



6-Pin DIP Optoisolators Transistor Output

The 4N35, 4N36 and 4N37 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Current Transfer Ratio — 100% Minimum @ Specified Conditions
- Guaranteed Switching Speeds
- Meets or Exceeds all JEDEC Registered Specifications
- **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

- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- Regulation Feedback Circuits
- Monitor & Detection Circuits
- Solid State Relays

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

Rating	Symbol	Value	Unit
INPUT LED			
Reverse Voltage	V_R	6	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°C	P_D	120	mW
		1.41	mW/ $^\circ\text{C}$

OUTPUT TRANSISTOR

Collector–Emitter Voltage	V_{CEO}	30	Volts
Emitter–Base Voltage	V_{EBO}	7	Volts
Collector–Base Voltage	V_{CBO}	70	Volts
Collector Current — Continuous	I_C	150	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above 25°C	P_D	150	mW
		1.76	mW/ $^\circ\text{C}$

TOTAL DEVICE

Isolation Source Voltage ⁽¹⁾ (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°C	P_D	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range ⁽²⁾	T_A	-55 to +100	$^\circ\text{C}$
Storage Temperature Range ⁽²⁾	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.

4N35*

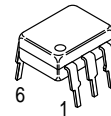
4N36

4N37

[CTR = 100% Min]

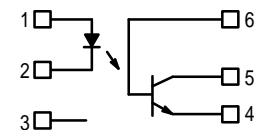
*Motorola Preferred Device

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

4N35 4N36 4N37

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)⁽¹⁾

Characteristic	Symbol	Min	Typ ⁽¹⁾	Max	Unit	
INPUT LED						
Forward Voltage (I _F = 10 mA)	V _F	T _A = 25°C	0.8	1.15	1.5	V
		T _A = -55°C	0.9	1.3	1.7	
		T _A = 100°C	0.7	1.05	1.4	
Reverse Leakage Current (V _R = 6 V)	I _R	—	—	10	μA	
Capacitance (V = 0 V, f = 1 MHz)	C _J	—	18	—	pF	

OUTPUT TRANSISTOR

Collector–Emitter Dark Current (V _{CE} = 10 V, T _A = 25°C) (V _{CE} = 30 V, T _A = 100°C)	I _{CEO}	—	1	50	nA μA
Collector–Base Dark Current (V _{CB} = 10 V)	I _{CBO}	—	0.2 100	20 —	nA
Collector–Emitter Breakdown Voltage (I _C = 1 mA)	V _{(BR)CEO}	30	45	—	V
Collector–Base Breakdown Voltage (I _C = 100 μA)	V _{(BR)CBO}	70	100	—	V
Emitter–Base Breakdown Voltage (I _E = 100 μA)	V _{(BR)EBO}	7	7.8	—	V
DC Current Gain (I _C = 2 mA, V _{CE} = 5 V)	h _{FE}	—	400	—	—
Collector–Emitter Capacitance (f = 1 MHz, V _{CE} = 0)	C _{CE}	—	7	—	pF
Collector–Base Capacitance (f = 1 MHz, V _{CB} = 0)	C _{CB}	—	19	—	pF
Emitter–Base Capacitance (f = 1 MHz, V _{EB} = 0)	C _{EB}	—	9	—	pF

COUPLED

Output Collector Current (I _F = 10 mA, V _{CE} = 10 V)	T _A = 25°C T _A = -55°C T _A = 100°C	I _C (CTR) ⁽²⁾	10 (100) 4 (40) 4 (40)	30 (300) — —	— — —	mA (%)
Collector–Emitter Saturation Voltage (I _C = 0.5 mA, I _F = 10 mA)		V _{CE(sat)}	—	0.14	0.3	V
Turn-On Time	(I _C = 2 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _{on}	—	7.5	10	μs
Turn-Off Time		t _{off}	—	5.7	10	
Rise Time		t _r	—	3.2	—	
Fall Time		t _f	—	4.7	—	
Isolation Voltage (f = 60 Hz, t = 1 sec)		V _{ISO}	7500	—	—	Vac(pk)
Isolation Current ⁽⁴⁾ (V _{I-O} = 3550 Vpk)	4N35	I _{ISO}	—	—	100	μA
(V _{I-O} = 2500 Vpk)	4N36		—	—	100	
(V _{I-O} = 1500 Vpk)	4N37		—	8	100	
Isolation Resistance (V = 500 V) ⁽⁴⁾		R _{ISO}	10 ¹¹	—	—	Ω
Isolation Capacitance (V = 0 V, f = 1 MHz) ⁽⁴⁾		C _{ISO}	—	0.2	2	pF

