



# 6-Pin DIP Optoisolators Transistor Output

The 4N25/A, 4N26, 4N27 and 4N28 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Most Economical Optoisolator Choice for Medium Speed, Switching Applications
- 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
- I/O Interfacing
- Solid State Relays

### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INPUT LED

Reverse Voltage	V <sub>R</sub>	3	Volts
Forward Current — Continuous	I <sub>F</sub>	60	mA
LED Power Dissipation @ T <sub>A</sub> = 25°C with Negligible Power in Output Detector Derate above 25°C	P <sub>D</sub>	120	mW
		1.41	mW/°C

#### OUTPUT TRANSISTOR

Collector–Emitter Voltage	V <sub>CEO</sub>	30	Volts
Emitter–Collector Voltage	V <sub>ECO</sub>	7	Volts
Collector–Base Voltage	V <sub>CB0</sub>	70	Volts
Collector Current — Continuous	I <sub>C</sub>	150	mA
Detector Power Dissipation @ T <sub>A</sub> = 25°C with Negligible Power in Input LED Derate above 25°C	P <sub>D</sub>	150	mW
		1.76	mW/°C

#### TOTAL DEVICE

Isolation Surge Voltage(1) (Peak ac Voltage, 60 Hz, 1 sec Duration)	V <sub>ISO</sub>	7500	Vac(pk)
Total Device Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	250	mW
		2.94	mW/°C
Ambient Operating Temperature Range(2)	T <sub>A</sub>	–55 to +100	°C
Storage Temperature Range(2)	T <sub>stg</sub>	–55 to +150	°C
Soldering Temperature (10 sec, 1/16" from case)	T <sub>L</sub>	260	°C

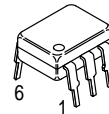
1. Isolation surge voltage is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

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

**4N25\***  
**4N25A\***  
**4N26\***  
[CTR = 20% Min]  
**4N27**  
**4N28**  
[CTR = 10% Min]

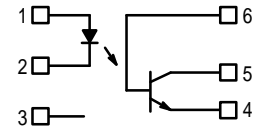
\*Motorola Preferred Devices

### 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

# 4N25 4N25A 4N26 4N27 4N28

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)<sup>(1)</sup>

Characteristic	Symbol	Min	Typ <sup>(1)</sup>	Max	Unit	
<b>INPUT LED</b>						
Forward Voltage (I <sub>F</sub> = 10 mA)	V <sub>F</sub>	T <sub>A</sub> = 25°C	—	1.15	1.5	Volts
		T <sub>A</sub> = -55°C	—	1.3	—	
		T <sub>A</sub> = 100°C	—	1.05	—	
Reverse Leakage Current (V <sub>R</sub> = 3 V)	I <sub>R</sub>	—	—	100	μA	
Capacitance (V = 0 V, f = 1 MHz)	C <sub>J</sub>	—	18	—	pF	

## OUTPUT TRANSISTOR

Collector–Emitter Dark Current (V <sub>CE</sub> = 10 V, T <sub>A</sub> = 25°C)	4N25,25A,26,27	I <sub>CEO</sub>	—	1	50	nA
	4N28		—	1	100	
(V <sub>CE</sub> = 10 V, T <sub>A</sub> = 100°C)	All Devices	I <sub>CEO</sub>	—	1	—	μA
Collector–Base Dark Current (V <sub>CB</sub> = 10 V)		I <sub>CBO</sub>	—	0.2	—	nA
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 1 mA)		V <sub>(BR)CEO</sub>	30	45	—	Volts
Collector–Base Breakdown Voltage (I <sub>C</sub> = 100 μA)		V <sub>(BR)CBO</sub>	70	100	—	Volts
Emitter–Collector Breakdown Voltage (I <sub>E</sub> = 100 μA)		V <sub>(BR)ECO</sub>	7	7.8	—	Volts
DC Current Gain (I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)		h <sub>FE</sub>	—	500	—	—
Collector–Emitter Capacitance (f = 1 MHz, V <sub>CE</sub> = 0)		C <sub>CE</sub>	—	7	—	pF
Collector–Base Capacitance (f = 1 MHz, V <sub>CB</sub> = 0)		C <sub>CB</sub>	—	19	—	pF
Emitter–Base Capacitance (f = 1 MHz, V <sub>EB</sub> = 0)		C <sub>EB</sub>	—	9	—	pF

