

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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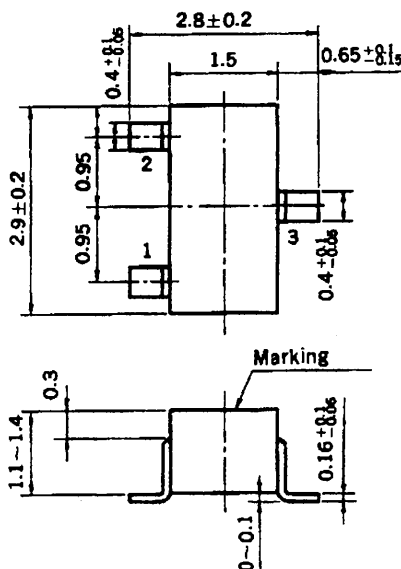
SILICON TRANSISTOR NTM3904

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



FEATURES

- Complementary to NTM3906.
- High voltage : $V_{CE0} > 40$ 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 ($T_a = 25^\circ\text{C}$)

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 ($T_a = 25^\circ\text{C}$)

Total Power Dissipation	P_T	200	mW
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Maximum Temperatures

Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

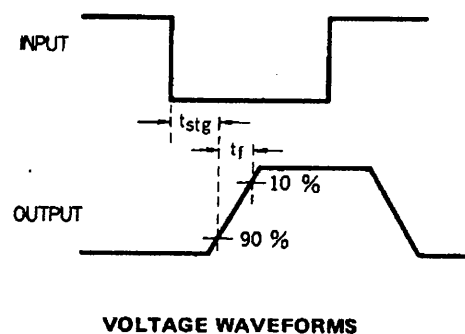
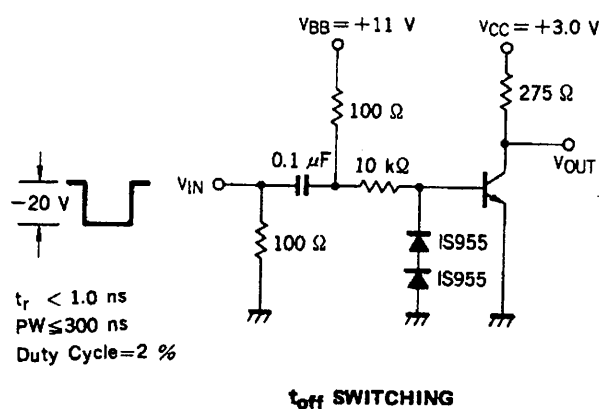
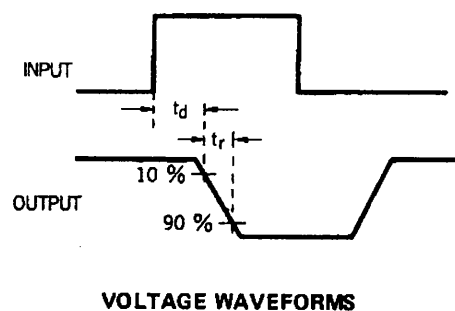
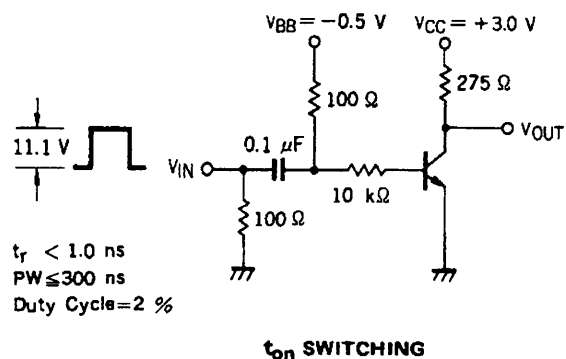
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Collector-Base Breakdown Voltage	BV_{CBO}	60		V	$I_C = 10\ \mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage	BV_{CEO}^*	40		V	$I_C = 1.0\ \text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0		V	$I_E = -10\ \mu\text{A}$, $I_C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

* These parameters must be measured by pulse techniques. $PW \leq 350\ \mu\text{s}$, Duty Cycle $\leq 2\%$