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = I_C/I_F × 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

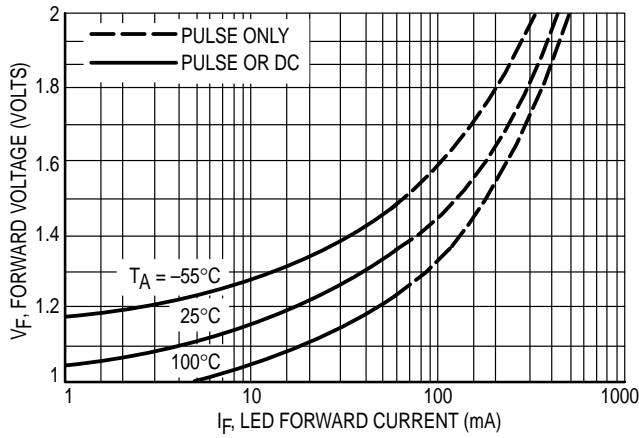


Figure 1. LED Forward Voltage versus Forward Current

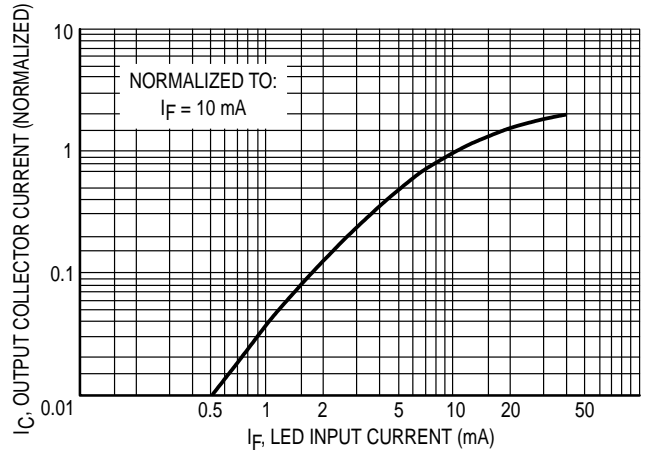


Figure 2. Output Current versus Input Current

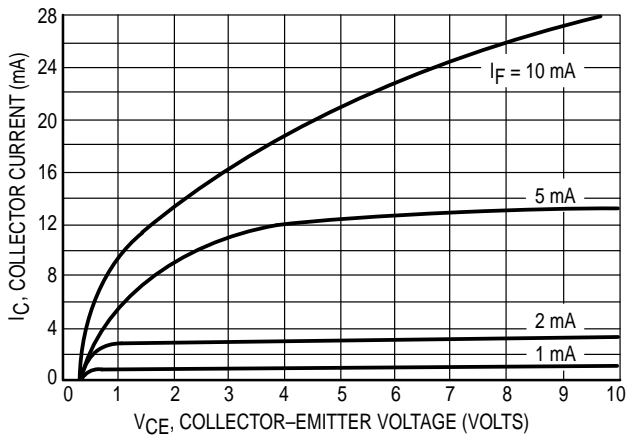


