

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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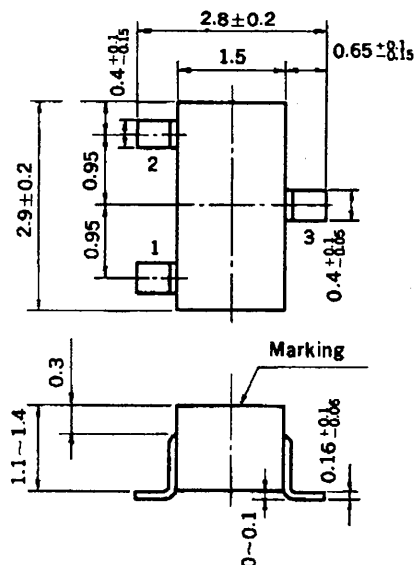
SILICON TRANSISTOR NTM3906

GENERAL PURPOSE SWITCHING AND AMPLIFIER PNP SILICON EPITAXIAL TRANSISTOR MINI MOLD

DESCRIPTION

The NTM3906 is designed for general purpose switching and amplifier application, especially Hybrid Integrated Circuit.

PACKAGE DIMENSIONS in millimeters



FEATURES

- Complementary to NTM3904.
- 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 2N3906.

ABSOLUTE MAXIMUM RATINGS

Maximum Voltages and Current ($T_a = 25^\circ\text{C}$)

Collector to Base Voltage ($R_{BE} = \infty$)	V_{CBO}	-40	V
Collector to Emitter Voltage (Open Base)	V_{CEO}	-40	V
Emitter to Base Voltage	V_{EBO}	-5.0	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 ($T_a = 25^\circ\text{C}$)

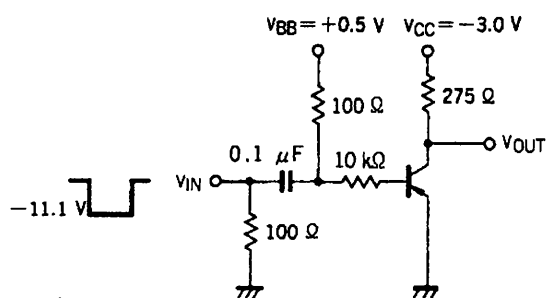
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Collector-Base Breakdown Voltage	BV_{CBO}	-40		V	$I_C = -10\ \mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage	BV_{CEO}^*	-40		V	$I_C = -1.0\ \text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-5.0		V	$I_E = -10\ \mu\text{A}$, $I_C = 0$
Collector Cutoff Current	I_{CEX}		-50	nA	$V_{CE} = -30\ \text{V}$, $V_{BE} = 3.0\ \text{V}$
	I_{CBO}		-50	nA	$V_{EB} = -3.0\ \text{V}$, $I_E = 0$
DC Current Gain	h_{FE1}^*	60			$V_{CE} = -1.0\ \text{V}$, $I_C = -0.1\ \text{mA}$
	h_{FE2}^*	80			$V_{CE} = -1.0\ \text{V}$, $I_C = -1.0\ \text{mA}$
	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	$V_{CE(sat)1}^*$		-0.25	V	$I_C = -10\ \text{mA}$, $I_B = -1.0\ \text{mA}$
	$V_{CE(sat)2}^*$		-0.4	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	250		MHz	$I_C = -10\ \text{mA}$, $V_{CE} = -20\ \text{V}$
Output Capacitance	C_{ob}		4.5	pF	$V_{CB} = -5.0\ \text{V}$, $I_E = 0$, $f = 100\ \text{kHz}$
Input Capacitance	C_{ib}		10	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 ($T_a = 25^\circ\text{C}$)

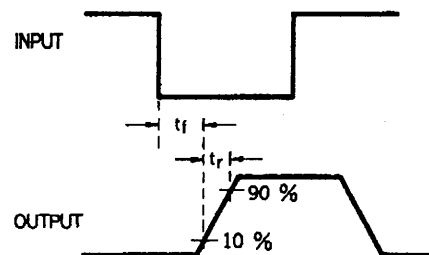
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
Delay Time	t_d		35	ns	$V_{CC} = -3.0\text{ V}$, $V_{BE} = 0.5\text{ V}$ $I_C = -10\text{ mA}$, $I_{B1} = -1.0\text{ mA}$
Rise Time	t_r		35	ns	
Storage Time	t_{stg}		225	ns	$V_{CC} = -3.0\text{ V}$, $I_C = -10\text{ mA}$ $I_{B1} = -I_{B2} = -1.0\text{ mA}$
Fall Time	t_f		75	ns	