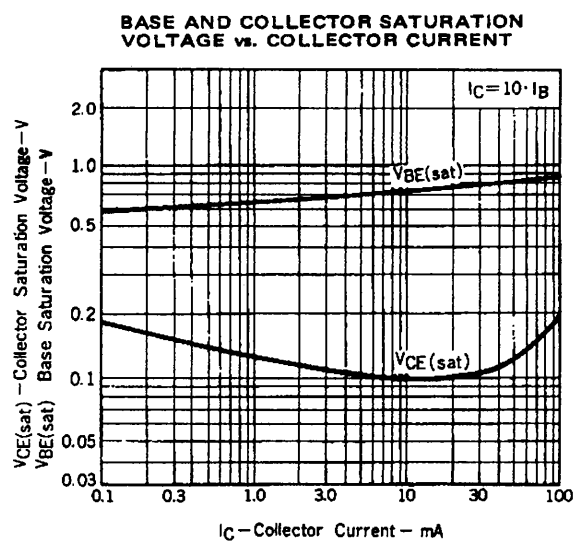
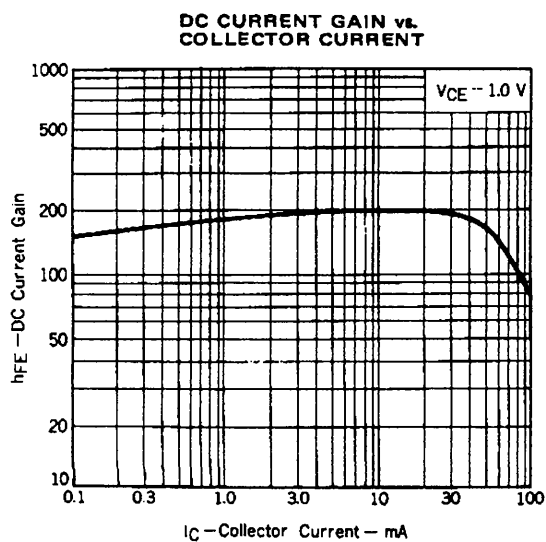
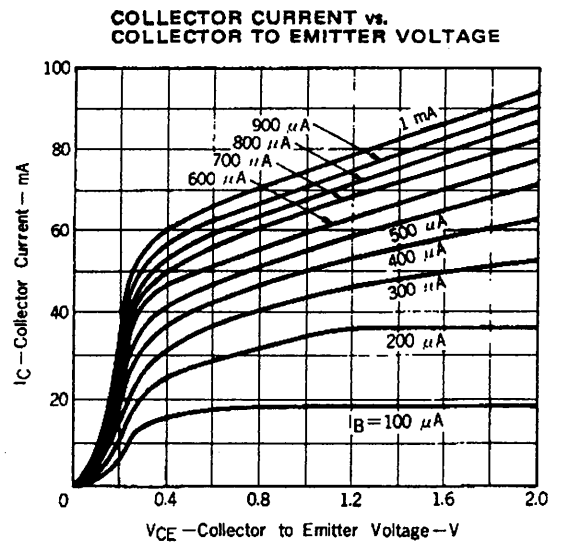
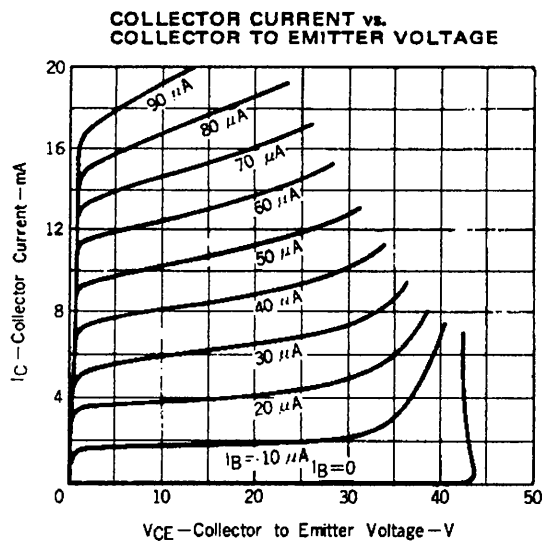
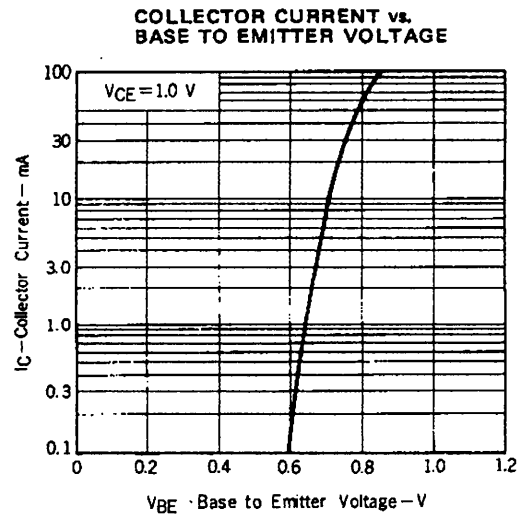
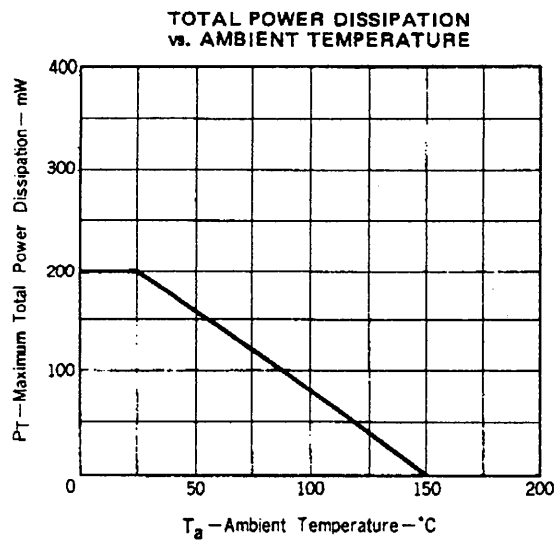
SWITCHING CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