Figure 3. Collector Current versus Collector-Emitter Voltage

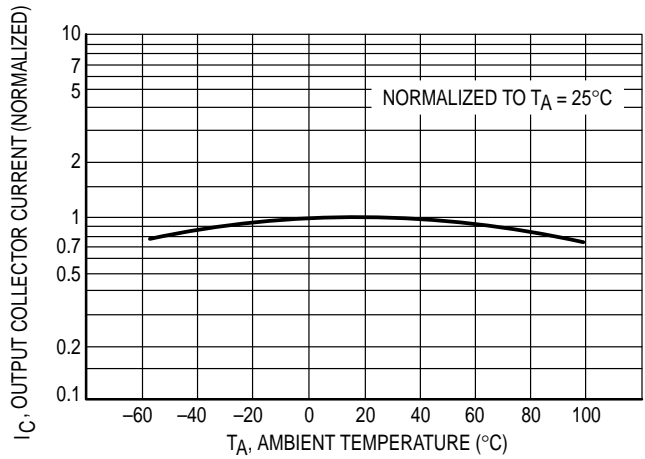


Figure 4. Output Current versus Ambient Temperature

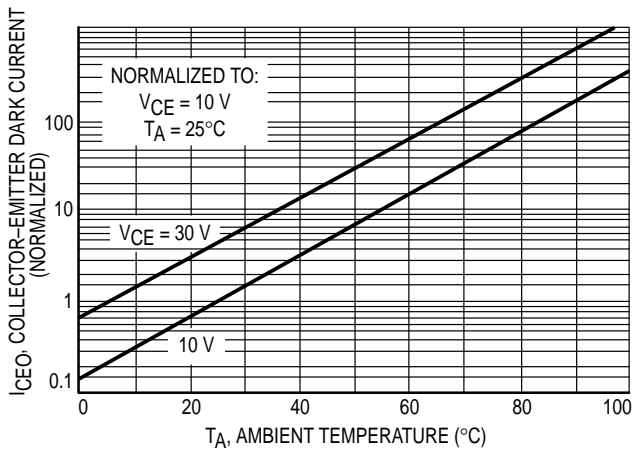


Figure 5. Dark Current versus Ambient Temperature

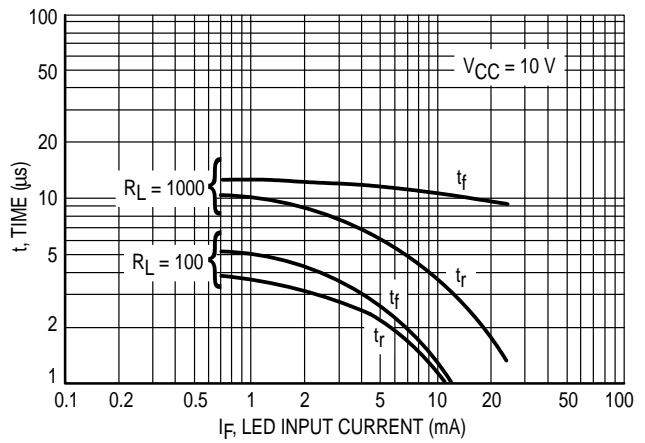


Figure 6. Rise and Fall Times (Typical Values)

