



## 6-Pin DIP Optoisolators Darlington Output (Low Input Current)

The H11B1 and H11B3 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector. They are designed for use in applications requiring high output current ( $I_C$ ) at low LED input currents ( $I_F$ ).

- High Sensitivity to Low Input Drive Current ( $I_F = 1$  mA)
- **To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.**

### Applications

- Appliances, Measuring Instruments
- I/O Interfaces for Computers
- Programmable Controllers
- Interfacing and coupling systems of different potentials and impedances
- Solid State Relays
- Portable Electronics

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INPUT LED

Reverse Voltage	$V_R$	3	Volts
Forward Current — Continuous	$I_F$	60	mA
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above $25^\circ\text{C}$	$P_D$	150 1.41	mW mW/ $^\circ\text{C}$

#### OUTPUT DETECTOR

Collector–Emitter Voltage	$V_{CEO}$	25	Volts
Emitter–Base Voltage	$V_{EBO}$	7	Volts
Collector–Base Voltage	$V_{CBO}$	30	Volts
Collector Current — Continuous	$I_C$	100	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above $25^\circ\text{C}$	$P_D$	150 1.76	mW mW/ $^\circ\text{C}$

#### TOTAL DEVICE

Isolation Surge Voltage <sup>(1)</sup> (Peak ac Voltage, 60 Hz, 1 sec Duration)	$V_{ISO}$	7500	Vac(pk)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range <sup>(2)</sup>	$T_A$	–55 to +100	$^\circ\text{C}$
Storage Temperature Range <sup>(2)</sup>	$T_{stg}$	–55 to +150	$^\circ\text{C}$
Soldering Temperature (10 sec, 1/16" from case)	$T_L$	260	$^\circ\text{C}$

1. Isolation surge voltage is an internal device dielectric breakdown rating.  
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

**Preferred** devices are Motorola recommended choices for future use and best overall value.  
GlobalOptoisolator is a trademark of Motorola, Inc.

**H11B1\***

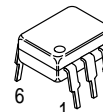
[CTR = 500% Min]

**H11B3**

[CTR = 100% Min]

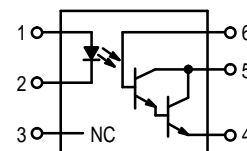
\*Motorola Preferred Device

### STYLE 1 PLASTIC



STANDARD THRU HOLE  
CASE 730A–04

### SCHEMATIC



- PIN 1. LED ANODE  
2. LED CATHODE  
3. N.C.  
4. EMITTER  
5. COLLECTOR  
6. BASE

# H11B1 H11B3

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)<sup>(1)</sup>

Characteristic	Symbol	Min	Typ <sup>(1)</sup>	Max	Unit	
INPUT LED						
Forward Voltage (I <sub>F</sub> = 10 mA)	H11B1	V <sub>F</sub>	—	1.15	1.5	Volts
Forward Voltage (I <sub>F</sub> = 50 mA)	H11B3	V <sub>F</sub>	—	1.34	1.5	Volts
Reverse Leakage Current (V <sub>R</sub> = 3 V)	I <sub>R</sub>	—	—	10		μA
Capacitance (V = 0 V, f = 1 MHz)	C <sub>J</sub>	—	18	—		pF

## OUTPUT DETECTOR

Collector–Emitter Dark Current ( $V_{CE} = 10\text{ V}$ )	$I_{CEO}$	—	5	100	nA
Collector–Emitter Breakdown Voltage ( $I_C = 10\text{ mA}$ )	$V_{(BR)CEO}$	25	80	—	Volts
Collector–Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{A}$ )	$V_{(BR)CBO}$	30	100	—	Volts
Emitter–Collector Breakdown Voltage ( $I_E = 100\text{ }\mu\text{A}$ )	$V_{(BR)ECO}$	7	—	—	Volts
DC Current Gain ( $I_C = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$ ) (Typical Value)	$h_{FE}$	—	16K	—	—
Collector–Emitter Capacitance ( $f = 1\text{ MHz}$ , $V_{CE} = 5\text{ V}$ )	$C_{CE}$	—	4.9	—	pF
Collector–Base Capacitance ( $f = 1\text{ MHz}$ , $V_{CB} = 5\text{ V}$ )	$C_{CB}$	—	6.3	—	pF
Emitter–Base Capacitance ( $f = 1\text{ MHz}$ , $V_{EB} = 5\text{ V}$ )	$C_{EB}$	—	3.8	—	pF

