

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.

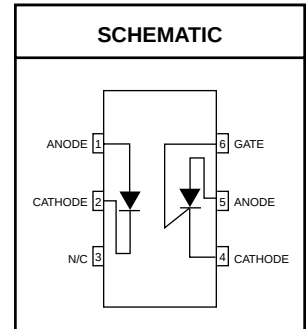
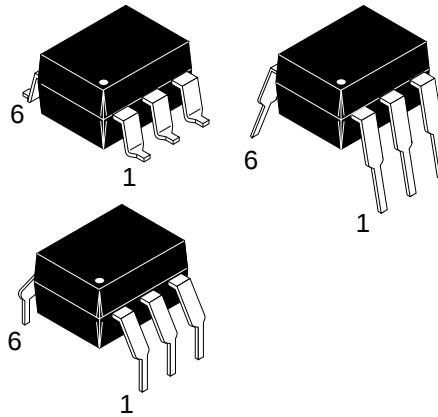
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FEATURES

- 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.



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) Derate above 50°C	P _D	All	450	mW
			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) Derate above 50°C	P _D	All	100	mW
			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) Derate above 50°C	P _D	All	400	mW
			8.0	mW/°C

Note

* Indicates JEDEC Registered Data

** Typical values at T_A = 25°C

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

INDIVIDUAL COMPONENT CHARACTERISTICS

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

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

Characteristics	Test Conditions	Symbol	Device	Min	Typ**	Max	Units
*Input Current to Trigger	$V_{AK} = 50\text{ V}$, $R_{GK} = 10\text{ k}\Omega$	I_{FT}	4N39			30	mA
	$V_{AK} = 100\text{ V}$, $R_{GK} = 27\text{ k}\Omega$		4N40			14	
*Turn-On Time	$V_{AK} = 50\text{ V}$, $I_F = 30\text{ mA}$ $R_{GK} = 10\text{ k}\Omega$, $R_L = 200\text{ }\Omega$	t_{on}	ALL			50	μs
Package Capacitance (input to output)	$f = 1\text{ MHz}$ 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	($I_{I-O} \leq 1\text{ }\mu\text{A}$, V_{rms} , $t = 1\text{ min.}$)	V_{ISO}	5300			Vac(rms)
*Isolation Resistance	($V_{I-O} = 500\text{ VDC}$)	R_{ISO}	10^{11}			Ω
Isolation Capacitance	($V_{I-O} = \emptyset$, $f = 1\text{ MHz}$)	C_{ISO}		0.8		pf

