

MAXIMUM RATINGS

Rating	Symbol	MD2904 MD2905	MD2904A,AF MD2905A,AF	Unit
		MQ2904	MQ2905A	
Collector-Emitter Voltage	V _{CEO}	40	60	Vdc
Collector-Base Voltage	V _{CBO}	60		Vdc
Emitter-Base Voltage	V _{EBO}	5.0		Vdc
Collector Current — Continuous	I _C	600		mAdc
Total Device Dissipation @ T _A = 25°C	P _D	One Die	All Die Equal Power	mW
MD2904, A, MD2905, A		575	625	mW/°C
MD2904F, AF, MD2905F, AF		350	400	
MQ2904, MQ2905A		400	600	
Derate above 25°C				
MD2904, A, MD2905, A		3.29	3.57	
MD2904, F, AF, MD2905, AF		2.0	2.28	
MQ2904, MQ2905A		2.28	3.42	
Total Device Dissipation @ T _C = 25°C	P _D			Watts
MD2904, A, MD2905, A		1.8	2.5	mW/°C
MD2904F, AF, MD2905F, AF		1.0	2.0	
MQ2904, MQ2905A		0.9	3.6	
Derate above 25°C				
MD2904, A, MD2905, A		10.3	14.3	
MD2904F, AF, MD2905F, AF		5.71	11.4	
MQ2904, MQ2905A		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 MD2904, A, MD2905, A MD2904, AF, MD2905, AF MQ2904, MQ2905A	R _{θJC}	97	70	°C/W
		175	87.5	
		195	48.8	
Thermal Resistance, Junction to Ambient MD2904, A, MD2905, A MD2904, AF, MD2905, AF MQ2904, MQ2905A	R _{θJA} (1)	304	280	°C/W
		500	438	
		438	292	
		Junction to Ambient	Junction to Case	
Coupling Factor MD2904, A, MD2905, A MD2904, AF, MD2905, AF MQ2904, MQ2905A (Q1-Q2) (Q1-Q3 or Q1-Q4)		84 75 57 55	44 0 0 0	%


(1) R_{θJA} is measured with the device soldered into a typical printed circuit board.

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}	40 60	—	—	Vdc
Collector-Base Breakdown Voltage (I _C = 10 μAdc, I _E = 0)	V _{(BR)CBO}	60	—	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	5.0	—	—	Vdc
Collector Cutoff Current (V _{CB} = 50 Vdc, I _E = 0) (V _{CB} = 50 Vdc, I _E = 0, T _A = 150°C)	I _{CBO}	—	—	0.020 30	μAdc

**MD2904, A, AF
MD2905, A, AF
MQ2904, MQ2905A**


MD2904, A
MD2905, A
CASE 654-07, STYLE 1
DUAL



MD2904, AF
MD2905, AF
CASE 610A-04, STYLE 1
DUAL



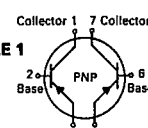
MQ2904
MQ2905A
CASE 607-04, STYLE 1
QUAD



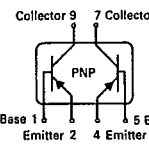
AMPLIFIER TRANSISTORS
PNP SILICON

PIN CONNECTION DIAGRAMS

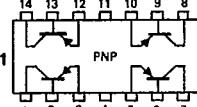
CASE 654-07, STYLE 1



CASE 610A-04, STYLE 1



CASE 607-04, STYLE 1



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

Characteristic	Symbol	Min	Typ	Max	Unit
Emitter Cutoff Current ($V_{BE} = 3.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	—	30	nAdc

ON CHARACTERISTICS(2)