## COUPLED

Output Collector Current ( $I_F = 1\text{ mA}$ , $V_{CE} = 5\text{ V}$ )	H11B1 H11B3	$I_C\text{ (CTR)}^{(2)}$	5 (500) 1 (100)	—	—	mA (%)
Collector–Emitter Saturation Voltage ( $I_C = 1\text{ mA}$ , $I_F = 1\text{ mA}$ )	$V_{CE(sat)}$	—	0.7	1	—	Volts
Turn–On Time ( $I_F = 5\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ ) <sup>(3)</sup>	$t_{on}$	—	3.5	—	—	$\mu\text{s}$
Turn–Off Time ( $I_F = 5\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ ) <sup>(3)</sup>	$t_{off}$	—	95	—	—	$\mu\text{s}$
Rise Time ( $I_F = 5\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ ) <sup>(3)</sup>	$t_r$	—	1	—	—	$\mu\text{s}$
Fall Time ( $I_F = 5\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ ) <sup>(3)</sup>	$t_f$	—	2	—	—	$\mu\text{s}$
Isolation Voltage ( $f = 60\text{ Hz}$ , $t = 1\text{ sec}$ ) <sup>(4)</sup>	$V_{ISO}$	7500	—	—	—	Vac(pk)
Isolation Resistance ( $V = 500\text{ V}$ ) <sup>(4)</sup>	$R_{ISO}$	$10^{11}$	—	—	—	$\Omega$
Isolation Capacitance ( $V = 0\text{ V}$ , $f = 1\text{ MHz}$ ) <sup>(4)</sup>	$C_{ISO}$	—	0.2	—	—	pF

1. Always design to the specified minimum/maximum electrical limits (where applicable).

2. Current Transfer Ratio (CTR) =  $I_C/I_F \times 100\%$ .

3. For test circuit setup and waveforms, refer to Figure 11.

4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

## TYPICAL CHARACTERISTICS

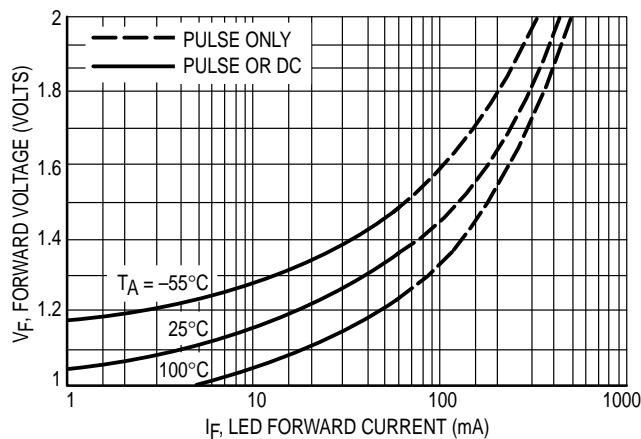


Figure 1. LED Forward Voltage versus Forward Current

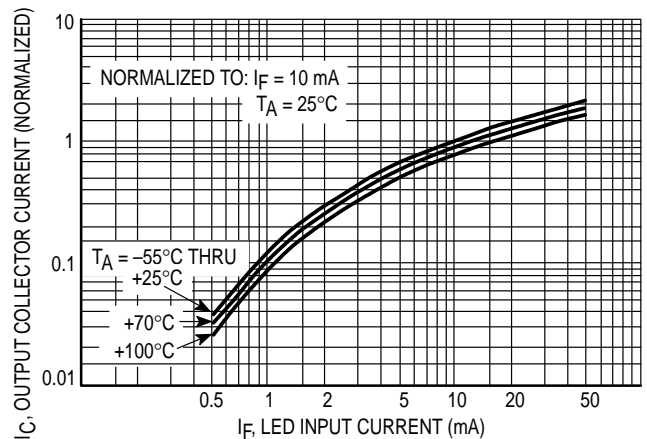
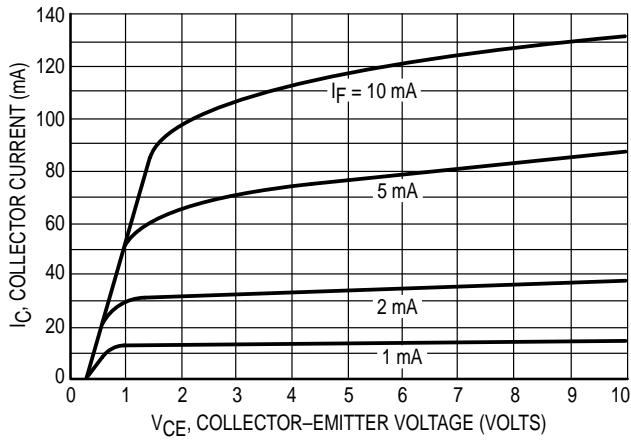
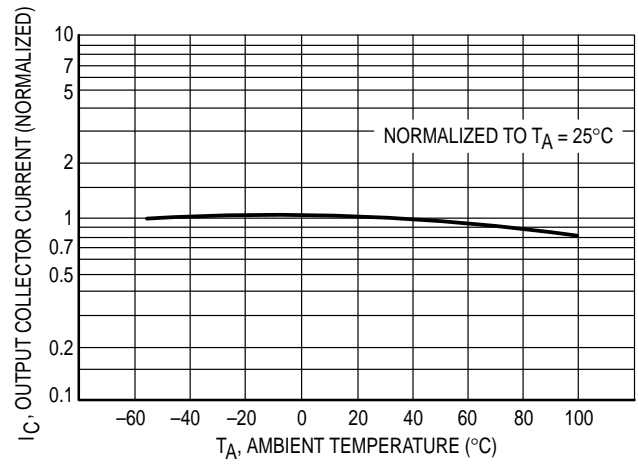


