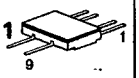
MD6001, F MD6002, F MD6003, MQ6001

MD6001, MD6002, MD6003
CASE 654-07, STYLE 5
DUAL

MD6001F, MD6002F
CASE 610A-04, STYLE 1
DUAL



MQ6001
CASE 607-04, STYLE 1
QUAD

COMPLEMENTARY GENERAL PURPOSE TRANSISTORS
NPN/PNP SILICON

MAXIMUM RATINGS

Rating	Symbol	MD6003 MD6003F	MD6001,F MD6002,F MQ6001,2	Unit
Collector-Emitter Voltage	V_{CEO}	30		Vdc
Collector-Base Voltage	V_{CBO}	50	60	Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	500		mAdc
		One Die	All Die Equal Power	
Total Device Dissipation @ T_A = 25°C	P_D			mW
MD6001,2,3		575	625	
MD6001F,2F		350	400	
MQ6001		400	600	
Derate above 25°C				
MD6001,2,3		3.29	3.57	mW/°C
MD6001F,2F		2.0	2.28	
MQ6001		2.28	3.42	
Total Device Dissipation @ T_C = 25°C	P_D			Watts
MD6001,2,3		1.8	2.5	
MD6001F,2F		1.0	2.0	
MQ6001		0.9	3.6	
Derate above 25°C				mW/°C
MD6001,2,3		10.3	14.3	
MD6001F,2F		5.71	11.4	
MQ6001		5.13	20.5	
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200		°C

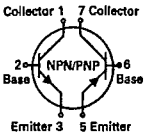
THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$			°C/W
MD6001,2,3		97	70	
MD6001F,2F		175	87.5	
MQ6001		195	48.8	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$(1)			°C
MD6001,2,3		304	280	
MD6001F,2F		500	438	
MQ6001		438	292	
		Junction to Ambient	Junction to Case	
Coupling Factor				%
MD6001,2,3		84	44	
MD6001F,2F		75	0	
MQ6001 (Q1-Q2)		57	0	
(Q1-Q3 or Q1-Q4)		55	0	

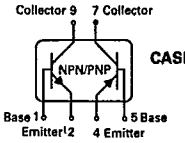
(1) $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

PIN CONNECTION DIAGRAMS

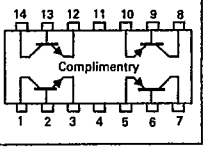
CASE 654-07, STYLE 5



CASE 610A-04, STYLE 1



CASE 607-04, STYLE 1



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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(2) (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0) MD6003	$V_{(BR)CBO}$	50	—	—	Vdc
MD6001,F, MD6002,F, MQ6001, MQ6002		60	—	—	
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Base Cutoff Current	I_{BEV}				nAdc
(V_{CE} = 30 Vdc, V_{BE} = 3.0 Vdc) MD6003		—	—	50	
(V_{CE} = 50 Vdc, V_{EB} = 3.0 Vdc) MD6001,F,2,F,		—	—	30	

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

Characteristic		Symbol	Min	Typ	Max	Unit
Collector Cutoff Current		I_{CEV}				
(V_{CE} = 30 Vdc, $V_{BE(off)}$ = 3.0 Vdc)	MD6003		—	—	30	nAdc
(V_{CE} = 50 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	MD6001,F,2,F, MQ6001		—	—	20	nAdc
(V_{CE} = 50 Vdc, $V_{EB(off)}$ = 3.0 Vdc, T_A = 150°C)	MD6001,F,2,F, MQ6001		—	—	30	μAdc
Collector Cutoff Current		I_{CBO}				
(V_{CB} = 40 Vdc, I_E = 0)	MD6003,F		—	—	100	nA
ON CHARACTERISTICS(2)						
DC Current Gain		h_{FE}				—
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		20	80	—	
	MD6002,F		35	70	—	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		25	90	—	
	MD6003		40	70	—	
	MQ6002,F		50	100	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		35	70	—	
	MD6002,F		75	110	—	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		40	—	120	
	MD6003		70	110	—	
	MD6002,F		100	200	300	
(I_C = 300 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		20	—	—	
	All Other Devices		30	90	—	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	MD6001,F, MQ6001		20	80	—	
	MD6002,F		50	—	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	All Devices		—	0.3	0.4	
(I_C = 300 mAdc, I_B = 30 mAdc)	MD6001, MD6002,F, MQ6001		—	0.59	1.4	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$				Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	All Devices		—	1.02	1.3	
(I_C = 300 mAdc, I_B = 30 mAdc)	MD6001, MD6002,F, MQ6001		—	1.25	2.0	

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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FIGURE 1 – DC CURRENT GAIN

