

MOTOROLA
Semiconductors

BOX 20912 • PHOENIX, ARIZONA 85036

MHQ2369

MPQ2369

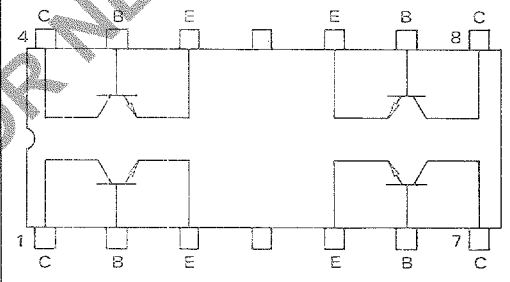
**QUAD DUAL-IN-LINE
NPN SILICON ANNULAR
SWITCHING TRANSISTORS**

... designed for low-current, high-speed switching and space saving applications.

- Choice of Ceramic or Plastic Package
- High Current-Gain-Bandwidth Product —
 $f_T = 550 \text{ MHz (Typ) @ } I_C = 10 \text{ mA dc}$
- Fast Switching Times — @ $V_{CC} = 3.0 \text{ Vdc}$
 $t_{on} = 9.0 \text{ ns (Typ)}$
 $t_{off} = 15 \text{ ns (Typ)}$
- Low Saturation Voltage —
 $V_{CE(sat)} = 0.25 \text{ Vdc (Max) @ } I_C = 10 \text{ mA dc}$
- Each Transistor Similar to 2N2369
- TO-116 Package — Compact Size Compatible With IC Automatic Insertion Equipment

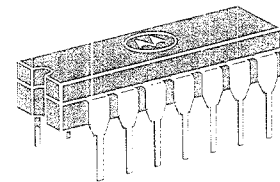
**QUAD DUAL-IN-LINE
NPN SILICON
SWITCHING
TRANSISTORS**

CONNECTION DIAGRAM



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	15	Vdc
Collector-Base Voltage	V_{CB}	40	Vdc
Emitter-Base Voltage	V_{EB}	4.5	Vdc
Collector Current — Peak	I_C	500	mA dc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$	P_D	Each Transistor	0.5
		Total Device	1.5
Derate above 25°C	MHQ2369 MPQ2369	Each Transistor	2.86
		Total Device	8.58
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200 -55 to +125	$^\circ\text{C}$



**MHQ2369
CERAMIC
CASE 632-02
TO-116**

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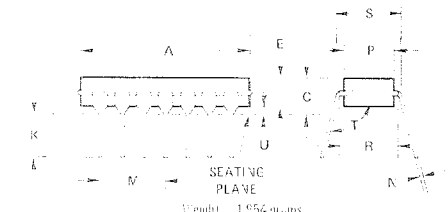
**MPQ2369
PLASTIC
CASE 646
TO-116**

1. DIMENSIONS TO LEAD CENTERLINE WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.710	0.740	18.030	18.789
B	0.240	0.260	6.030	6.600
C	0.160	0.180	4.060	4.570
D	0.015	0.020	0.381	0.508
E	0.100 TYP		2.54 TYP	
F	0.099	0.014	0.228	0.355
G	0.060	0.080	1.520	2.030
H	0.040	0.065	1.020	1.650
J	0.062	0.072	1.570	1.830
K	0.115	0.135	2.920	3.420
L	0.025	0.035	0.635	0.889
M	0°	10°	0°	10°
N	0.290	0.310	7.360	7.870
P	79° TYP		79° TYP	

Weight = 0.311 gram

*Dimension is to lead centerline when formed parallel. All JEDEC dimensions and notes apply.



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.690	0.720	17.400	18.300
C	0.250	0.250	6.350	6.350
D	0.015	0.023	0.381	0.584
F	0.030	0.070	0.760	1.770
H	0.030	0.110	0.760	2.790
J	0.130	0.210	3.300	5.330
K	0.130	0.130	3.300	3.300
M	0.290	0.310	7.360	7.870
N	0.038	0.015	0.965	0.381
P	0.220	0.250	5.588	6.350
R	0.290	0.310	7.360	7.870
S	0.375	0.375	9.525	9.525
T	90°	105°		
U	0.020	0.030	0.508	0.762

NOTE:
1. "R" — Installed Position of Lead Centers.
2. "S" — Overall Installed Width.

All JEDEC TO-116 dimensions and notes apply.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(1) (I _C = 10 mA _{dc} , I _B = 0)	BV _{CEO}	15	—	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	BV _{CBO}	40	—	—	V _{dc}
Emitter-Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0)	BV _{EBO}	4.5	—	—	V _{dc}
Collector Cutoff Current (V _{CB} = 20 V _{dc} , I _E = 0)	I _{CBO}	—	—	0.4	μA _{dc}
Emitter Cutoff Current (V _{BE} = 3.0 V _{dc} , I _C = 0)	I _{EBO}	—	—	0.5	μA _{dc}
ON CHARACTERISTICS					
DC Current Gain(1) (I _C = 10 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 100 mA _{dc} , V _{CE} = 2.0 V _{dc})	h _{FE}	40 20	— —	— —	—
Collector-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{CE(sat)}	—	—	0.25	V _{dc}
Base-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{BE(sat)}	—	—	0.9	V _{dc}
DYNAMIC CHARACTERISTICS					
Current-Gain—Bandwidth Product (I _C = 10 mA _{dc} , V _{CE} = 10 V _{dc} , f = 100 MHz)	f _T	450	550	—	MHz
Output Capacitance (V _{CB} = 5.0 V _{dc} , I _E = 0, f = 140 kHz)	C _{ob}	—	2.5	4.0	pF
Input Capacitance (V _{BE} = 0.5 V _{dc} , I _C = 0, f = 140 kHz)	C _{ib}	—	3.0	5.0	pF
SWITCHING CHARACTERISTICS					
Turn-On Time (V _{CC} = 3.0 V _{dc} , V _{BE(off)} = 1.5 V _{dc} , I _C = 10 mA _{dc} , I _{B1} = 3.0 mA _{dc})	t _{on}	—	9.0	—	ns
Turn-Off Time (V _{CC} = 3.0 V _{dc} , I _C = 10 mA _{dc} , I _{B1} = 3.0 mA _{dc} , I _{B2} = 1.5 mA _{dc})	t _{off}	—	15	—	ns

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle = 2%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

FIGURE 1 — t_{on} CIRCUIT

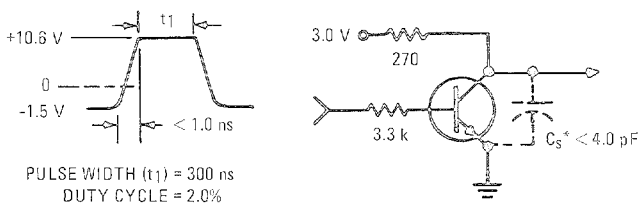
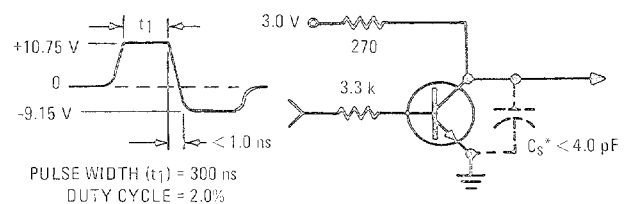


FIGURE 2 — t_{off} CIRCUIT



*Total Shunt Capacitance of test jig and connectors.

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