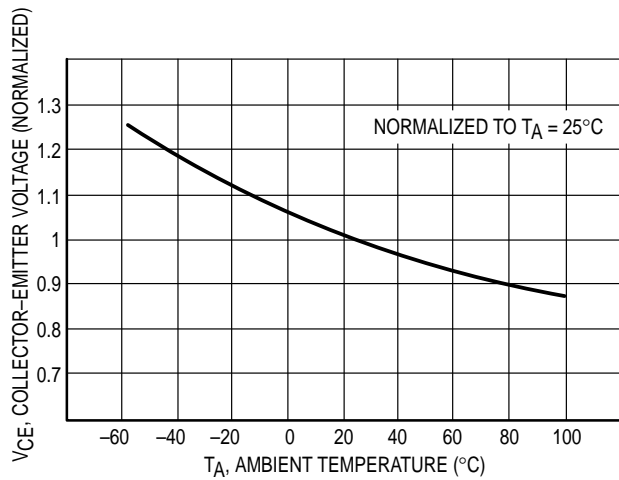
Figure 2. Output Current versus Input Current



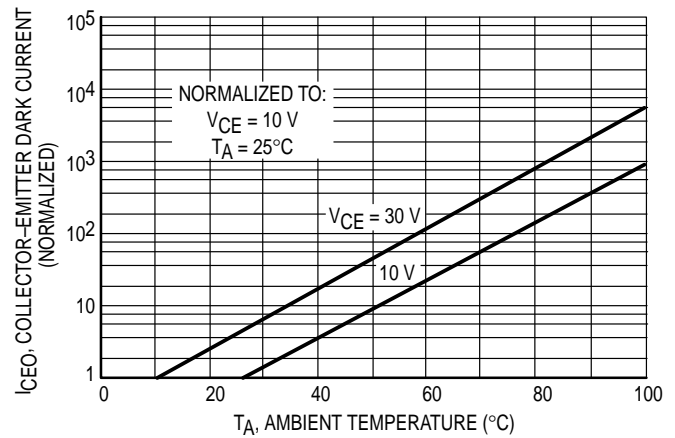
**Figure 3. Collector Current versus Collector-Emitter Voltage**



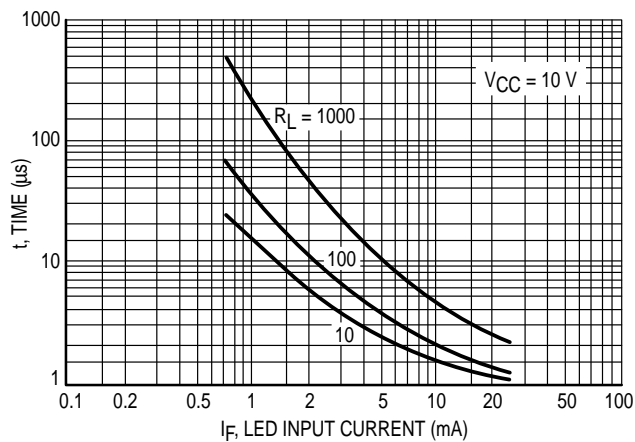
**Figure 4. Output Current versus Ambient Temperature**