Note

* Indicates JEDEC Registered Data

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

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

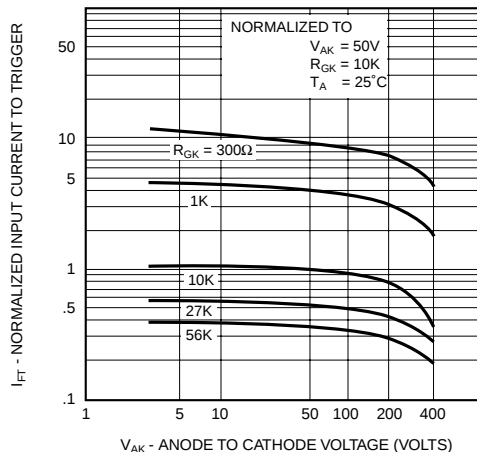


Figure 2. Input Current To Trigger vs. Temperature

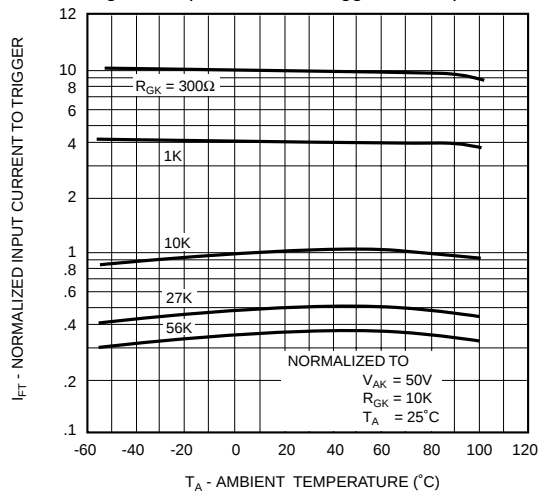


Figure 3. Input Current To Trigger Distribution vs. Temperature

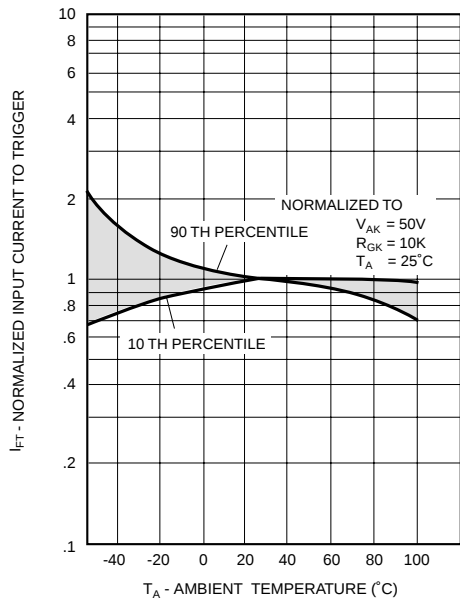


Figure 4. Input Current To Trigger vs. Pluse Width

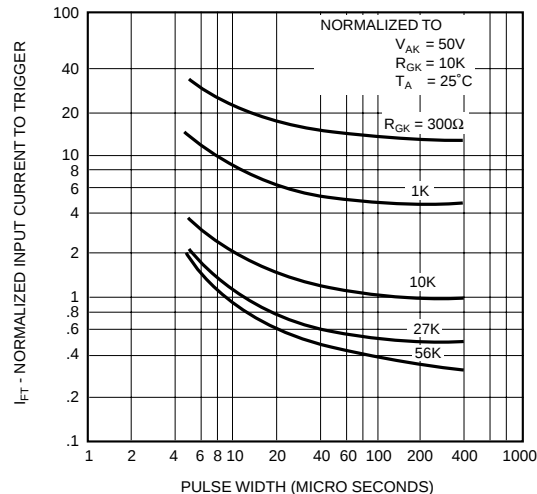


Figure 5. Turn-On Time vs. Input Current

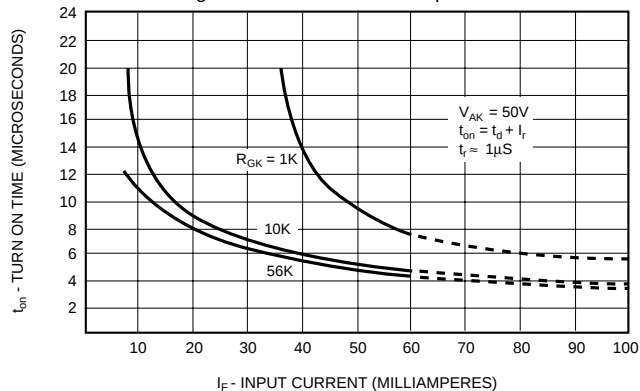
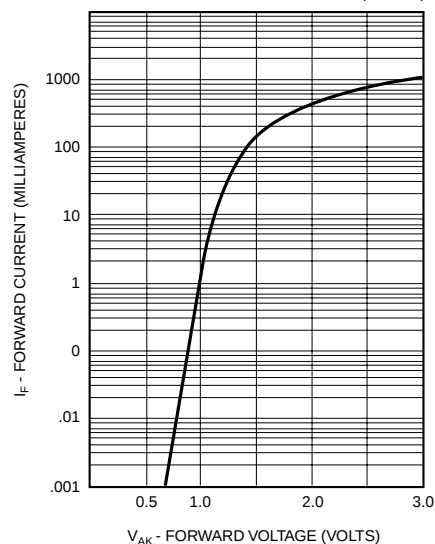


Figure 6. Input Characteristics I_F vs. V_F



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Figure 7. Holding Current vs. Temperature

