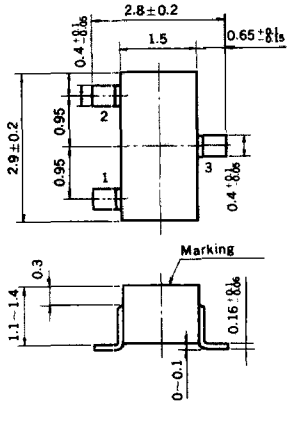
SILICON TRANSISTOR
NTM3904

GENERAL PURPOSE SWITCHING AND AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
MINI MOLD

DESCRIPTION

The NTM3904 is designed for general purpose switching and amplifier application, especially Hybrid Integrated Circuit.

PACKAGE DIMENSIONS
in millimeters



1. Emitter
2. Base
3. Collector

Marking B25

FEATURES

- Complementary to NTM3906.
- High voltage : $V_{CEO} > 40$ V
- High DC current gain : $h_{FE} = 100$ to 300 ($V_{CE} = 1.0$ V, $I_C = 10$ mA)
- Electrically similar to 2N3904.

ABSOLUTE MAXIMUM RATINGS

Maximum Voltages and Current (T_a=25 °C)			
Collector to Base Voltage ($R_{BE} = \infty$)	V_{CBO}	60	V
Collector to Emitter Voltage (Open Base)	V_{CEO}	40	V
Emitter to Base Voltage	V_{EBO}	6.0	V
Collector Current (DC)	I_C	200	mA
Maximum Power Dissipation (T_a=25 °C)			
Total Power Dissipation	P_T	200	mW
Maximum Temperatures			
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C

ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

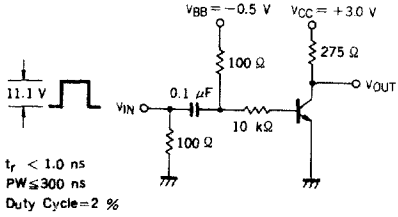
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Collector-Base Breakdown Voltage	BV_{CBO}	60		V	I_C = 10 μA, I_E = 0
Collector-Emitter Breakdown Voltage	BV_{CEO}*	40		V	I_C = 1.0 mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0		V	I_E = −10 μA, I_C = 0
Collector Cutoff Current	I_{CEX}		50	nA	V_{CE} = 30 V, V_{BE} = −3.0 V
Emitter Cutoff Current	I_{EBO}		50	nA	V_{EB} = 3.0 V, I_E = 0
DC Current Gain	h_{FE1}*	40			V_{CE} = 1.0 V, I_C = 100 μA
	h_{FE2}*	70			V_{CE} = 1.0 V, I_C = 1.0 mA
	h_{FE3}*	100	300		V_{CE} = 1.0 V, I_C = 10 mA
	h_{FE4}*	60			V_{CE} = 1.0 V, I_C = 50 mA
	h_{FE5}*	30			V_{CE} = 1.0 V, I_C = 100 mA
Collector Saturation Voltage	$V_{CE(sat)1}$*		0.2	V	I_C = 10 mA, I_B = 1.0 mA
	$V_{CE(sat)2}$*		0.3	V	I_C = 50 mA, I_B = 5.0 mA
Base Saturation Voltage	$V_{BE(sat)1}$*	0.65	0.85	V	I_C = 10 mA, I_B = 1.0 mA
	$V_{BE(sat)2}$*		0.95	V	I_C = 50 mA, I_B = 5.0 mA
Gain Bandwidth Product	f_T	300		MHz	V_{CE} = 20 V, I_C = 10 mA
Output Capacitance	C_{ob}		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz
Input Capacitance	C_{ib}		8.0	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz

* These parameters must be measured by pulse techniques. PW ≦ 350 μs, Duty Cycle ≦ 2 %

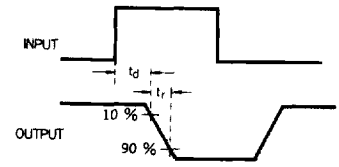
SWITCHING CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Delay Time	t_d		35	ns	V_{CC} = 3.0 V, V_{BB} = −0.5 V
Rise Time	t_r		35	ns	I_C = 10 mA, I_{B1} = 1.0 mA
Storage Time	t_{stg}		200	ns	V_{CC} = 3.0 V, I_C = 10 mA
Fall Time	t_f		50	ns	I_{B1} = −I_{B2} = 1.0 mA

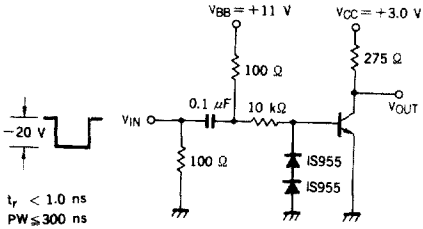
SWITCHING TIME TEST CIRCUIT



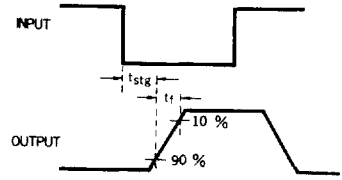
t_{on} SWITCHING



VOLTAGE WAVEFORMS



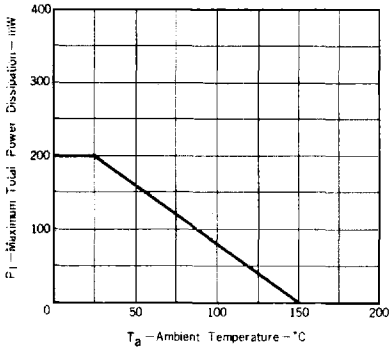
t_{off} SWITCHING



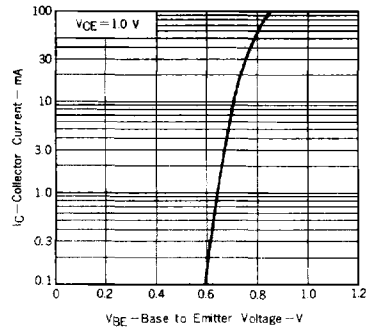
VOLTAGE WAVEFORMS

TYPICAL CHARACTERISTICS (T_a = 25 °C)

