



DUAL SURFACE MOUNT NPN TRANSISTORS

This device contains two electrically-isolated 2N3904 NPN transistors. The two transistors have well matched hFE and are encapsulated in an ultra-small SOT-363 (SC70-6L) package. This device is ideal for portable applications where board space is at a premium.

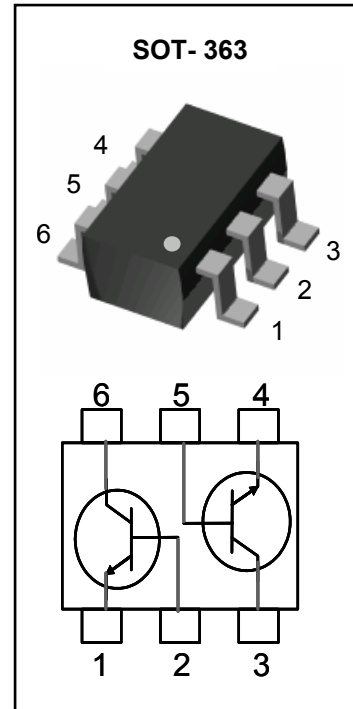
FEATURES

- Electrically Isolated Dual NPN Switching Transistor
- Lead-Free Plating (100% matte tin finish)

APPLICATIONS

- General Purpose Amplifier Applications
- Hand-Held Computers, PDAs

Device Marking Code: S1A



MAXIMUM RATINGS

$T_J = 25^{\circ}\text{C}$ Unless otherwise noted

Rating	Symbol	Value	Units
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EB}	6.0	V
Collector Current	I_C	200	mA
Total Power Dissipation (Note 1)	P_D	200	mW
Operating Junction Temperature Range	T_J	-55 to +150	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Units
Thermal Resistance, Junction to Ambient (Note 1)	R_{thja}	625	$^{\circ}\text{C}/\text{W}$

Note 1. FR-5 board 1.0 x 0.75 x 0.062 inch with minimum recommended pad layout

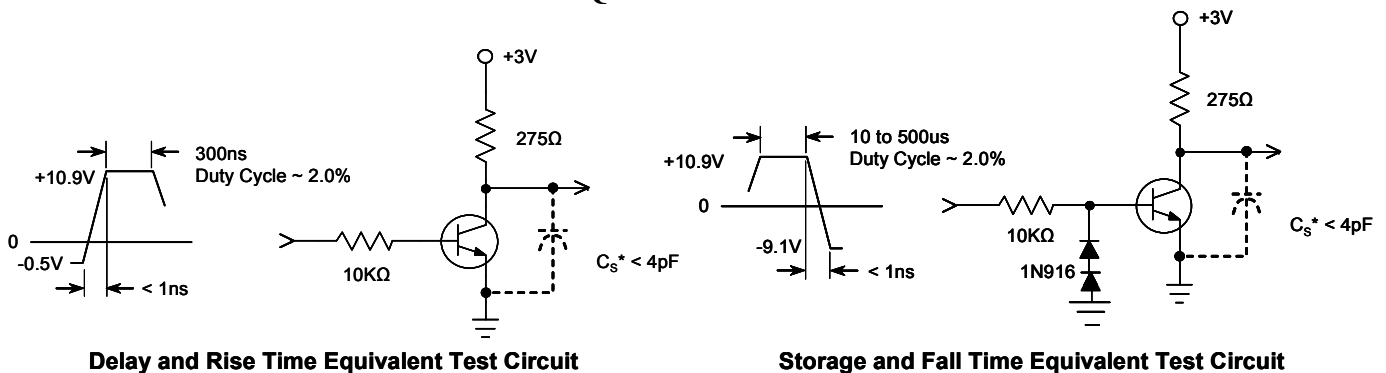


ELECTRICAL CHARACTERISTICS (Each Transistor) $T_J = 25^\circ\text{C}$ Unless otherwise noted