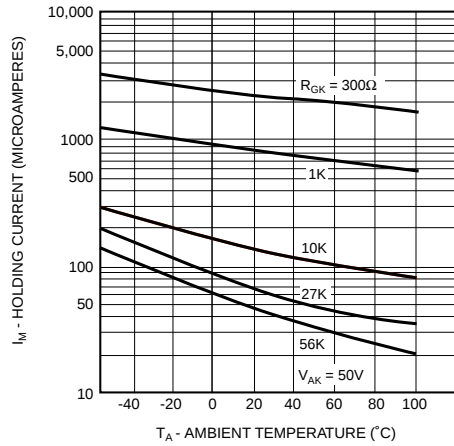


Figure 8. Maximum Transient Thermal Impedance

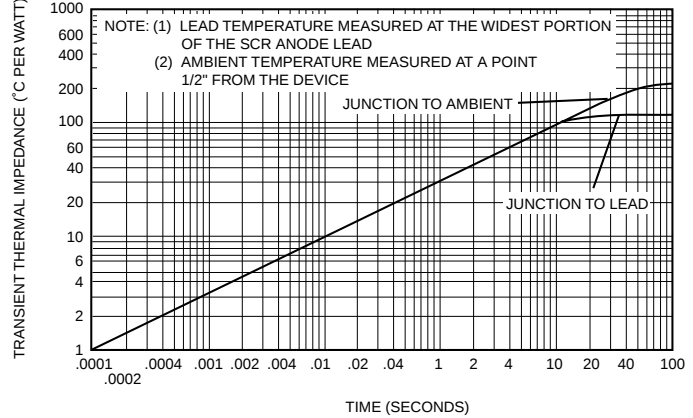


Figure 9. Off-State Forward Current vs. Temperature

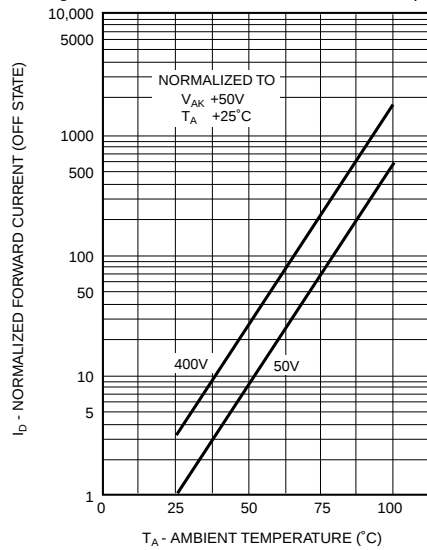


Figure 10. On-State Current vs. Maximum Allowable Temperature

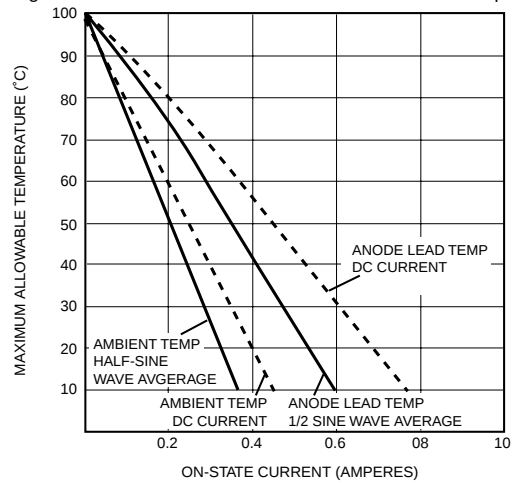


Figure 11. dv/dt vs. Temperature

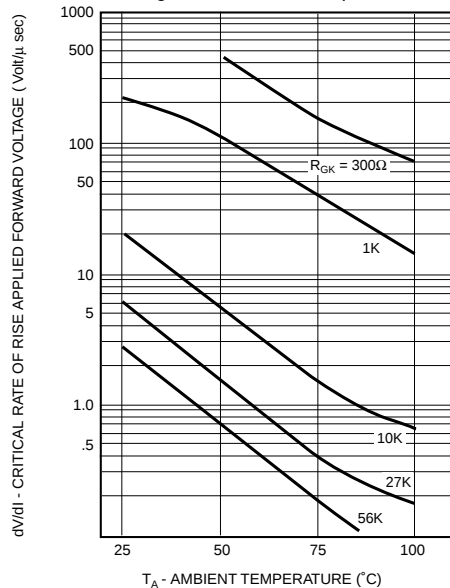
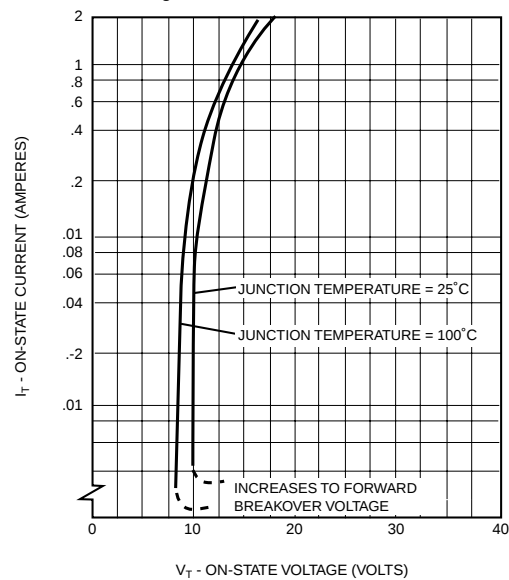