DC Current Gain	Symbol	Min	Typ	Max	Unit
($I_C = 0.1\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD2904	20	50	—	—
	MD2904A	40	70	—	—
	MD2905	35	70	—	—
	MD2905A	75	150	—	—
($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD2904	25	75	—	—
	MD2904A	40	75	—	—
	MD2905	50	100	—	—
	MD2905A	100	175	—	—
($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD2904	35	90	—	—
	MD2904A	40	90	—	—
	MD2905	75	110	—	—
	MD2905A	100	200	—	—
($I_C = 150\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD2904,A, MD2905,A	40 100	90 200	120 300	—
	MD2904 MD2904A MD2905 MD2905A	20 40 30 50	60 80 130 150	— — — —	—
Collector-Emitter Saturation Voltage ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	$V_{CE(sat)}$	—	0.25	0.4	Vdc
		—	0.5	1.6	Vdc
Base-Emitter Saturation Voltage ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	$V_{BE(sat)}$	—	0.88	1.3	Vdc
		—	1.0	2.6	Vdc

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SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product(3) ($I_C = 50\text{ mAdc}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	200	320	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)	C_{obo}	—	5.8	8.0	pF
Input Capacitance ($V_{BE} = 2.0\text{ Vdc}$, $I_C = 0$, $f = 100\text{ kHz}$)	C_{ibo}	—	16	30	pF

SWITCHING CHARACTERISTICS

Turn-On Time	($V_{CC} = 30\text{ Vdc}$, $V_{BE} = 0.5\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$)	t_{on}	—	—	45	ns
Delay Time		t_d	—	—	12	ns
Rise Time		t_r	—	—	35	ns
Turn-Off Time	($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$)	t_{off}	—	—	130	ns
Storage Time		t_s	—	—	100	ns
Fall Time		t_f	—	—	40	ns

(2) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

(3) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

MD2904, A, AF, MD2905, A, AF, MQ2904, MQ2905A

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FIGURE 1 - DC CURRENT GAIN

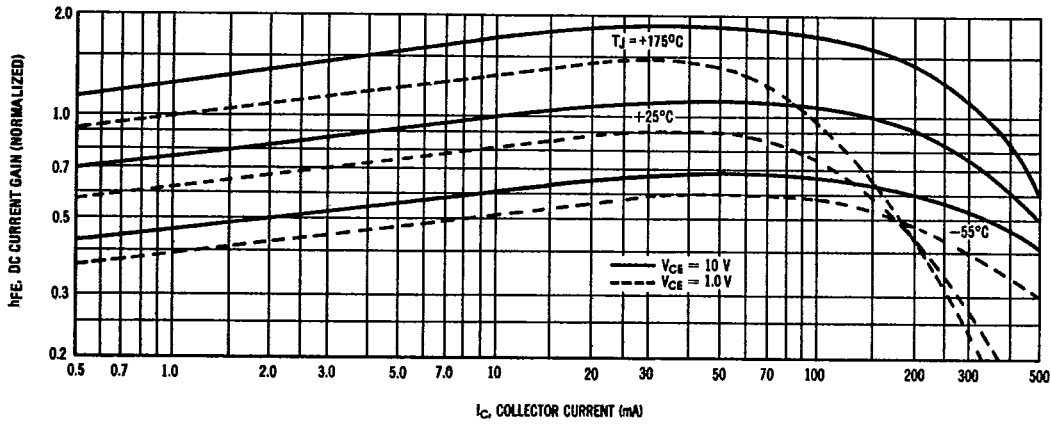


FIGURE 2 - "ON" VOLTAGES

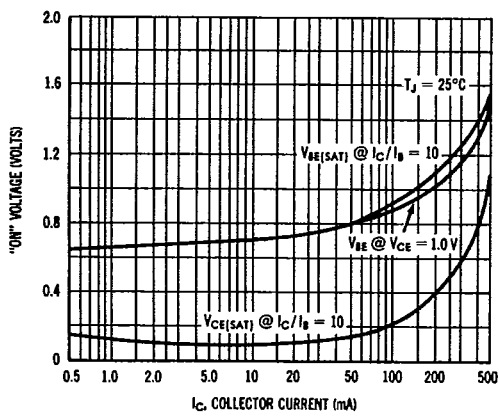
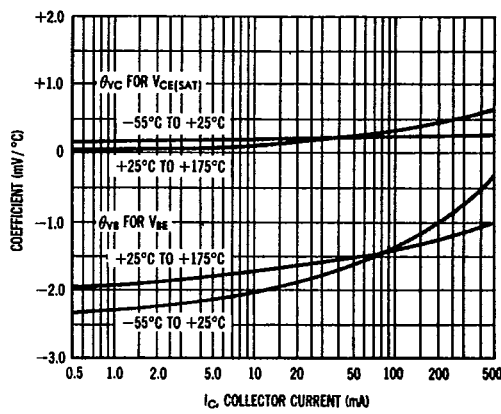


