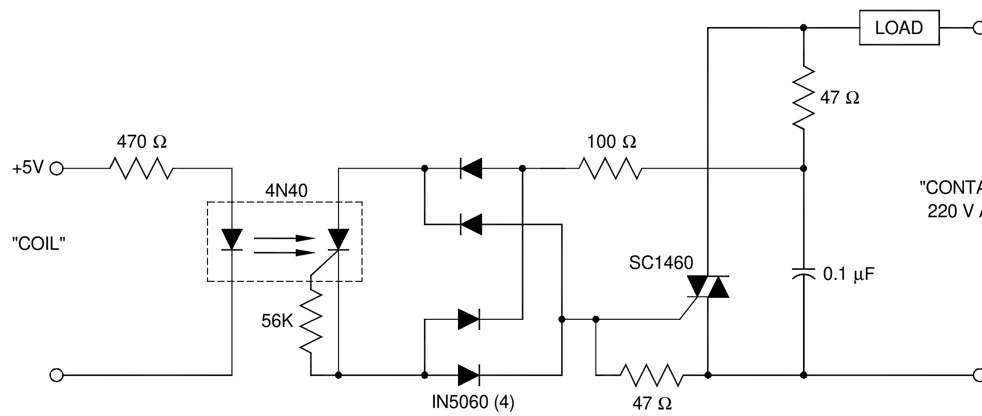


Fig. 13 Coupled dv/dt - Test Circuit

TYPICAL APPLICATIONS

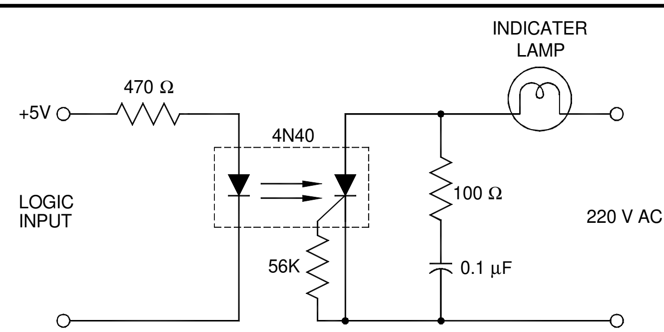
10A, T^2L COMPATIBLE, SOLID STATE RELAY

Use of the 4N40 for high sensitivity, 5300 V isolation capability, provides this highly reliable solid state relay design. This design is compatible with 74, 74S and 74H series T^2L logic systems inputs and 220V AC loads up to 10A.



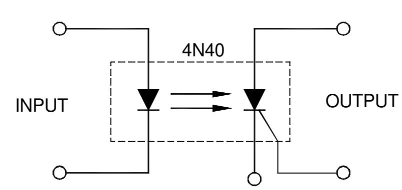
25W, LOGIC INDICATOR LAMP DRIVER

The high surge capability and non-reactive input characteristics of the 4N40 allow it to directly couple, without buffers, T^2L and DTL logic to indicator alarm devices, without danger of introducing noise and logic glitches.