## COUPLED

Output Collector Current (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V)	I <sub>C</sub> (CTR) <sup>(2)</sup>	2 (20) 1 (10)	7 (70) 5 (50)	— —	mA (%)
4N25,25A,26 4N27,28					
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 2 mA, I <sub>F</sub> = 50 mA)	V <sub>CE(sat)</sub>	—	0.15	0.5	Volts
Turn–On Time (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω) <sup>(3)</sup>	t <sub>on</sub>	—	2.8	—	μs
Turn–Off Time (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω) <sup>(3)</sup>	t <sub>off</sub>	—	4.5	—	μs
Rise Time (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω) <sup>(3)</sup>	t <sub>r</sub>	—	1.2	—	μs
Fall Time (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω) <sup>(3)</sup>	t <sub>f</sub>	—	1.3	—	μs
Isolation Voltage (f = 60 Hz, t = 1 sec) <sup>(4)</sup>	V <sub>ISO</sub>	7500	—	—	Vac(pk)
Isolation Resistance (V = 500 V) <sup>(4)</sup>	R <sub>ISO</sub>	10 <sup>11</sup>	—	—	Ω
Isolation Capacitance (V = 0 V, f = 1 MHz) <sup>(4)</sup>	C <sub>ISO</sub>	—	0.2	—	pF

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = I<sub>C</sub>/I<sub>F</sub> × 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