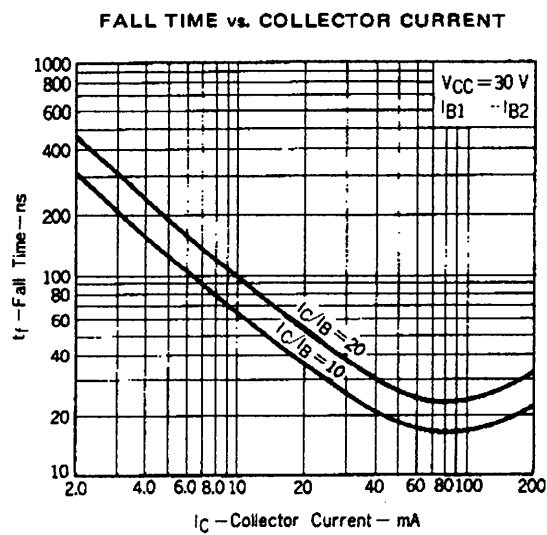
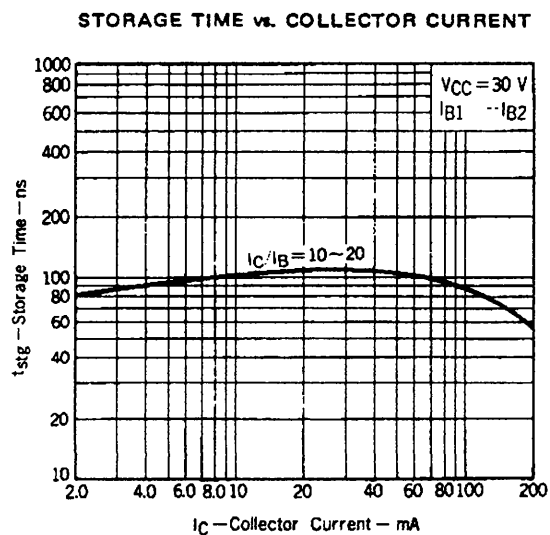
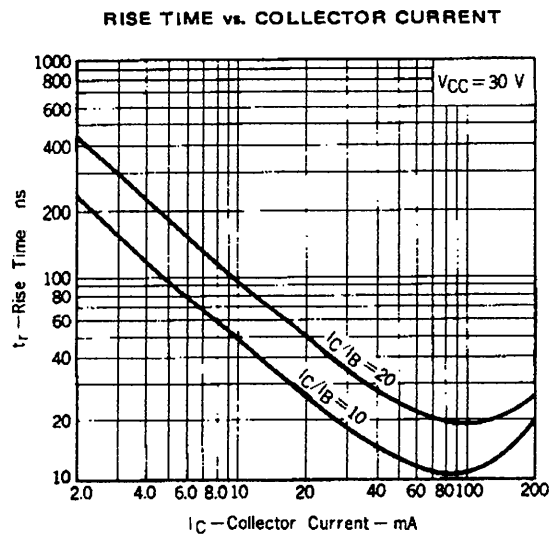
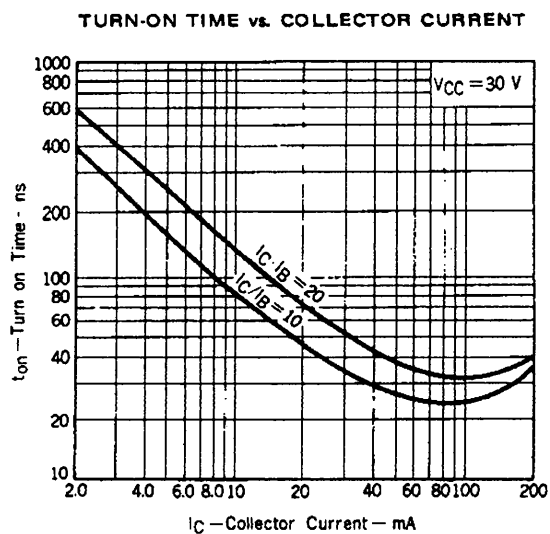
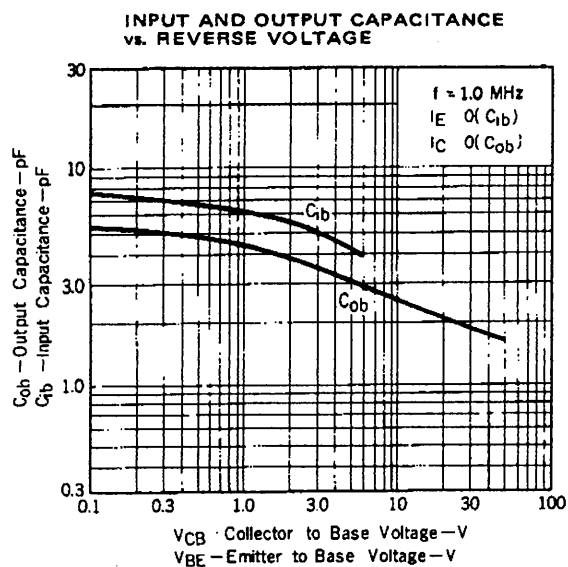
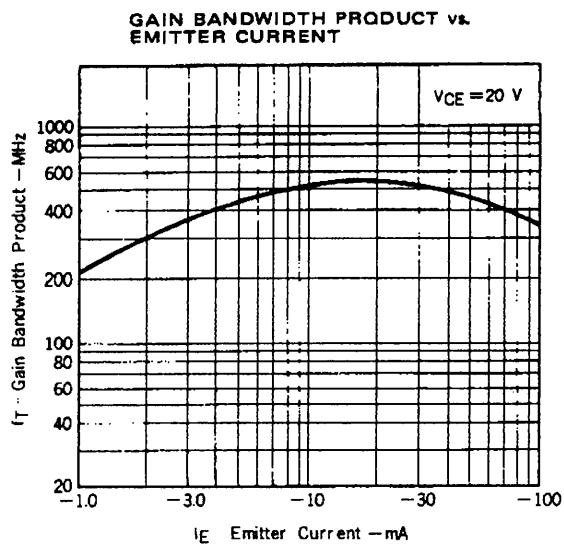
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Delay Time	t_d		35	ns	$V_{CC} = 3.0\text{ V}$, $V_{BB} = -0.5\text{ V}$ $I_C = 10\text{ mA}$, $I_{B1} = 1.0\text{ mA}$
Rise Time	t_r		35	ns	
Storage Time	t_{stg}		200	ns	$V_{CC} = 3.0\text{ V}$, $I_C = 10\text{ mA}$ $I_{B1} = -I_{B2} = 1.0\text{ mA}$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

SWITCHING TIME TEST CIRCUIT



TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)







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