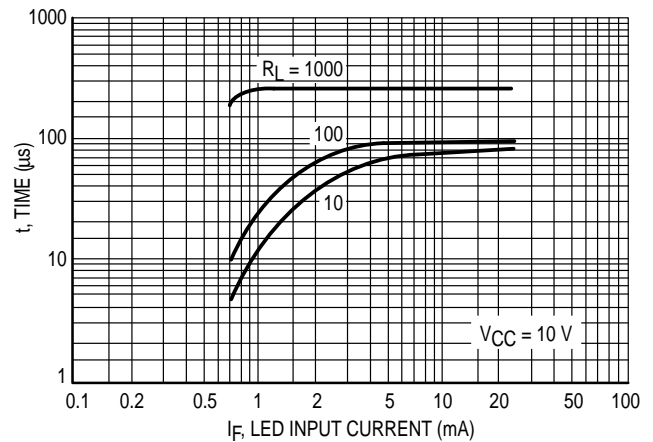
**Figure 5. Collector-Emitter Voltage versus Ambient Temperature**



**Figure 6. Collector-Emitter Dark Current versus Ambient Temperature**



**Figure 7. Turn-On Switching Times (Typical Values)**



**Figure 8. Turn-Off Switching Times (Typical Values)**

## H11B1 H11B3

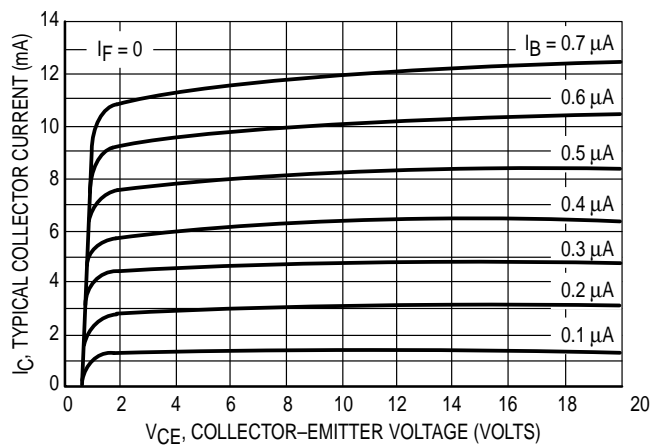


Figure 9. DC Current Gain (Detector Only)