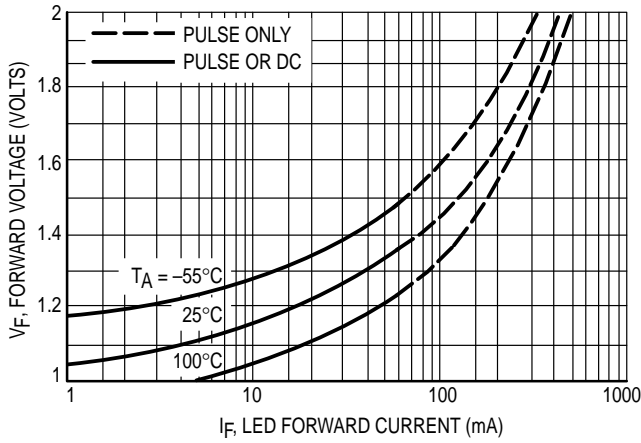


Figure 1. LED Forward Voltage versus Forward Current

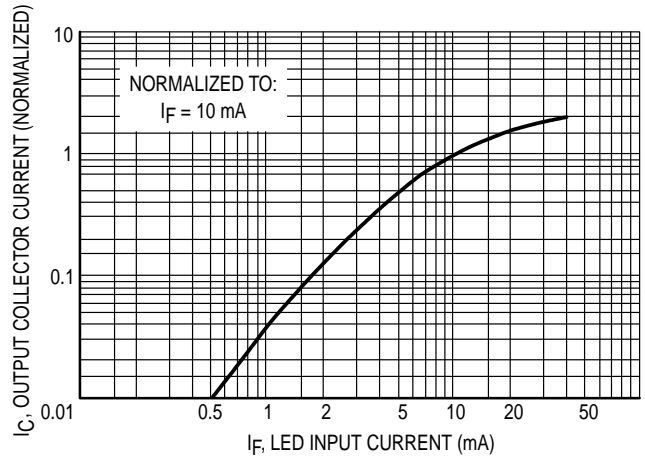


Figure 2. Output Current versus Input Current

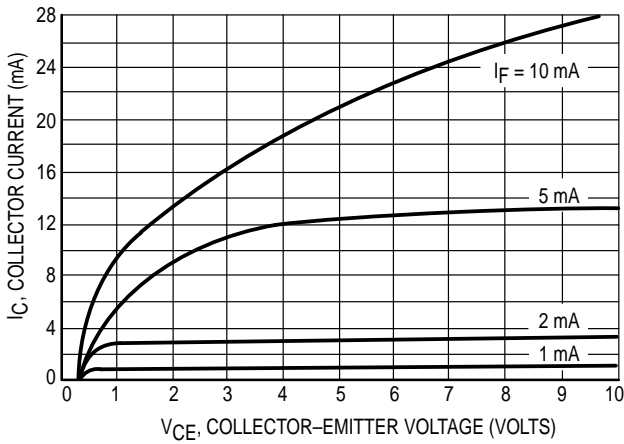


Figure 3. Collector Current versus Collector-Emitter Voltage

