



MOTOROLA
Semiconductors

MHQ2221 MHQ2222
MPQ2221 MPQ2222

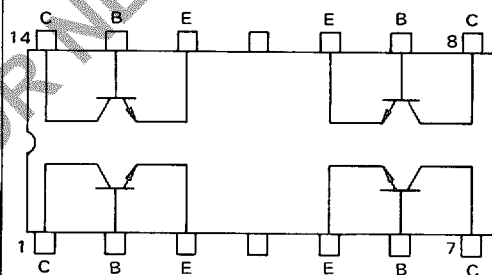
**QUAD DUAL-IN-LINE
NPN SILICON ANNULAR[♦]
GENERAL-PURPOSE TRANSISTORS**

... designed for general-purpose switching circuits and DC to VHF amplifier applications.

- Choice of Ceramic or Plastic Package
- DC Current Gain Specified – 10 to 500 mAdc
- Low Collector-Cutoff Current –
 $I_{CBO} = 10 \text{ nAdc (Max) @ } V_{CB} = 50 \text{ Vdc}$
- High Collector Breakdown Voltages –
 $BV_{CEO} = 40 \text{ Vdc (Min) } BV_{CBO} = 60 \text{ Vdc (Min)}$
- Transistors Similar to 2N2218 thru 2N2222 Series
- TO-116 Packaging – Compact Size Compatible With IC Automatic Insertion Equipment

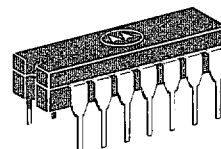
**QUAD DUAL-IN-LINE
NPN SILICON
GENERAL-PURPOSE
TRANSISTORS**

CONNECTION DIAGRAM



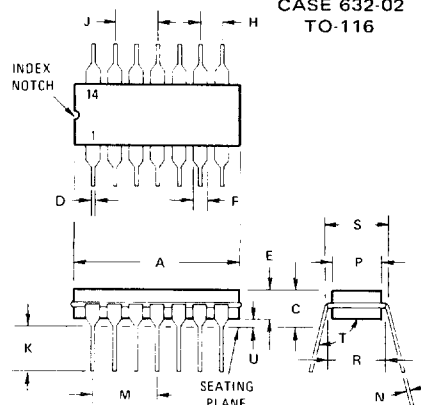
MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V_{CEO}	40		Vdc
Collector-Base Voltage	V_{CB}	60		Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current – Continuous	I_C	500		mAdc
		Each Transistor	Total Device	
Total Device Dissipation @ $T_A = 25^{\circ}\text{C}$	P_D	0.65	1.9	Watts
Derate above 25°C MHQ2221, MHQ2222 MPQ2221, MPQ2222		3.72 6.5	10.88 19	mW/ $^{\circ}\text{C}$
Operating and Storage Junction Temperature Range MHQ2221,22 MPQ2221,22	T_J, T_{stg}	-65 to +200 -55 to +125		$^{\circ}\text{C}$



MHQ2221, MHQ2222

CERAMIC
CASE 632-02
TO-116



Weight 1.954 grams

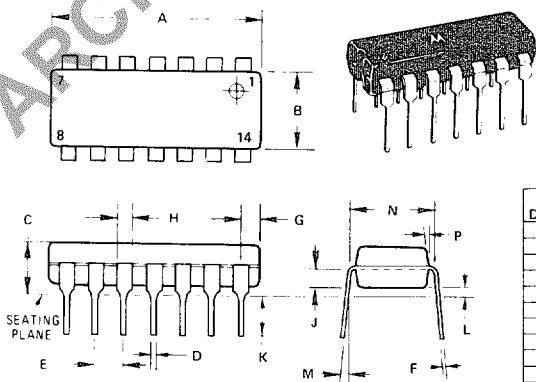
DIM	MIN	MAX	MIN	MAX
A	0.660	0.780	17.400	19.900
B	0.200	0.200	5.080	5.080
C	0.015	0.023	0.381	0.584
D	0.030	0.070	0.770	1.770
E	0.090	0.110	2.290	2.790
F	0.190	0.210	4.830	5.330
G	0.100	0.100	2.540	2.540
H	0.290	0.310	7.370	7.870
J	0.008	0.015	0.203	0.381
K	0.220	0.280	5.593	7.110
L	0.290	0.310	7.370	7.870
M	0.325	0.325	8.260	8.260
N	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.