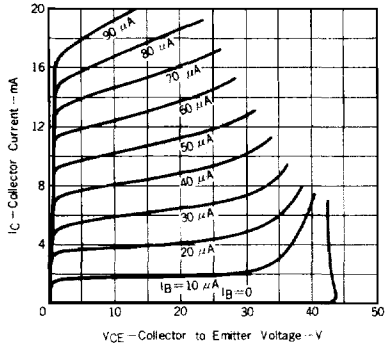
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



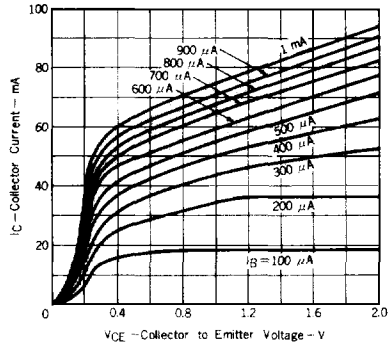
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



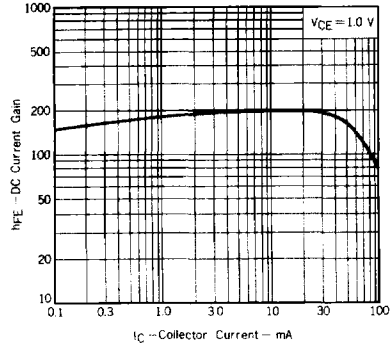
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



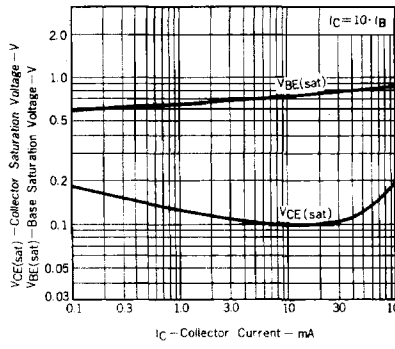
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



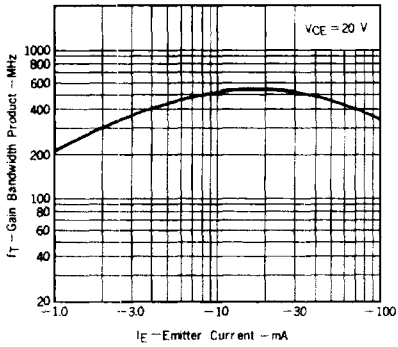
DC CURRENT GAIN vs. COLLECTOR CURRENT



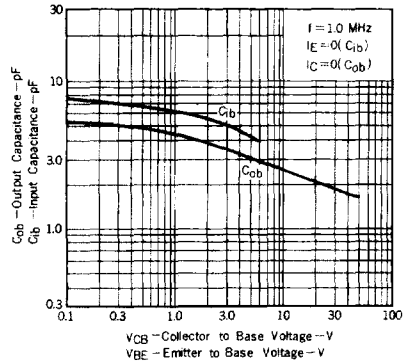
BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



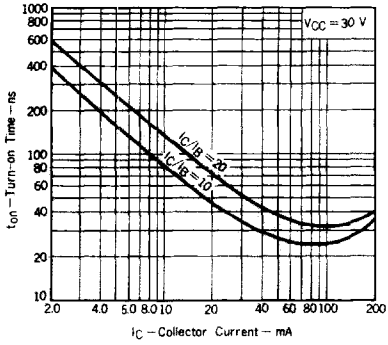
GAIN BANDWIDTH PRODUCT vs. EMITTER CURRENT



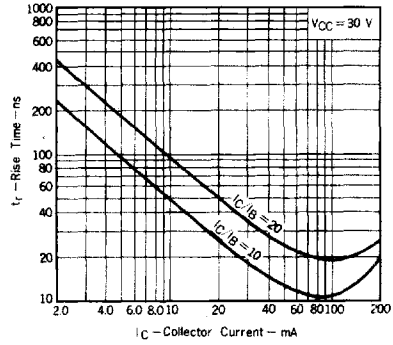
INPUT AND OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



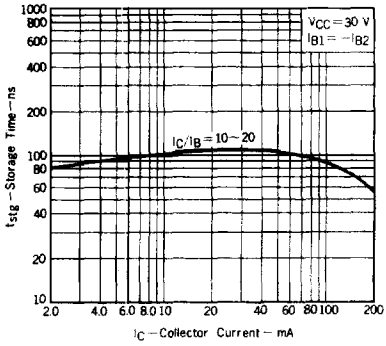
TURN-ON TIME vs. COLLECTOR CURRENT



RISE TIME vs. COLLECTOR CURRENT



STORAGE TIME vs. COLLECTOR CURRENT



FALL TIME vs. COLLECTOR CURRENT