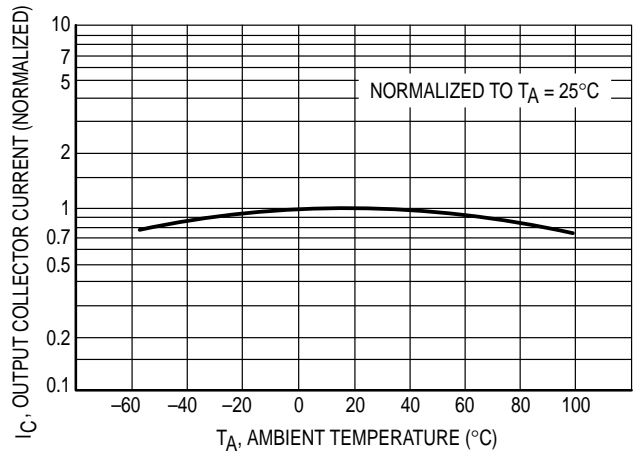


Figure 4. Output Current versus Ambient Temperature

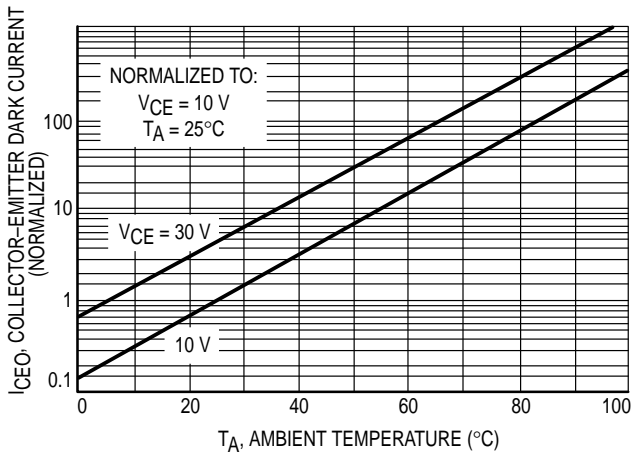


Figure 5. Dark Current versus Ambient Temperature

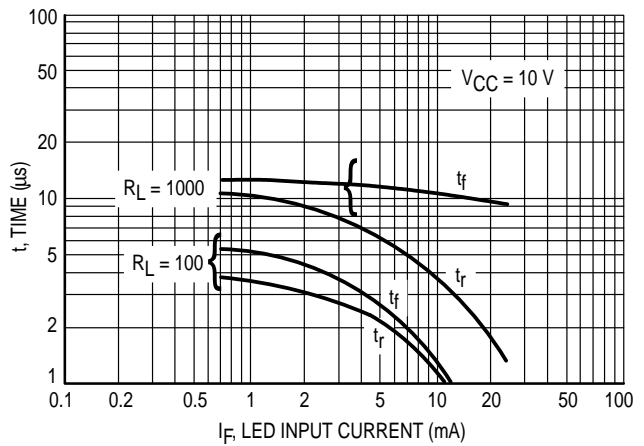
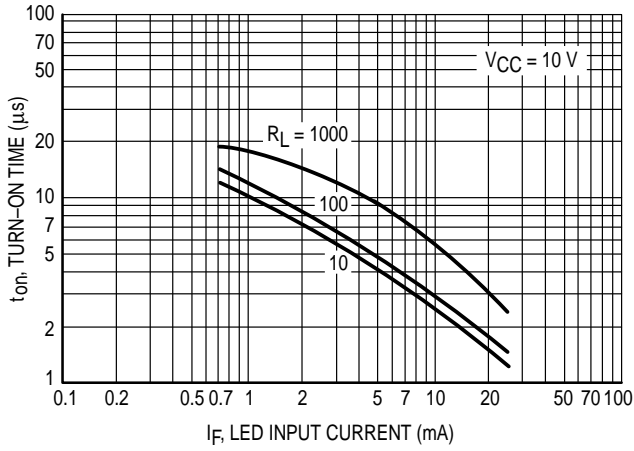
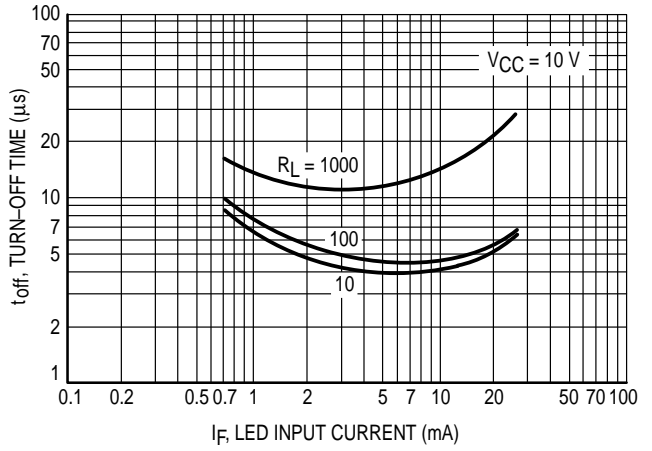