SWITCHING TIME TEST CIRCUIT

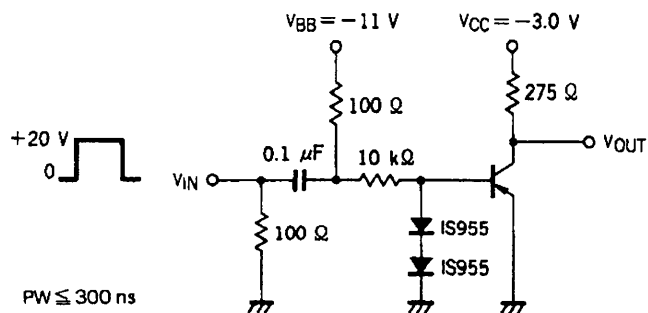


$PW \leq 300\text{ ns}$
 $t_r < 1.0\text{ ns}$
 $Z_{IN} = 50\ \Omega$
 Duty Cycle = 2 %

t_{on} SWITCHING

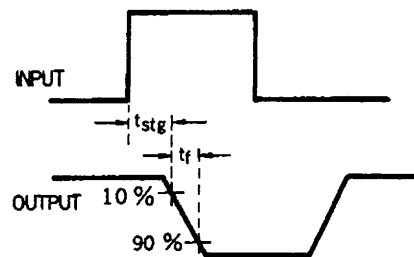


VOLTAGE WAVEFORMS



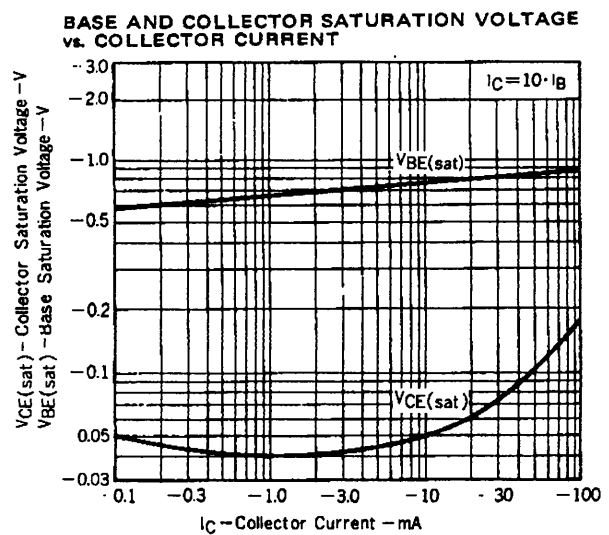
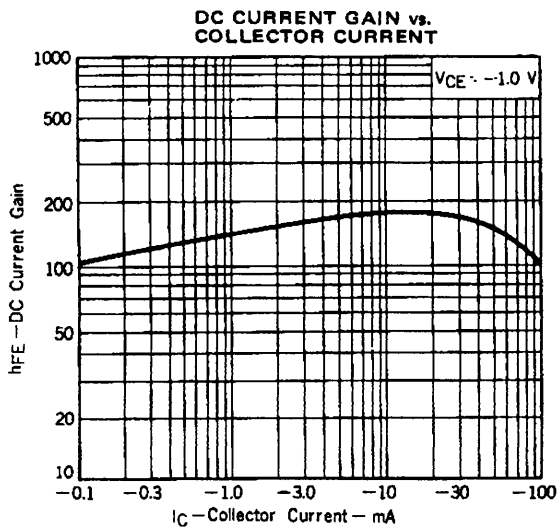
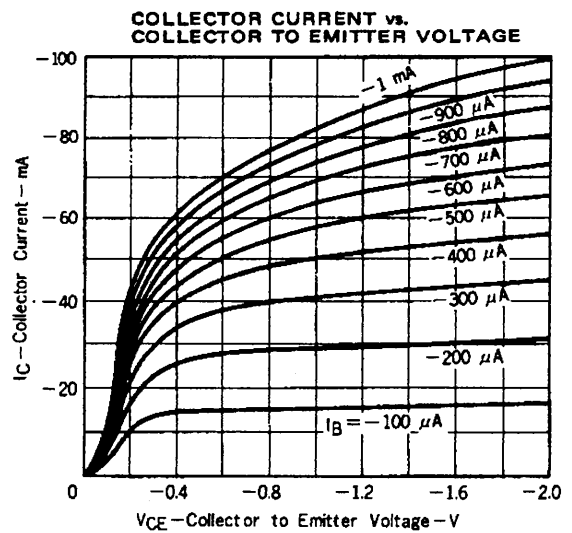
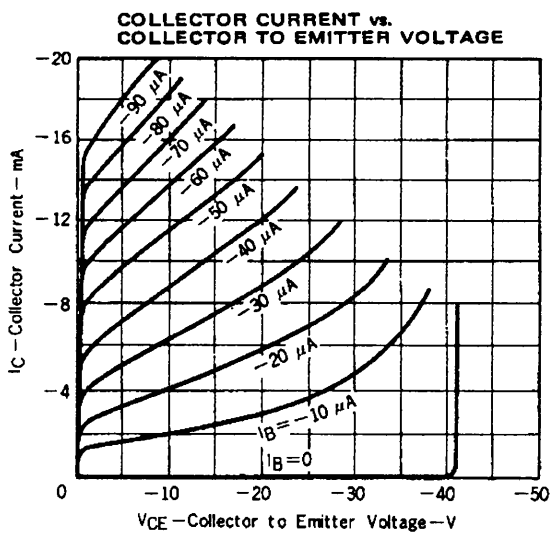
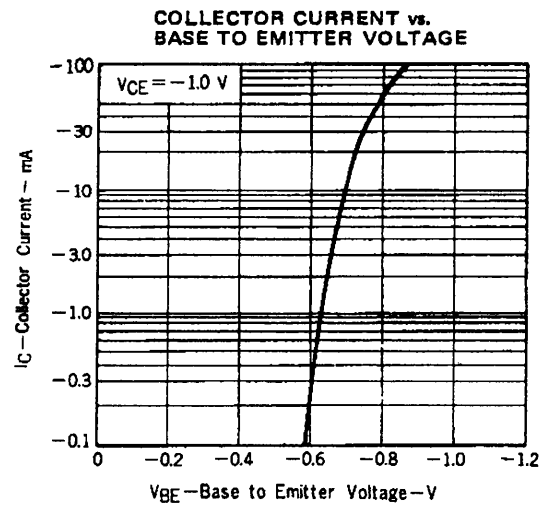
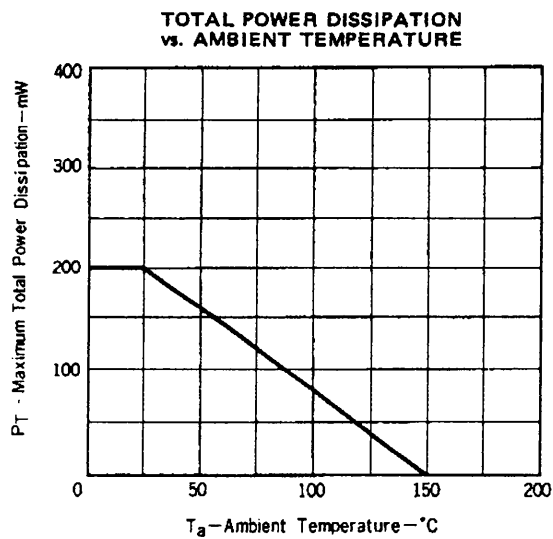
$PW \leq 300\text{ ns}$
 $t_r < 1.0\text{ ns}$
 Duty Cycle = 2 %