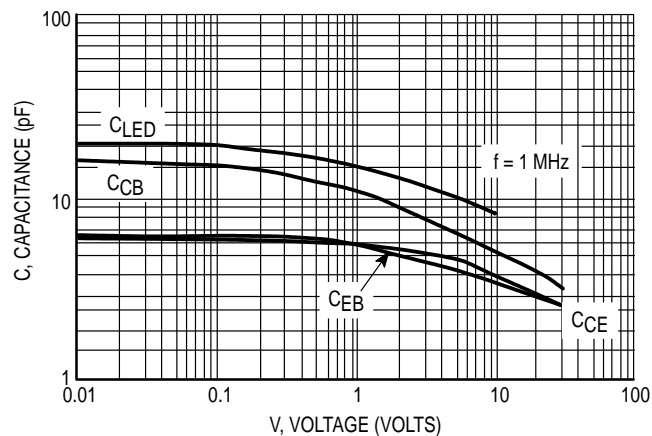


Figure 10. Capacitance versus Voltage

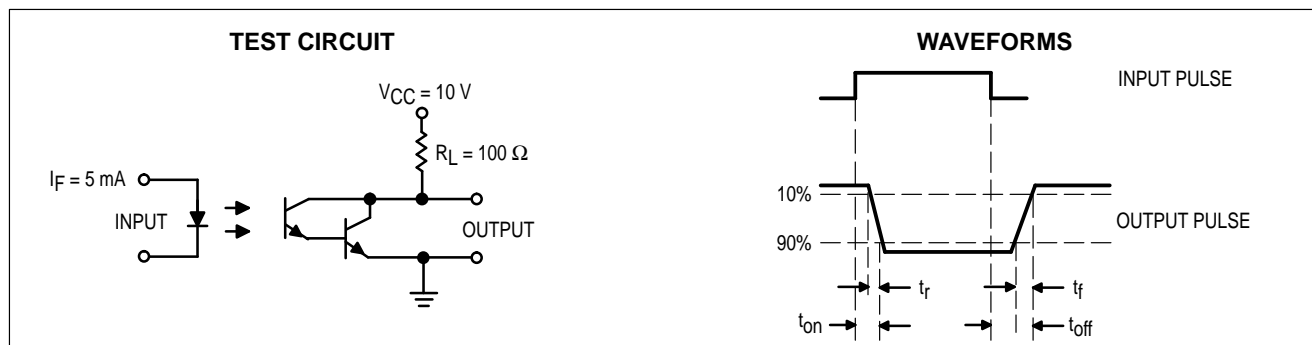
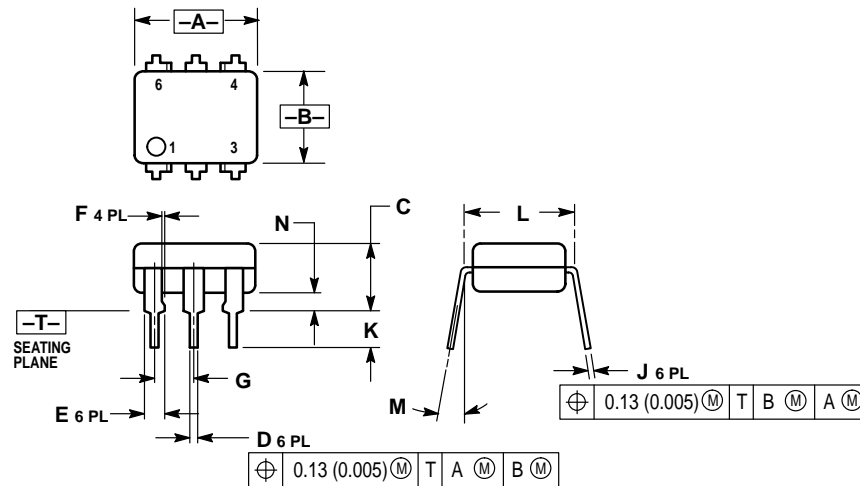


Figure 11. Switching Time Test Circuit and Waveforms

## PACKAGE DIMENSIONS

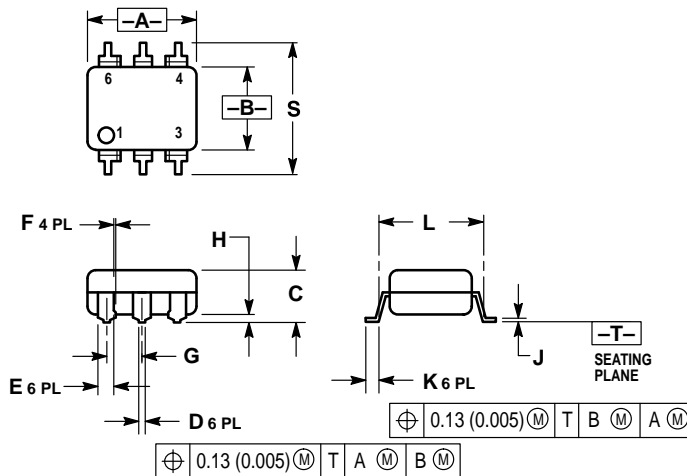


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.015	0.100	0.38	2.54

- STYLE 1:
- PIN 1: ANODE
2. CATHODE
3. NC
4. EMITTER
5. COLLECTOR
6. BASE

**CASE 730A-04**  
**ISSUE G**



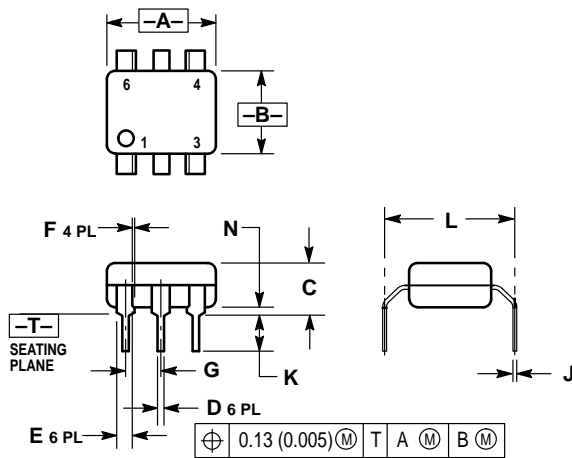
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  2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
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B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
H	0.020	0.025	0.51	0.63
J	0.008	0.012	0.20	0.30
K	0.006	0.035	0.16	0.88
L	0.320 BSC		8.13 BSC	
S	0.332	0.390	8.43	9.90

**\*Consult factory for leadform option availability**

**CASE 730C-04**  
**ISSUE D**

H11B1 H11B3




NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.  
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.400	0.425	10.16	10.80
N	0.015	0.040	0.38	1.02

\*Consult factory for leadform option availability

CASE 730D-05  
ISSUE D

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H11B1/D



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Datasheets for electronics components.