Figure 6. Rise and Fall Times (Typical Values)

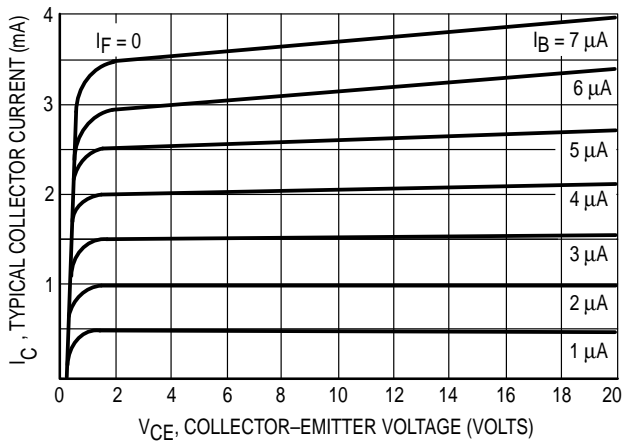
# 4N25 4N25A 4N26 4N27 4N28



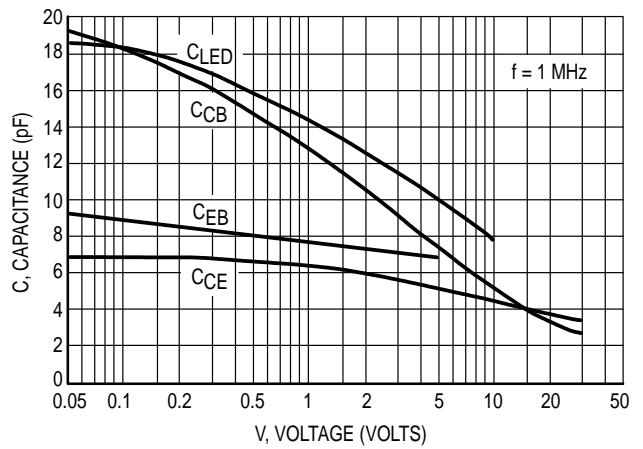
**Figure 7. Turn-On Switching Times (Typical Values)**



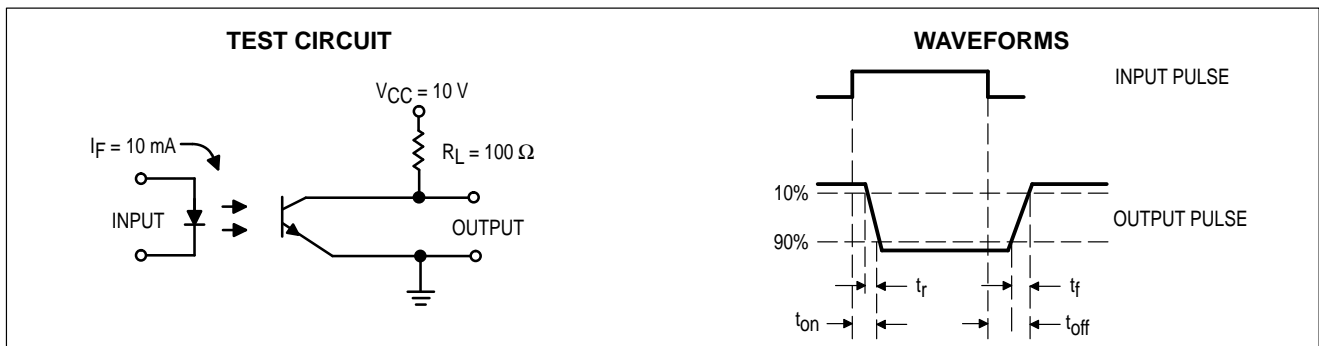
**Figure 8. Turn-Off Switching Times (Typical Values)**