FIGURE 3 - TEMPERATURE COEFFICIENTS



NOISE FIGURE
 $V_{CE} = 10\text{ V}, T_A = 25^\circ\text{C}$

FIGURE 4 - FREQUENCY EFFECTS

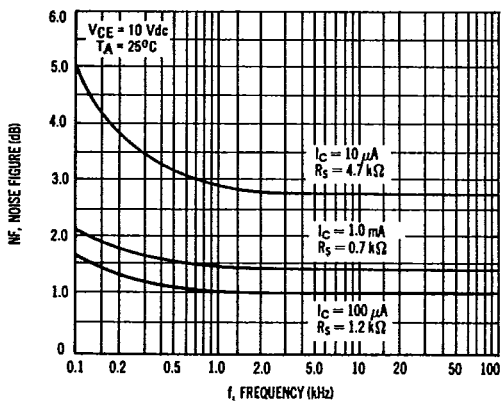


FIGURE 5 - SOURCE RESISTANCE EFFECTS

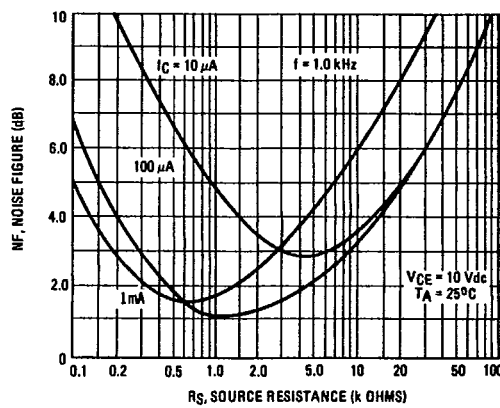


FIGURE 6 - CURRENT-GAIN BANDWIDTH PRODUCT

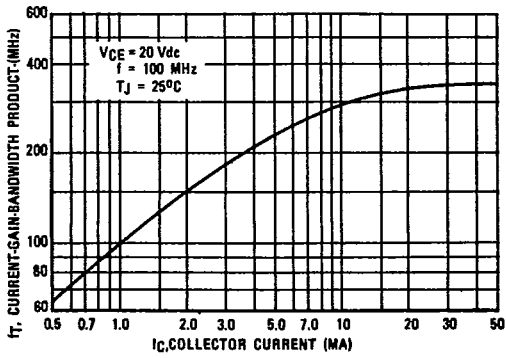
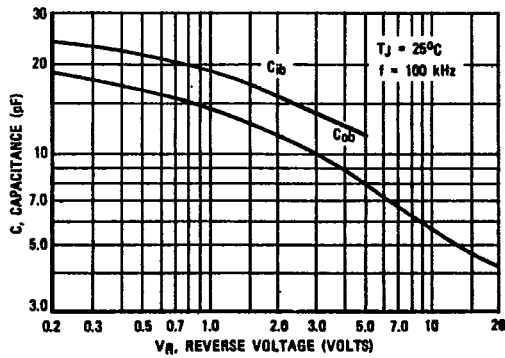