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1.0\text{mA}$	40	-	-	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}$	60	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}$	6.0	-	-	V
Collector Cutoff Current	I_{CEX}	$V_{CE} = 30\text{V}, V_{EB} = 3.0\text{V}$	-	-	50	nA
Base Cutoff Current	I_{BL}	$V_{CE} = 30\text{V}, V_{EB} = 3.0\text{V}$	-	-	50	nA
DC Current Gain (Note 2)	h_{FE}	$I_C = 0.1\text{mA}, V_{CE} = 1.0\text{V}$	40	-	-	
		$I_C = 1.0\text{mA}, V_{CE} = 1.0\text{V}$	70	-	-	
		$I_C = 10\text{mA}, V_{CE} = 1.0\text{V}$	100	-	300	-
		$I_C = 50\text{mA}, V_{CE} = 1.0\text{V}$	60	-	-	
		$I_C = 100\text{mA}, V_{CE} = 1.0\text{V}$	30	-	-	
Collector-Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$	-	-	0.2	V
		$I_C = 50\text{mA}, I_B = 5.0\text{mA}$	-	-	0.3	V
Base-Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$	0.65	-	0.85	V
		$I_C = 50\text{mA}, I_B = 5.0\text{mA}$	-	-	0.95	V
Gain-Bandwidth Product	f_T	$V_{CE} = 20\text{V}, I_C = 10\text{mA}$ $f = 100\text{MHz}$	300	-	-	MHz
Collector-Base Capacitance	C_{CBO}	$V_{CB} = 5.0\text{V}, f = 1.0\text{MHz}$	-	-	4.0	pF
Emitter-Base Capacitance	C_{EBO}	$V_{EB} = 0.5\text{V}, f = 1.0\text{MHz}$	-	-	8.0	pF
Delay Time	t_d	$V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$	-	-	35	ns
Rise Time	t_r	$V_{BE(off)} = -0.5\text{V}, I_{B1} = -1.0\text{mA}$	-	-	35	ns
Storage Time	t_s	$V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$	-	-	200	ns
Fall Time	t_f	$I_{B1} = I_{B2} = 1.0\text{mA}$	-	-	50	ns