Figure 12. On-State Characteristics



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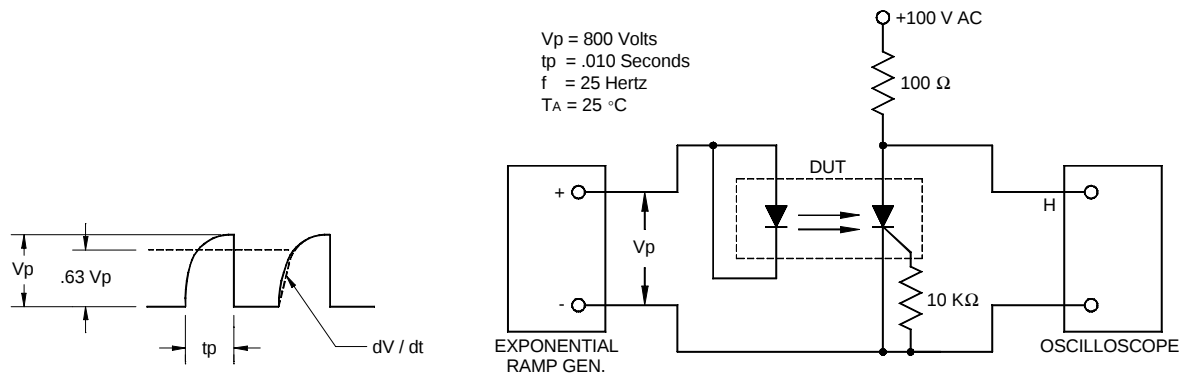
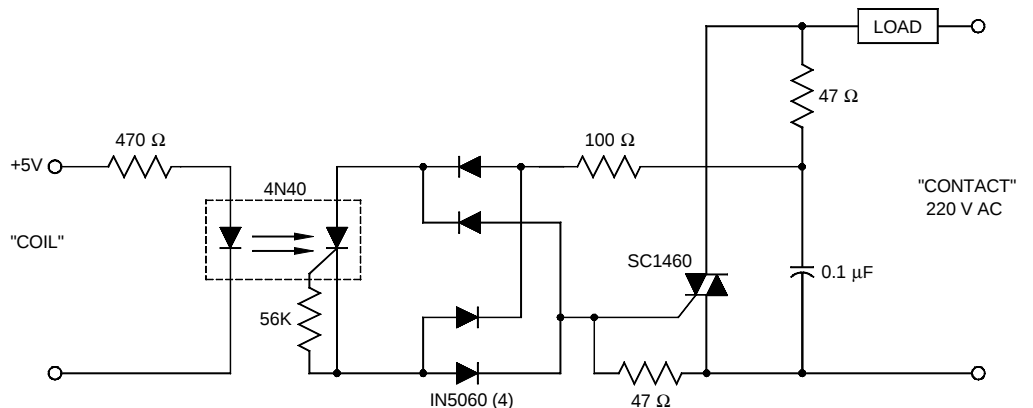


Fig. 13 Coupled dv/dt - Test Circuit

TYPICAL APPLICATIONS

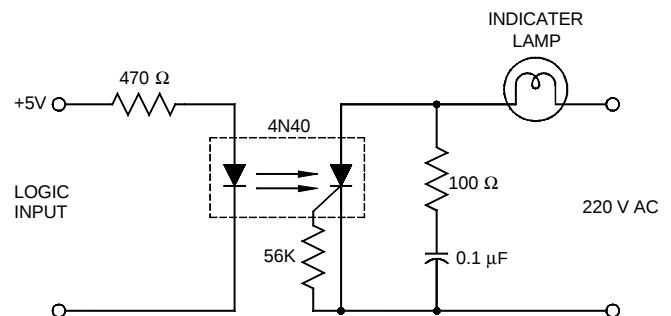
10A, T²L COMPATIBLE, SOLID STATE RELAY

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 T²L logic systems inputs and 220V AC loads up to 10A.