4N35 4N36 4N37

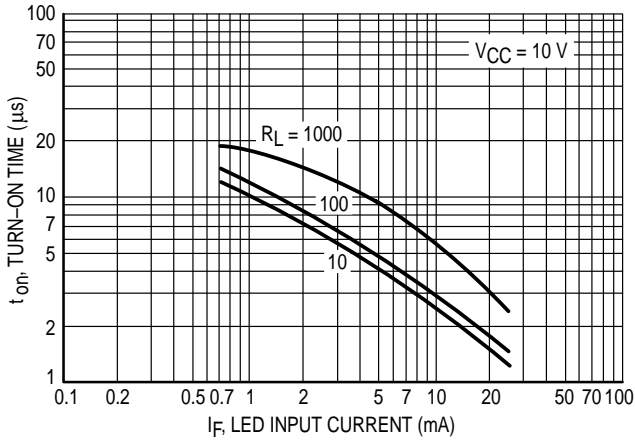


Figure 7. Turn-On Switching Times

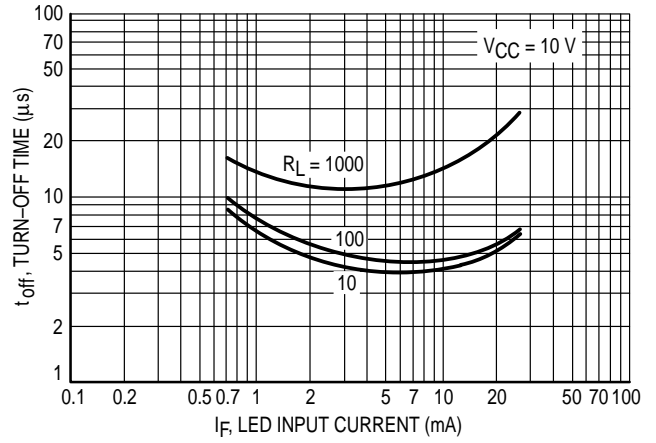


Figure 8. Turn-Off Switching Times

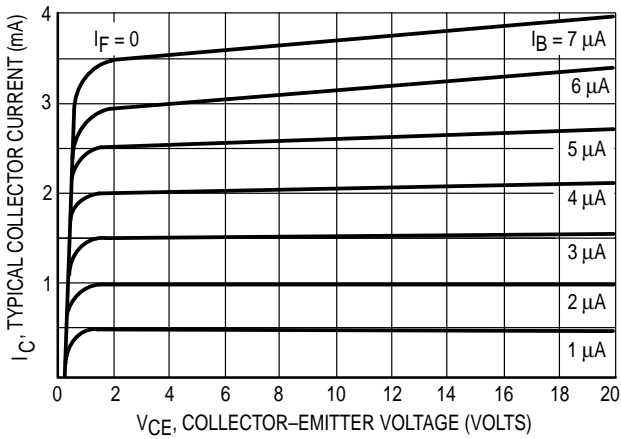


Figure 9. DC Current Gain (Detector Only)