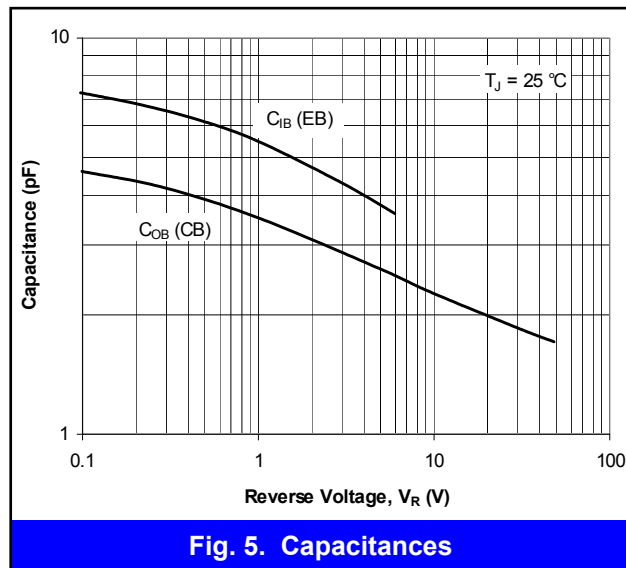
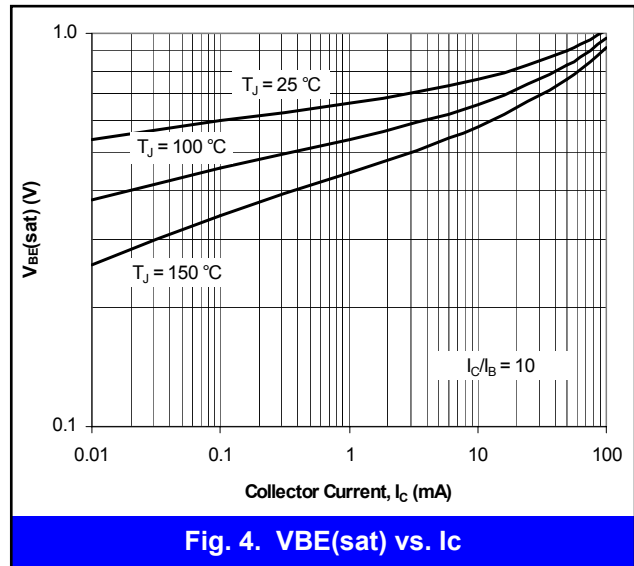
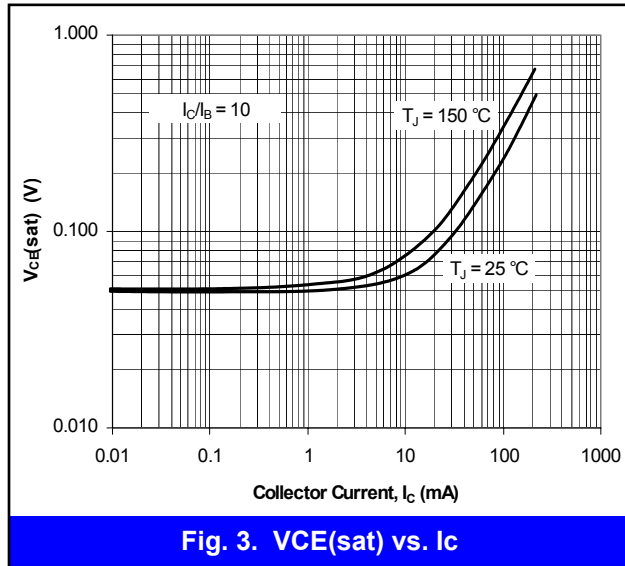
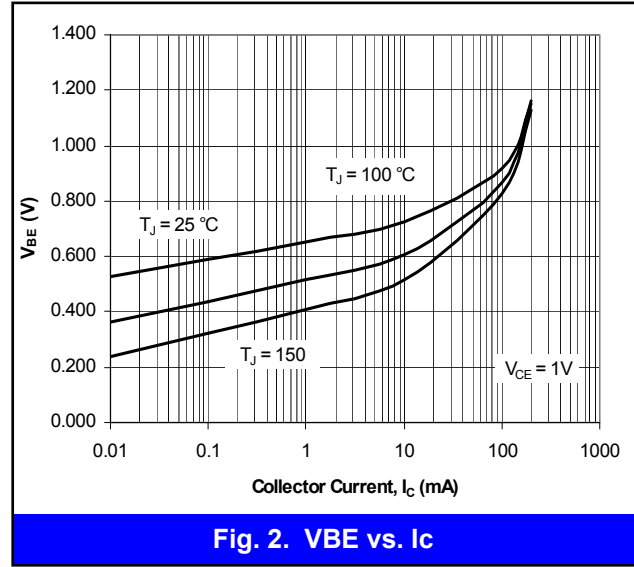
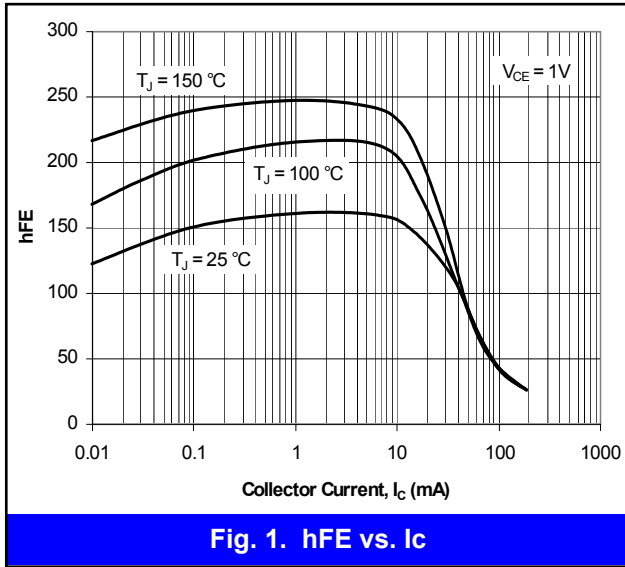
Note 2. Short duration test pulse used to minimize self-heating