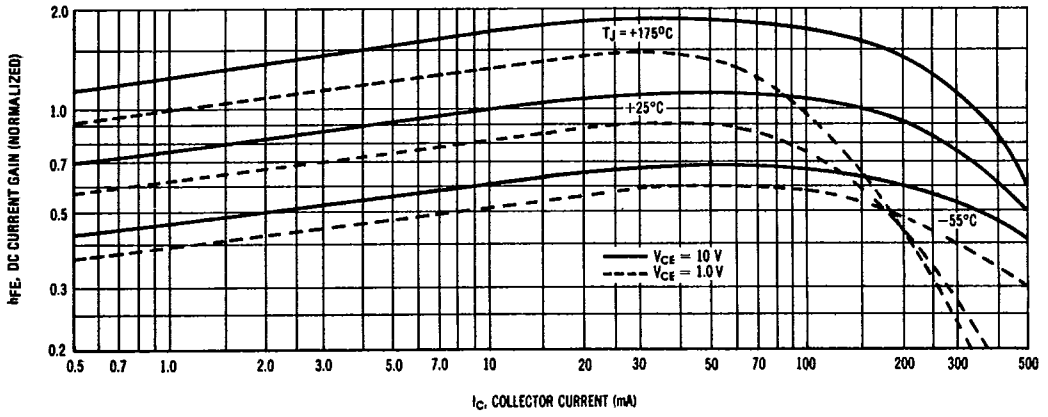


FIGURE 2 – "ON" VOLTAGES

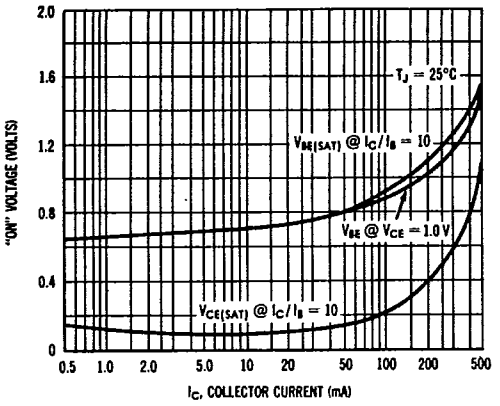
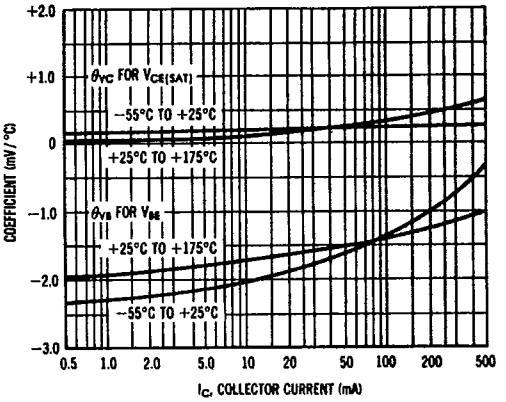