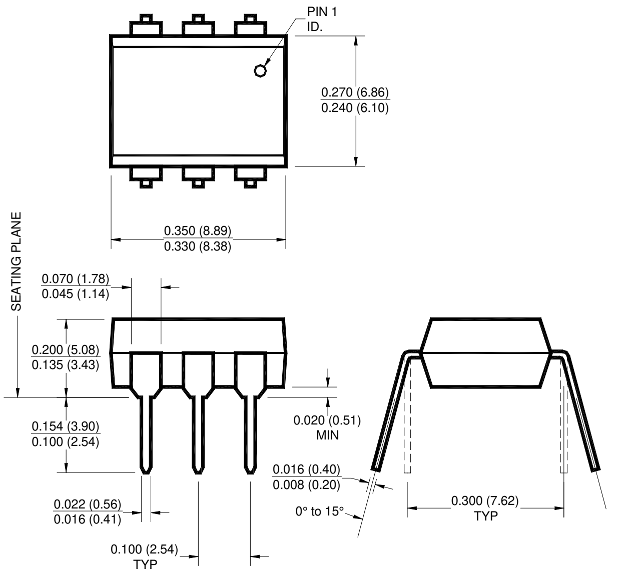


400V SYMMETRICAL TRANSISTOR COUPLER

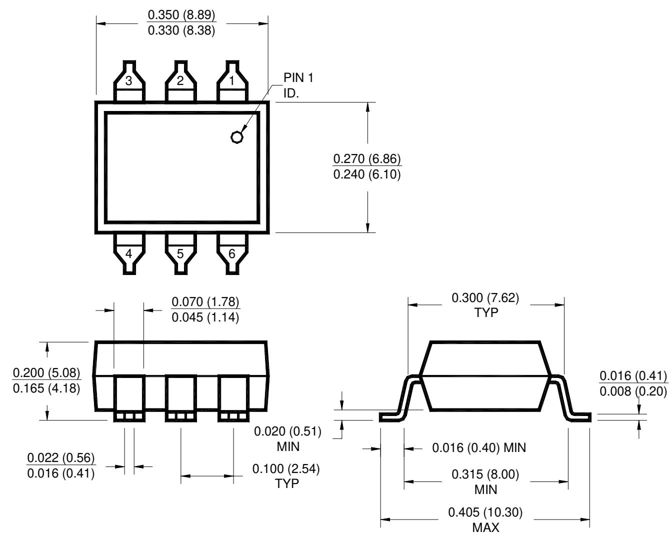
Use of the high voltage PNP portion of the 4N40 provides a 400V transistor capable of conducting positive and negative signals with current transfer ratios of over 1%. This function is useful in remote instrumentation, high voltage power supplies and test equipment. Care should be taken not to exceed the 40mW power dissipation rating when used at high voltages.



Package Dimensions (Through Hole)

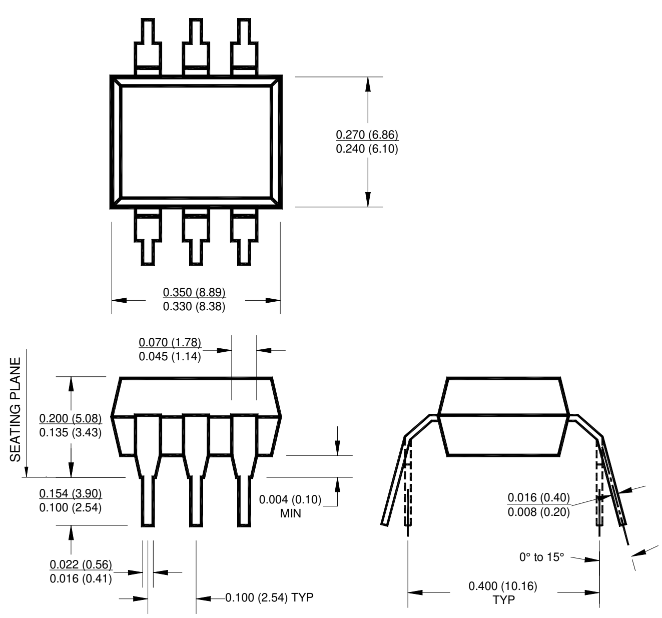


Package Dimensions (Surface Mount)

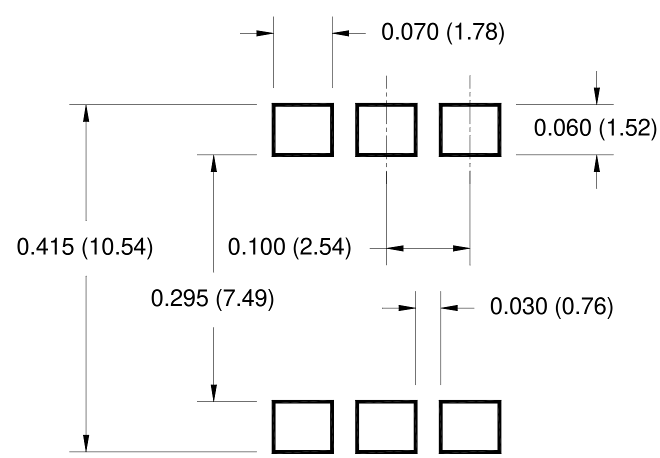


Lead Coplanarity : 0.004 (0.10) MAX

Package Dimensions (0.4”Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



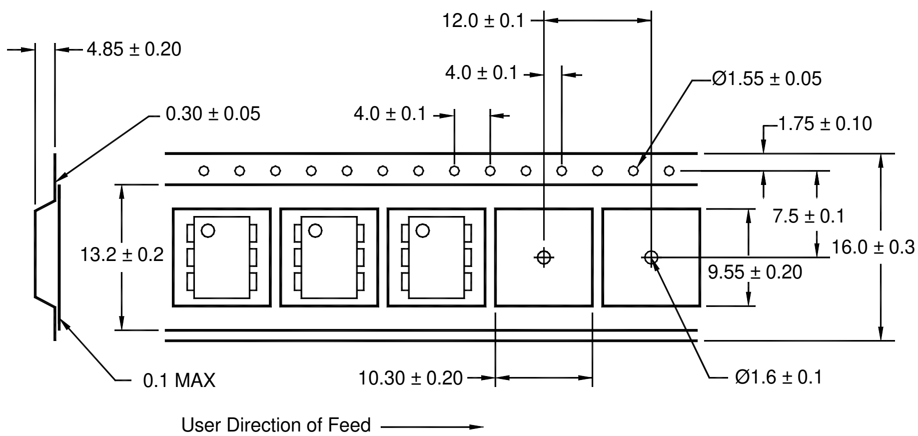
NOTE

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 millimeters

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