SWITCHING TIME EQUIVALENT TEST CIRCUITS



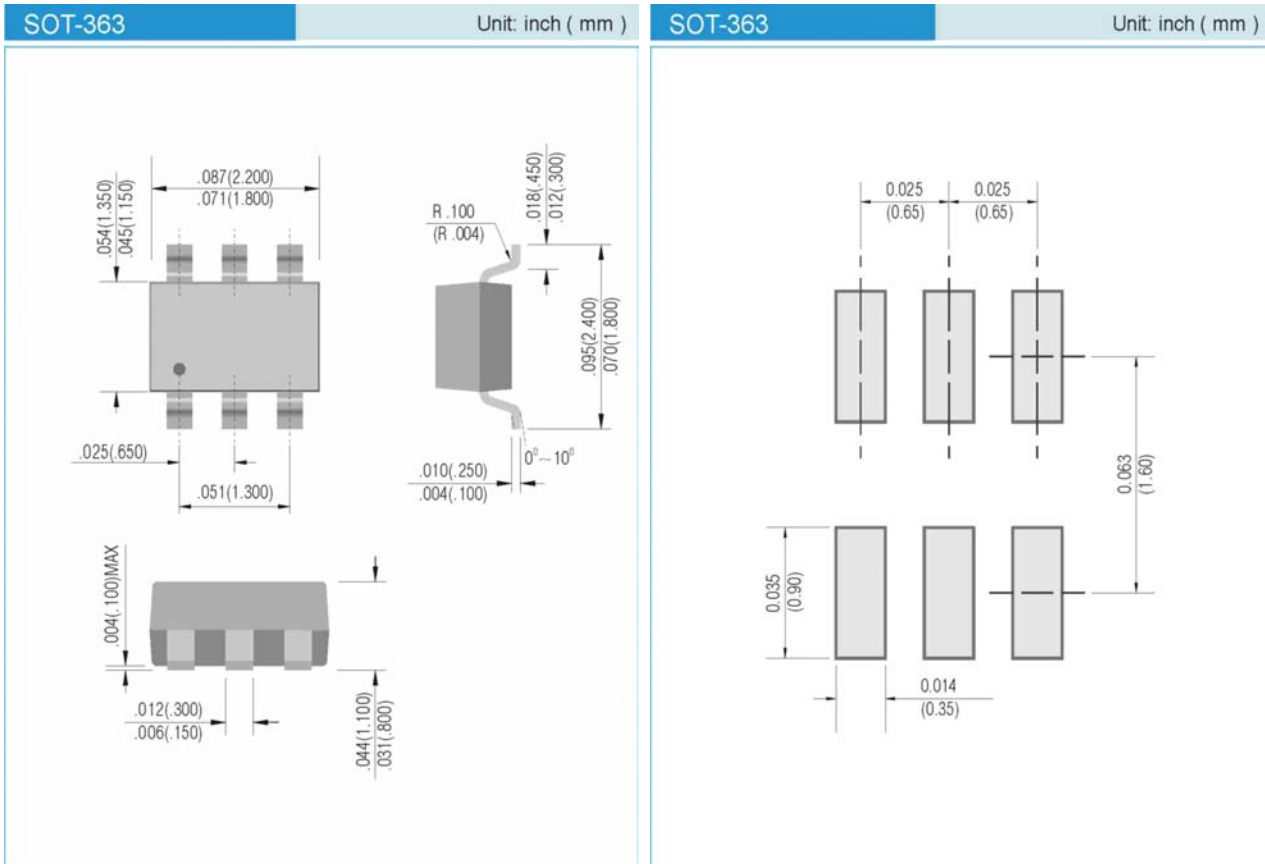


CHARACTERISTICS CURVES (Each Transistor) $T_J = 25^\circ\text{C}$ Unless otherwise noted





PACKAGE LAYOUT AND SUGGESTED PAD DIMENSIONS



ORDERING INFORMATION

MMDT3904 T/R7 - 3,000 units per 7 inch reel

MMDT3904 T/R13 -10,000 units per 13 inch reel

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