FIGURE 3 – TEMPERATURE COEFFICIENTS



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NOISE FIGURE

V_{CE} = 10 V, T_A = 25°C

FIGURE 4 – FREQUENCY EFFECTS

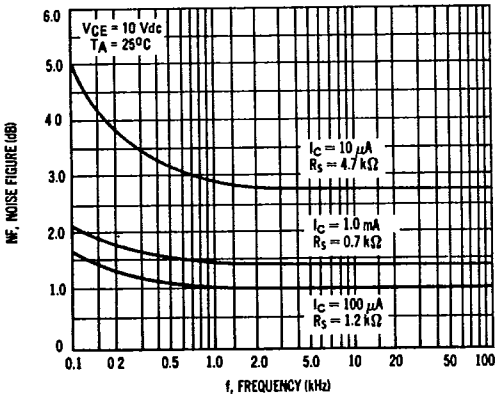

FIGURE 5 – SOURCE RESISTANCE EFFECTS

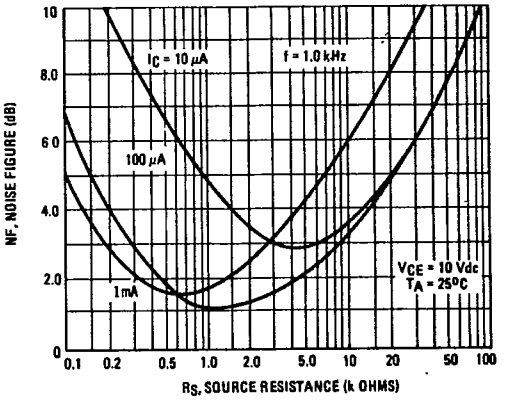

FIGURE 6 – CURRENT-GAIN BANDWIDTH PRODUCT

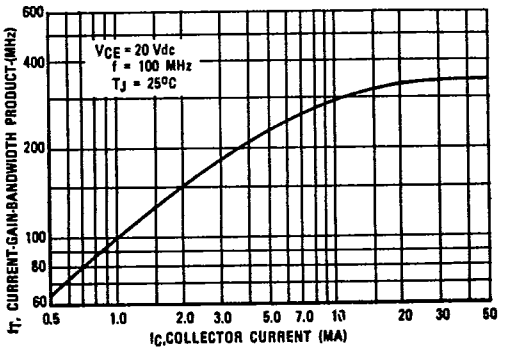

FIGURE 7 – CAPACITANCE

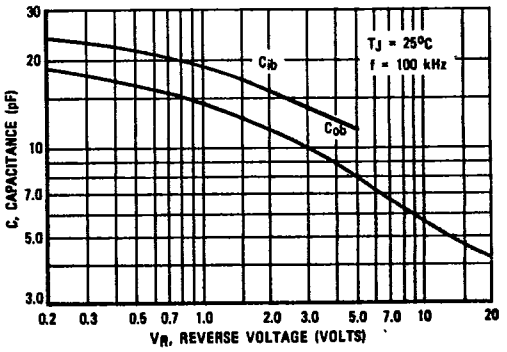

FIGURE 8 – TURN ON TIME

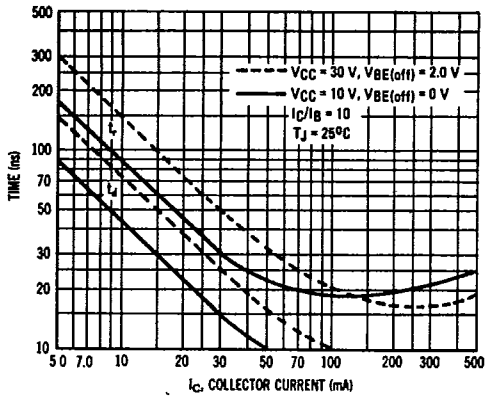

FIGURE 9 – CHARGE DATA

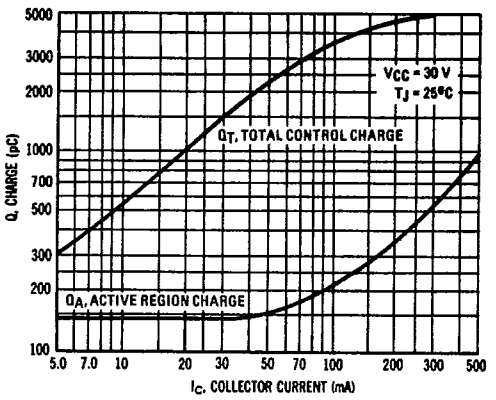

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FIGURE 10 – STORAGE TIME

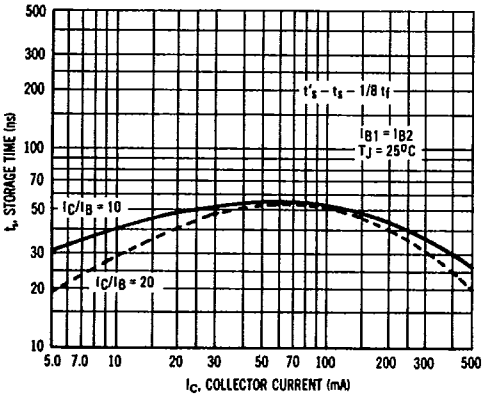


FIGURE 11 – FALL TIME

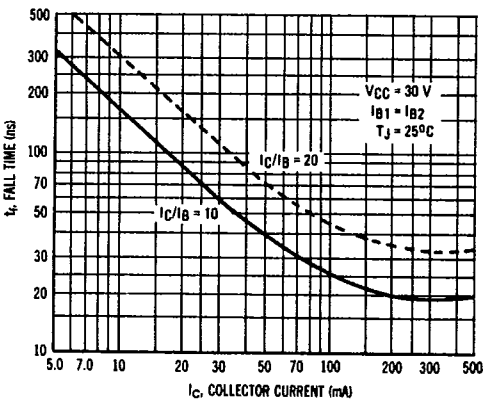


FIGURE 12 – DELAY AND RISE TIME TEST CIRCUIT

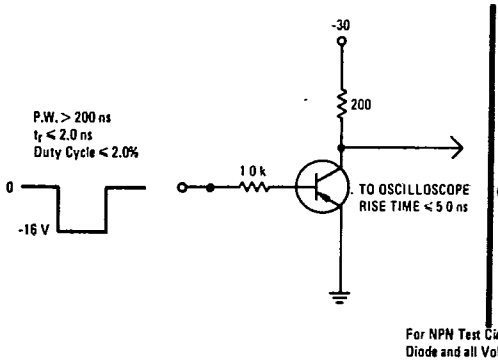
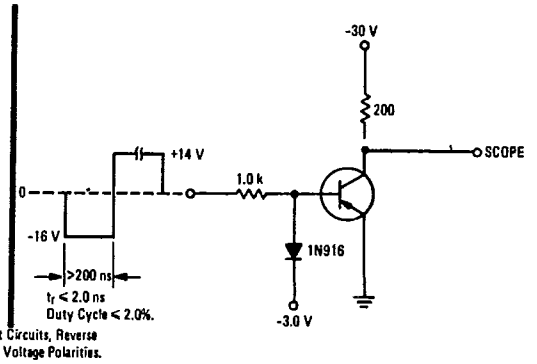


FIGURE 13 – STORAGE AND FALL TIME TEST CIRCUIT



For NPN Test Circuits, Reverse Diode and all Voltage Polarities.