**Figure 9. DC Current Gain (Detector Only)**

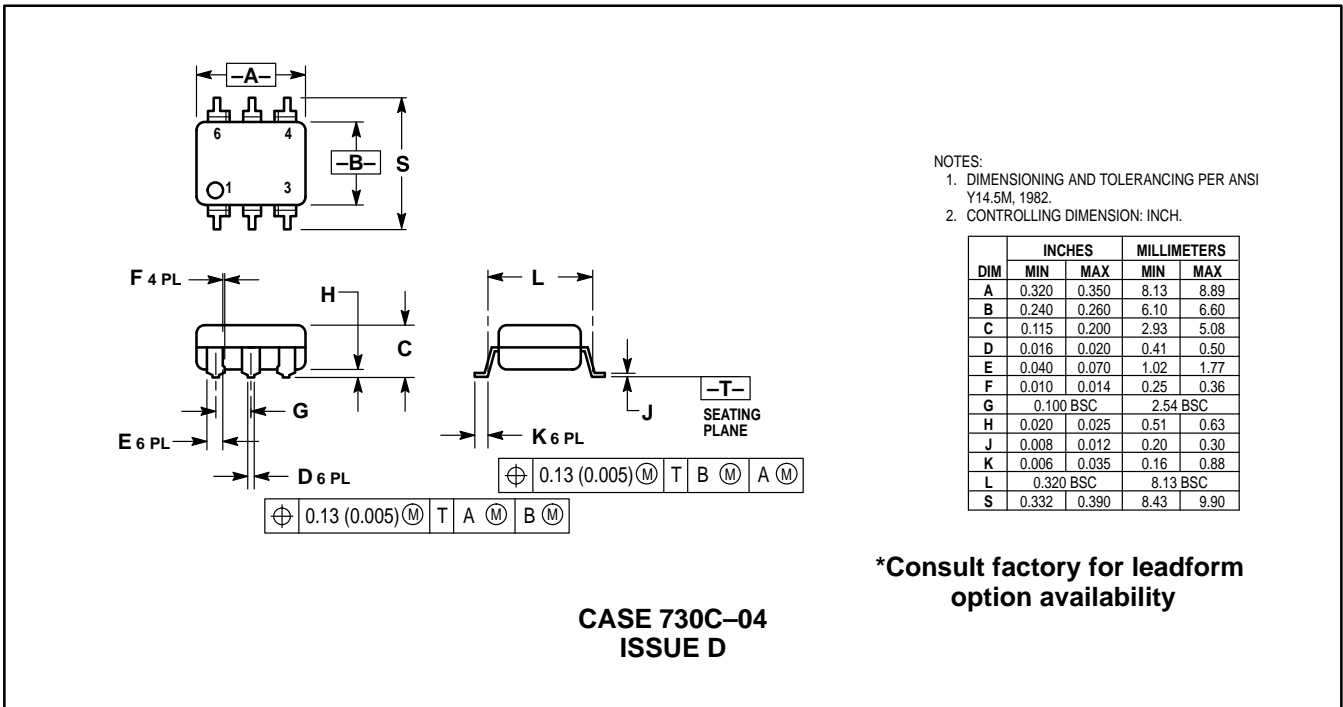
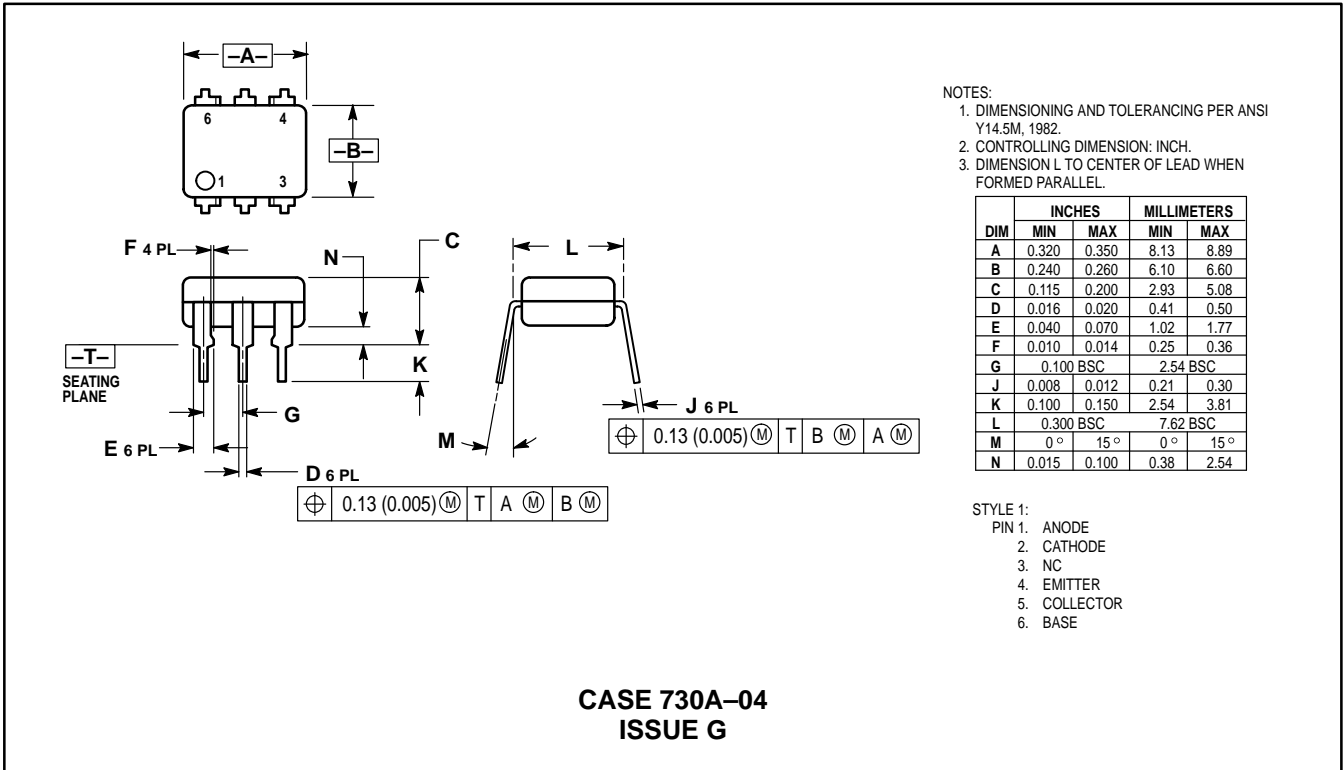


**Figure 10. Capacitances versus Voltage**

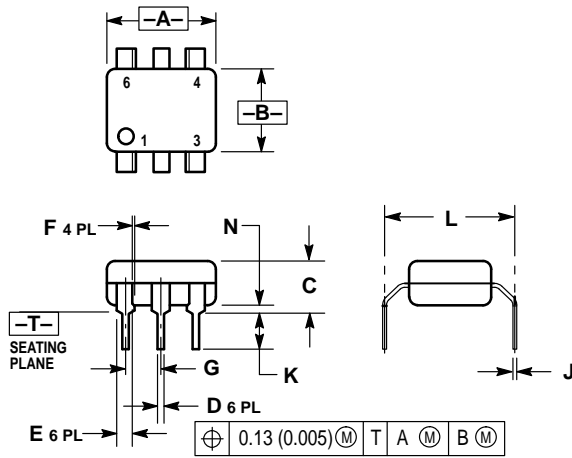


**Figure 11. Switching Time Test Circuit and Waveforms**

PACKAGE DIMENSIONS



# 4N25 4N25A 4N26 4N27 4N28



- 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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