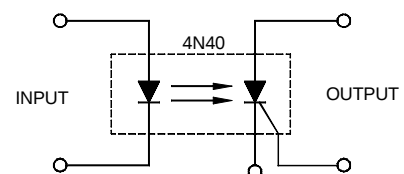
25W, LOGIC INDICATOR LAMP DRIVER

The high surge capability and non-reactive input characteristics of the 4N40 allow it to directly couple, without buffers, T²L and DTL logic to indicator alarm devices, without danger of introducing noise and logic glitches.



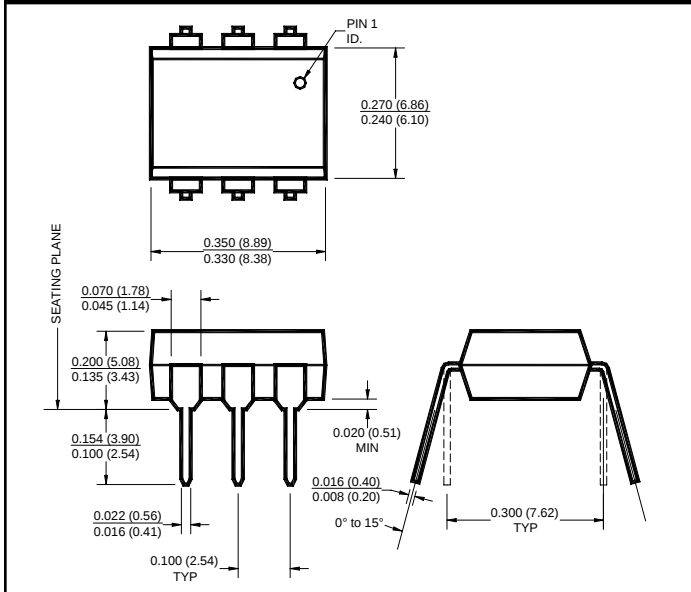
400V SYMMETRICAL TRANSISTOR COUPLER

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.