MPQ2221, MPQ2222

PLASTIC
CASE 646
TO-116



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

Weight ~ 0.911 gram

DIM	MIN	MAX	MIN	MAX
A	0.710	0.740	18.030	18.790
B	0.240	0.260	6.090	6.600
C	0.160	0.180	4.060	4.570
D	0.015	0.020	0.381	0.508
E	0.100 TYP	0.100 TYP	2.54 TYP	2.54 TYP
F	0.009	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	3.430
L	0.025	0.035	0.635	0.889
M	0°	10°	0°	10°
N	0.290	0.310	7.360	7.870
P	70° TYP	70° TYP	70° TYP	70° TYP

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(1) ($I_C = 10\text{ mA}$, $I_B = 0$)	BV_{CEO}	40	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{A}$, $I_E = 0$)	BV_{CBO}	60	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{A}$, $I_C = 0$)	BV_{EBO}	5.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	50	nAdc
Emitter Cutoff Current ($V_{BE} = 3.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	—	50	nAdc

ON CHARACTERISTICS

DC Current Gain(1) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	MHQ2221, MPQ2221	35	—	—	—
		MHQ2222, MPQ2222	75	—	—	—
($I_C = 150\text{ mA}$, $V_{CE} = 10\text{ Vdc}$)		MHQ2221, MPQ2221	40	—	—	—
		MHQ2222, MPQ2222	100	—	—	—
($I_C = 300\text{ mA}$, $V_{CE} = 10\text{ Vdc}$)		MHQ2221, MPQ2221	20	—	—	—
		MHQ2222, MPQ2222	30	—	—	—
Collector-Emitter Saturation Voltage ($I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$) ($I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$)	$V_{CE(sat)}$		—	—	0.4 1.6	Vdc
Base-Emitter Saturation Voltage ($I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$) ($I_C = 300\text{ mA}$, $I_B = 30\text{ mA}$)	$V_{BE(sat)}$		—	—	1.3 2.6	Vdc

DYNAMIC CHARACTERISTICS

Current-Gain-Bandwidth Product ($I_C = 20\text{ mA}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	200	350	—	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)	C_{ob}	—	4.5	8.0	—	pF
Input Capacitance ($V_{BE} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 100\text{ kHz}$)	C_{ib}	—	17	30	—	pF

SWITCHING CHARACTERISTICS (Figure 1)

Turn-On Time ($V_{CC} = 30\text{ Vdc}$, $V_{BE(off)} = 0.5\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$) (Figure 1)	t_{on}	—	25	—	—	ns
Turn-Off Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = I_{B2} = 15\text{ mA}$) (Figure 2)	t_{off}	—	250	—	—	ns

(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle = 2%.

FIGURE 1 — DELAY AND RISE TIME EQUIVALENT TEST CIRCUIT

GENERATOR RISE TIME $\leq 2.0\text{ ns}$
 PW $\leq 200\text{ ns}$
 DUTY CYCLE = 2.0%

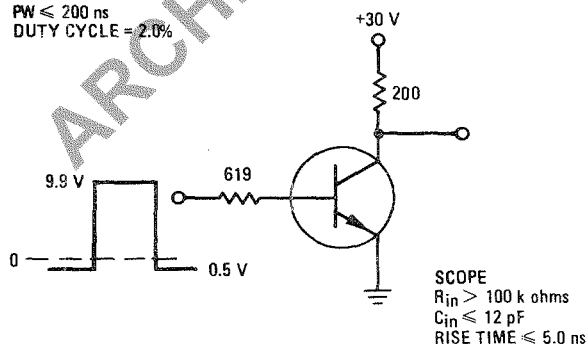
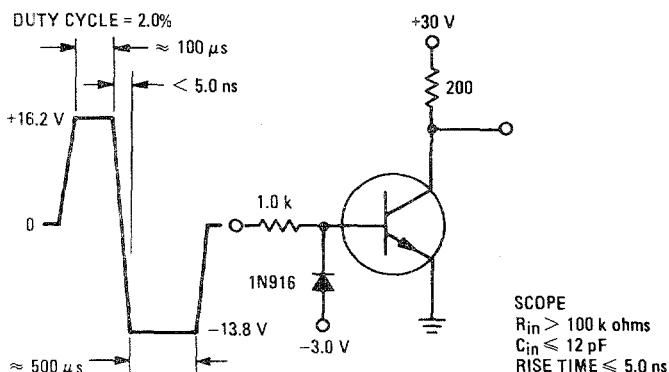


FIGURE 2 — STORAGE TIME AND FALL TIME EQUIVALENT TEST CIRCUIT



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