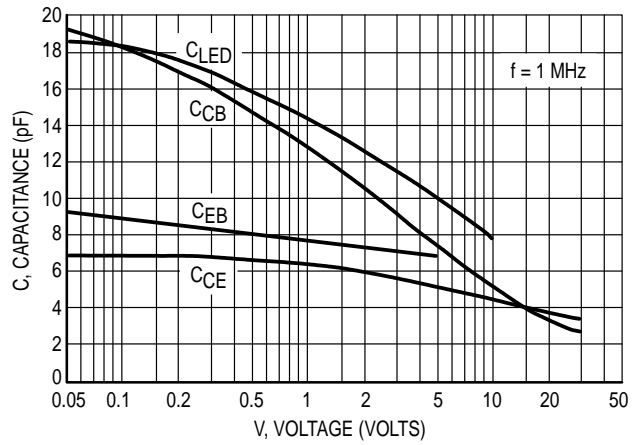


Figure 10. Capacitances versus Voltage

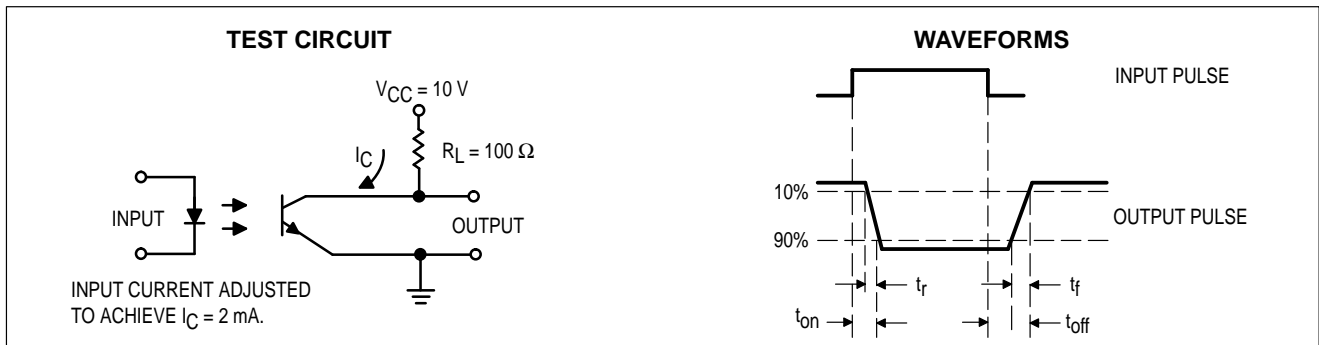
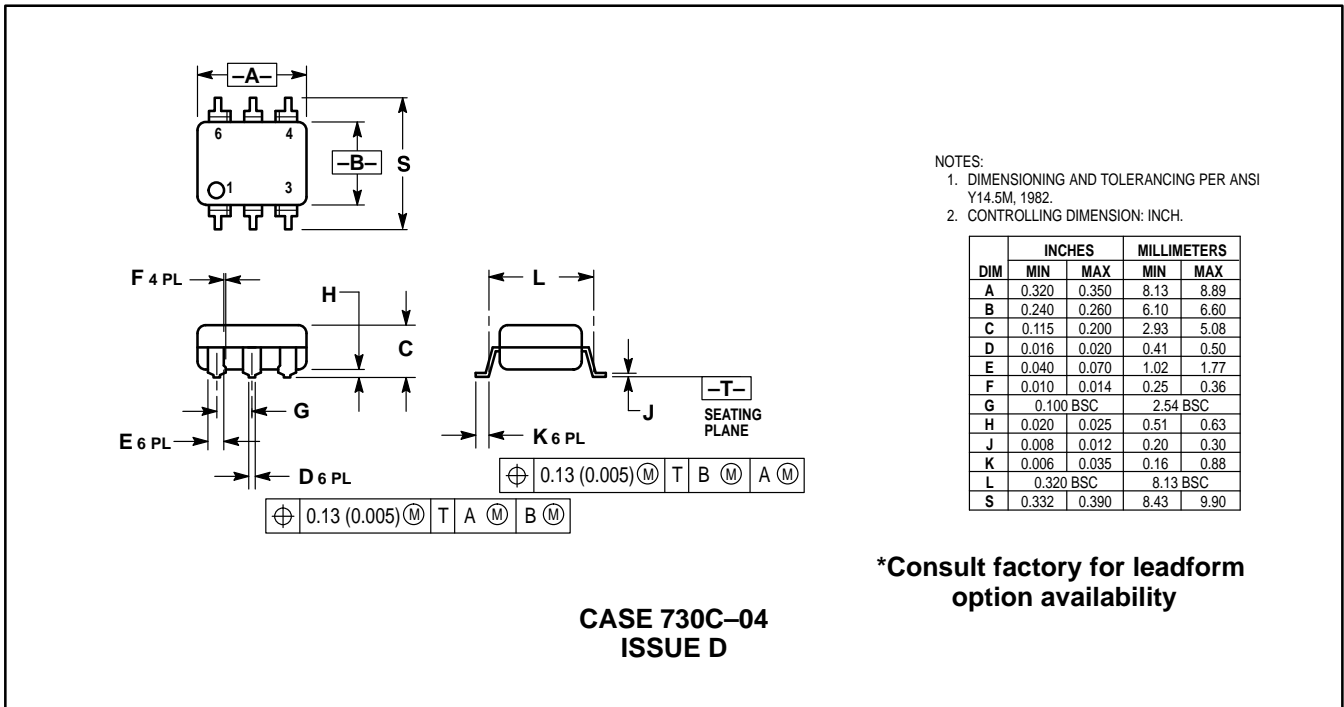
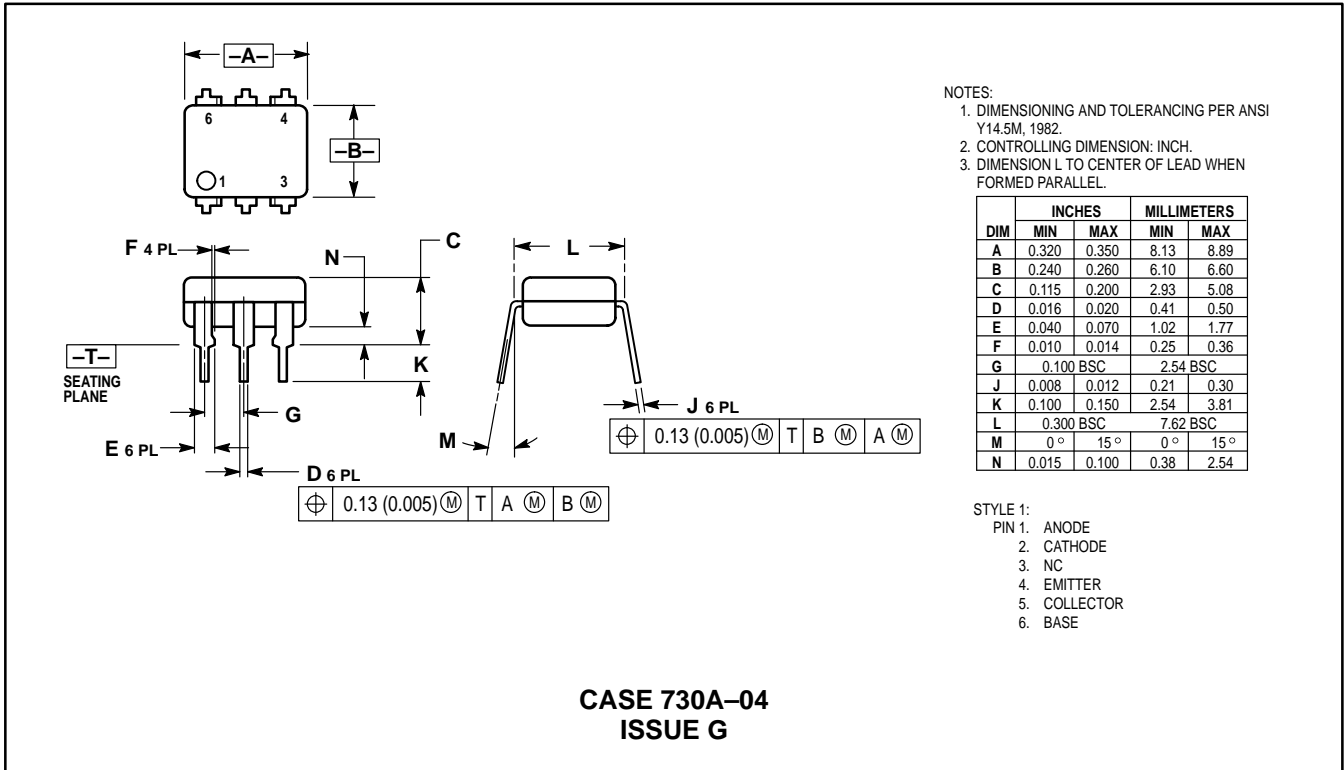
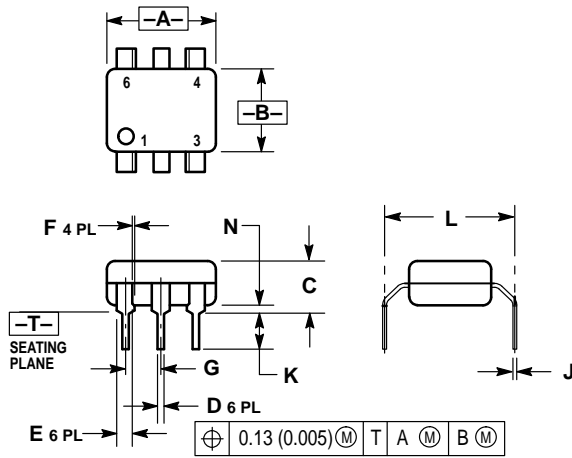


Figure 11. Switching Time Test Circuit and Waveforms

PACKAGE DIMENSIONS



4N35 4N36 4N37



- 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**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244-6609
INTERNET: http://Design-NET.com

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