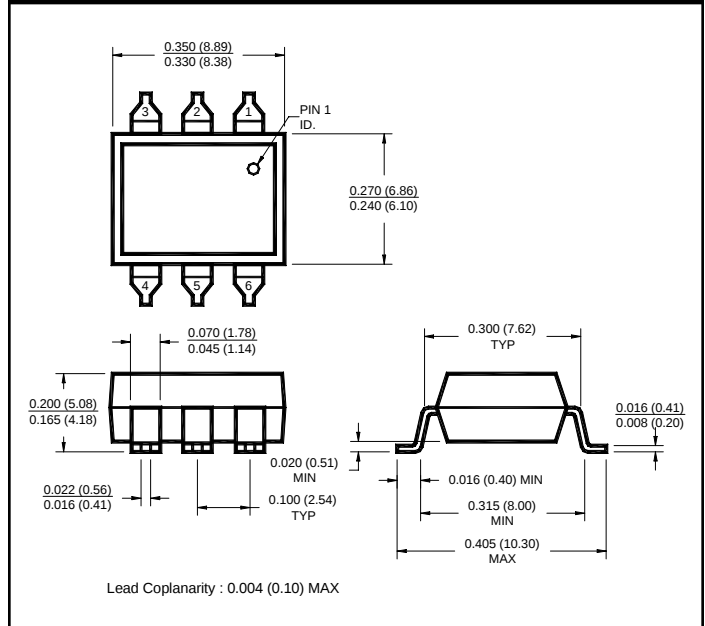


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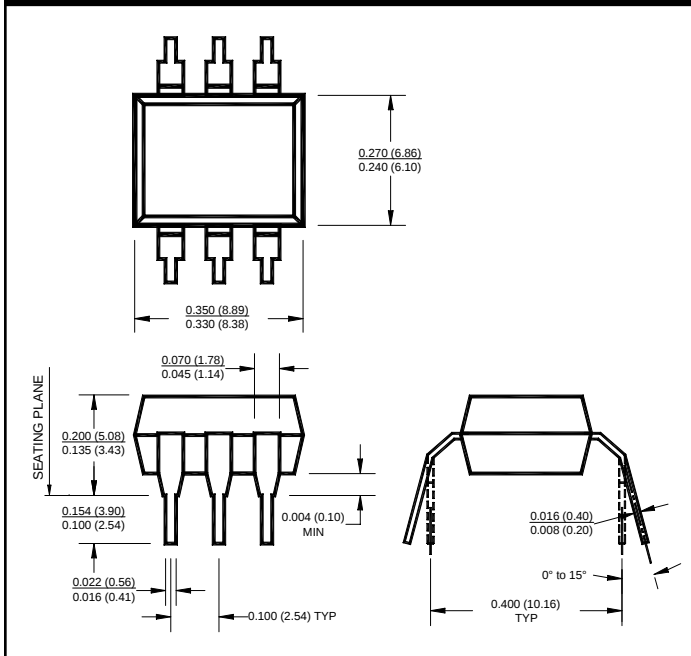
Package Dimensions (Through Hole)



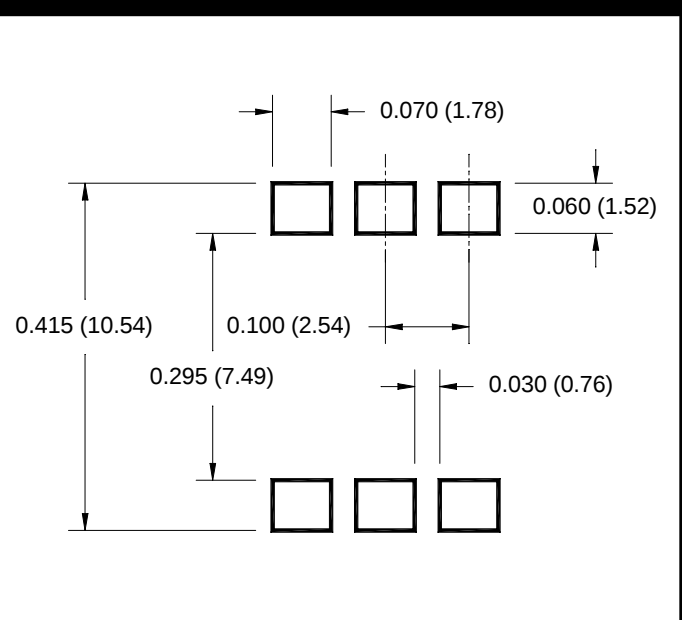
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

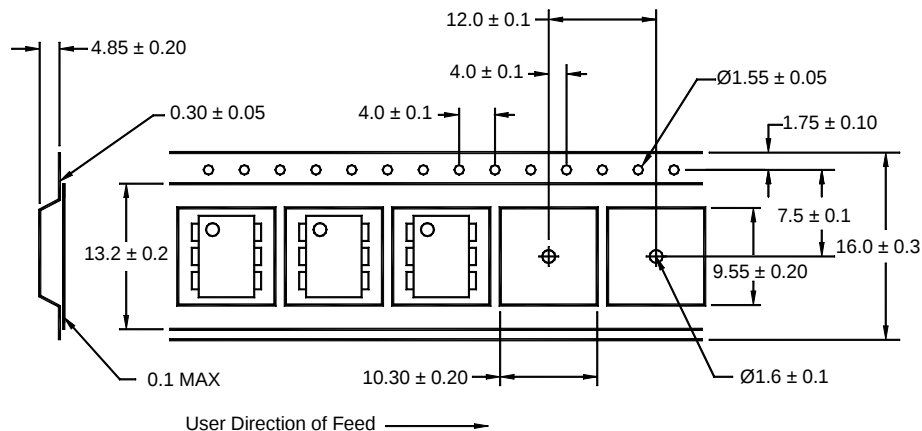
All dimensions are in inches (millimeters)

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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 millimeters

4N39	4N40
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Americas

Customer Response Center
Fairchild Semiconductor
7701 Las Colinas Ridge
Suite 400
Irving, TX 75063
Tel: 888.522.5372
Fax: 972.910.8036