FIGURE 7 - CAPACITANCE



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FIGURE 8 - TURN ON TIME

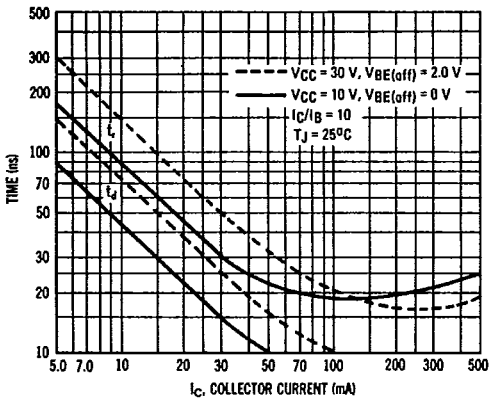
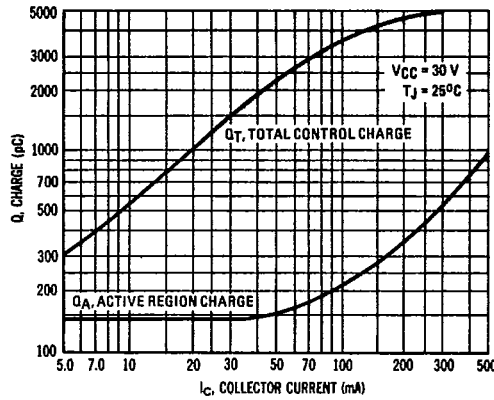


FIGURE 9 - CHARGE DATA



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FIGURE 10 - STORAGE TIME

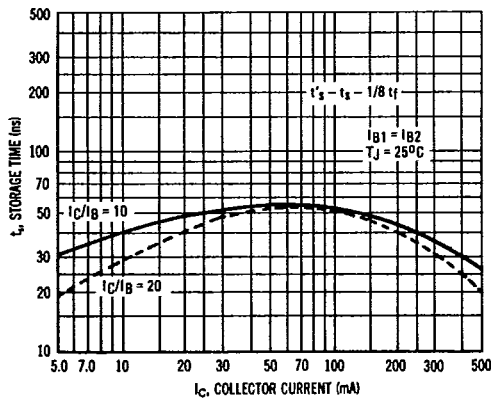
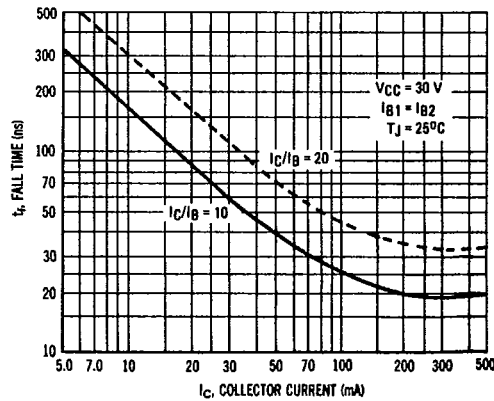


FIGURE 11 - FALL TIME



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FIGURE 12 - DELAY AND RISE TIME TEST CIRCUIT

P.W. > 200 ns
 $t_r \leq 2.0$ ns
Duty Cycle < 2.0%.

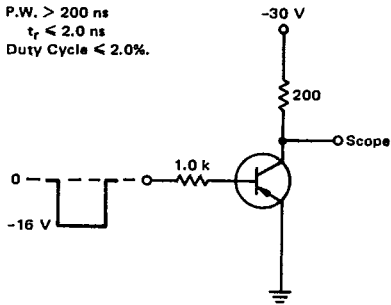
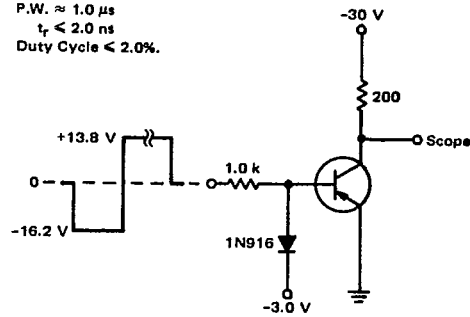


FIGURE 13 - STORAGE AND FALL TIME TEST CIRCUIT

P.W. $\approx 1.0 \mu$ s
 $t_r \leq 2.0$ ns
Duty Cycle < 2.0%.



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