t_{off} SWITCHING

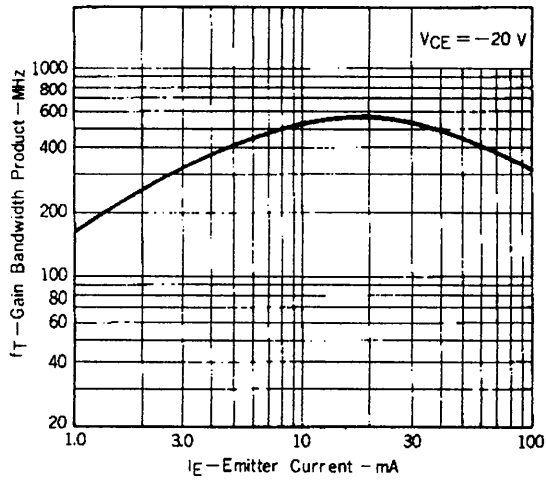


VOLTAGE WAVEFORMS

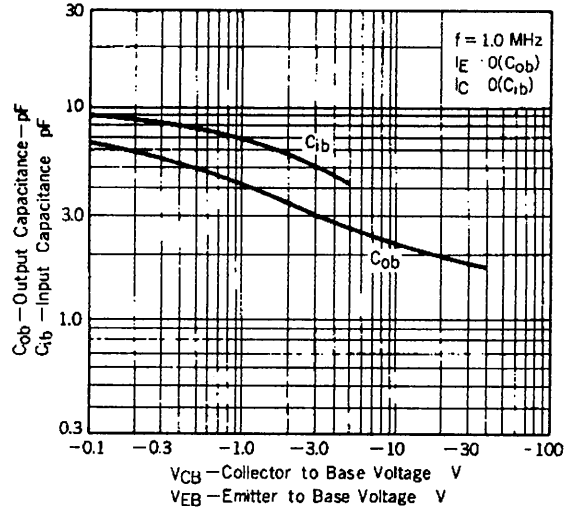
TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)