China

Fairchild Semiconductor
Hong Kong Ltd.
Shenzhen Representative Office
Room 3107, Shun Hing Square
Di Wang Commercial Centre
5002 Shen Nan Road East
Shenzhen, P.R.C. 518008
Tel: 86.755.246.2088
Fax: 86.755.246.2092

China

Fairchild Semiconductor Japan Ltd
Hong Kong Ltd.
Shanghai Representative Office
Room 1110, Shanghai International
Trade Centre
No. 2200 Yan An (W) Road
Shanghai, P.R.C. 200335
Tel: 86.21.6208.4118
Fax: 86.21.6219.7799

Finland

Fairchild Semiconductor
Itakatu 3 D 213
FIN-00930 Heisinki
Finland
Tel: 358.9.3411266
Fax: 358.9.341.1292

France

Fairchild Semiconductor
Centre d'Affaires "Le Parc de Massy"
Z.I. De la Bonde
1bis, Rue Marcel Paul - Bat.B
F-91742 Massy Cedex
France
Tel: 33.1.6930.3696
Fax: 33.1.6930.3693

Germany

Fairchild Semiconductor GmbH
Oskar-von-Miller-Strasse 4e
D-82256 Furstenfeldbruck
Germany
Tel: 49.8141.61020
Fax: 49.8141.6102.100

Hong Kong

Fairchild Semiconductor
Hong Kong Ltd
19/F, CMG Asia Tower
The Gateway II, 15 Canton Road
Tsimshatsui East, Kowloon
Hong Kong
Tel: 852.2722.8338
Fax: 852.2722.8383

Italy

Fairchild Semiconductor Srl
Via Carducci, 125
20099 Sesto San Giovanni (MI)
Italy
Tel: 39.02.249111.1
Fax: 39.02.26263424

Japan

Fairchild Semiconductor
6F Bancho-kaikan 12-1
Gobancho, Chiyoda-ku,
Tokyo, 102-0076 Japan
Tel: 81.3.5275.8380
Fax: 81.3.5275.8390

Japan

Fairchild Semiconductor
Osaka Office
Shin-Osaka Meiko Building 8F
4-3-12, Mlyahara, Yodogawa-ku
Osaka, 532-0003 Japan
Tel: 81.6.6398.3670
Fax: 81.6.6398.3680

Korea

Fairchild Korea Semiconductor, Ltd.
82-3, Dodang-Dong,
Wonmi-ku, Puchon,
Kyunggi-Do, Korea, 420-711
Tel: 82.32.680.1926
Fax: 82.32.680.1949

Korea

Fairchild Korea Semiconductor, Ltd.
Suwon Office
6th Floor Song-i Building,
976-12, Youngtong-Dong,
Paldal-ku, Suwon,
Kyunggi-Do, Korea, 442-470
Tel: 82.331.205.0291.8
Fax: 82.331.205.3352

Korea

Fairchild Korea Semiconductor, Ltd.
Kumi Office
5th Floor Shinlim Building
447-2, Songjung-Dong,
Kumi, Kyongsangbuk-Do,
Korea, 730-090
Tel: 82.546.457.4111
Fax: 82.546.457.4121

Mexico

Fairchild Semiconductor
Av. Vallarta #6503 Flr.14
Col. Cd Granjas
Zapopan Jalisco 45010
Mexico
Tel: 52-3-1100017
Fax: 52-3-1101878

Singapore

Fairchild Semiconductor
Asia Pacific Pte. Ltd.
350 Orchard Road
#20-01/03 Shaw House
Singapore 238868
Tel: 65.836.0936
Fax: 65.838.0321/3

Sweden

Fairchild Semiconductor
Industrivagen 7
SE-171 48 Solna
Sweden
Tel: 46.8.6515530
Fax: 46.8.6515505

Taiwan

Fairchild Semiconductor
Hong Kong Ltd. Taiwan Branch
16/F. No. 167
Tu Hwa North Road
Taipei, Taiwan
Tel: 886.2.2712.0500
Fax: 886.2.2716.9285

UK

Fairchild Semiconductor Ltd.
10 Interface Business Park
Wootton Bassett
Swindon SN4 8SY
United Kingdom
Tel: 44.1793.856856
Fax: 44.1793.856857

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