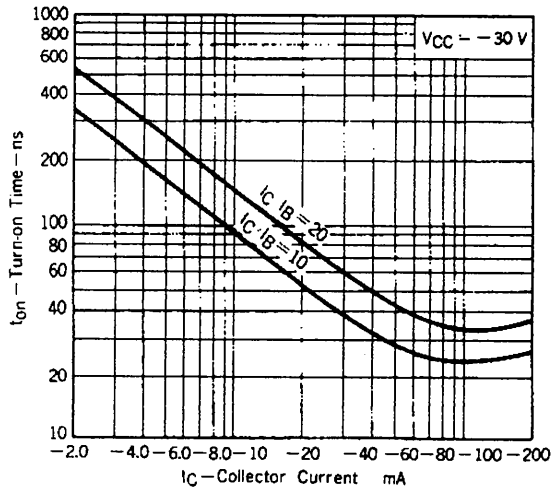
**GAIN BANDWIDTH PRODUCT
vs. EMITTER CURRENT**



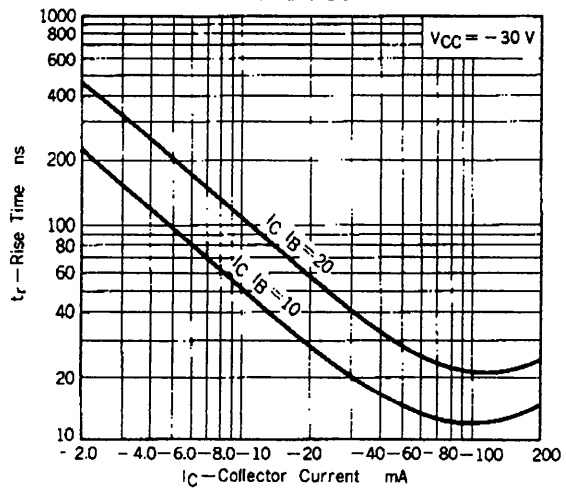
**INPUT AND OUTPUT CAPACITANCE
vs. REVERSE VOLTAGE**



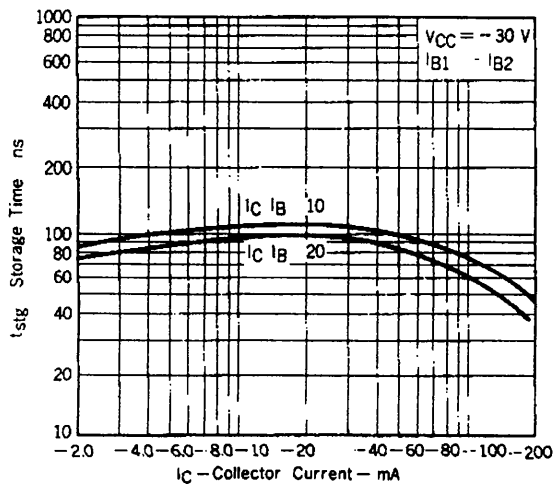
**TURN-ON TIME vs.
COLLECTOR CURRENT**



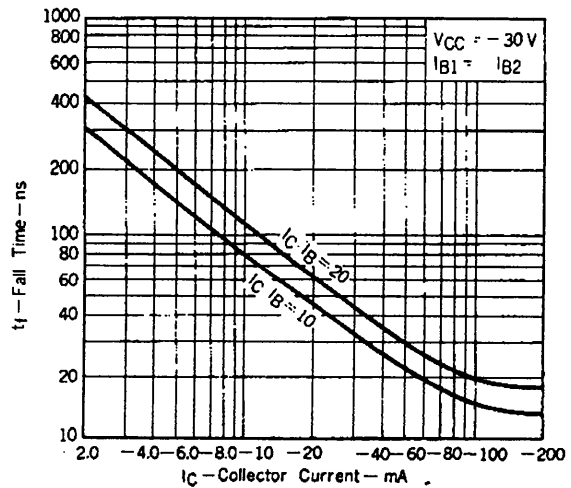
**RISE TIME vs.
COLLECTOR CURRENT**

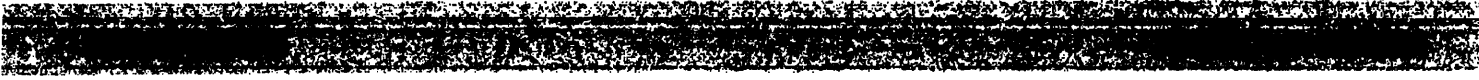


**STORAGE TIME vs.
COLLECTOR CURRENT**



**FALL TIME vs.
COLLECTOR CURRENT**





NEC Corporation

INTERNATIONAL ELECTRON DEVICES DIV.

SUMITOMO MITA Building, 37-8,
Shiba Gochome, Minato-ku, Tokyo 108, Japan
Tel: Tokyo 456-3111
Telex Address: NECTOK J22686
Cable Address: NEC TOKYO

TC-1273C
SEPT.-10-84M
Printed in Japan