



**MMST4401**

### **SOT-323 BIPOLEAR TRANSISTORS**

**TRANSISTOR (NPN)**

#### **FEATURES**

- \* Power dissipation  
P<sub>cm</sub>: 0.2 W (T<sub>amb</sub>=25°C)
- \* Collector current  
I<sub>cm</sub>: 0.6 A
- \* Collector-base voltage  
V(BR)CBO: 60 V
- \* Operation and storage junction temperature range  
T<sub>J,Tstg</sub>: -55°C to +150°C

#### **MECHANICAL DATA**

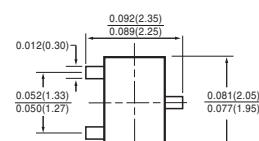
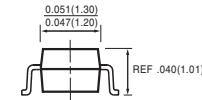
- \* Case: Molded plastic
- \* Epoxy: UL 94V-O rate flame retardant
- \* Lead: MIL-STD-202E method 208C guaranteed
- \* Mounting position: Any
- \* Weight: 0.006 gram

#### **MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS**

Ratings at 25 °C ambient temperature unless otherwise specified.



**SOT-323**



Dimensions in inches and (millimeters)

#### **MAXIMUM RATINGES ( @ TA = 25°C unless otherwise noted )**

RATINGS	SYMBOL	VALUE	UNITS
Zener Current ( see Table "Characteristics" )	-	-	-
Max. Steady State Power Dissipation (1)	P <sub>D</sub>	200	mW
Max. Operating Temperature Range	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C

#### **ELECTRICAL CHARACTERISTICS ( @ TA = 25°C unless otherwise noted )**

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS
Thermal Resistance Junction to Ambient (1)	R <sub>θJA</sub>	-	-	625	°C/W
Max. Instantaneous Forward Voltage at I <sub>F</sub> = 10mA	V <sub>F</sub>	-	-	-	Volts

NOTES : 1.Valid provided that terminals are kept at ambient temperature.

2006-3

**ELECTRICAL CHARACTERISTICS** (@ $T_A=25^\circ C$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

**OFF CHARACTERISTICS (2)**

Collector-Emitter Breakdown Voltage ( $I_C = 1.0\text{mA}$ , $I_B = 0$ )	$V_{(BR)\text{CEO}}$	40	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100\mu\text{A}$ , $I_E = 0$ )	$V_{(BR)\text{CBO}}$	60	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100\mu\text{A}$ , $I_C = 0$ )	$V_{(BR)\text{EBO}}$	6.0	-	Vdc
Collector Cutoff Current ( $V_{CE} = 35\text{Vdc}$ , $I_B = 0$ )	$I_{\text{CEO}}$	-	0.5	$\mu\text{A}$
Collector Cutoff Current ( $V_{CB} = 35\text{Vdc}$ , $I_E = 0$ )	$I_{\text{CBO}}$	-	0.1	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 5\text{Vdc}$ , $I_C = 0$ )	$I_{\text{EBO}}$	-	0.1	$\mu\text{A}$
Base Cutoff Current ( $V_{CE} = 35\text{Vdc}$ , $V_{EB(\text{off})} = 0.4\text{Vdc}$ )	$I_{BL}$	-	100	nAdc

**ON CHARACTERISTICS (2)**

DC Current Gain ( $I_C = 0.1\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ ) ( $I_C = 1.0\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ ) ( $I_C = 10\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ ) ( $I_C = 150\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ ) ( $I_C = 500\text{mA}$ , $V_{CE} = 2.0\text{Vdc}$ )	$h_{FE}$	20 40 50 100 40	- - - 300 -	
Collector-Emitter Saturation Voltage ( $I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ ) ( $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$ )	$V_{CE(\text{sat})}$	- -	0.40 0.75	Vdc
Base-Emitter Saturation Voltage ( $I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ ) ( $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$ )	$V_{BE(\text{sat})}$	- -	0.95 -	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

Current-Gain-Bandwidth Product ( $I_C = 20\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 100\text{MHz}$ )	$f_T$	250	-	MHz
Output Capacitance ( $V_{CB} = 5\text{Vdc}$ , $I_E = 0$ , $f = 1.0\text{MHz}$ )	$C_{ob}$	-	6.5	pF
Input Capacitance ( $V_{EB} = 0.5\text{Vdc}$ , $I_C = 0$ , $f = 1.0\text{MHz}$ )	$C_{eb}$	-	30	pF
Input Impedance ( $I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ )	$h_{ie}$	1.0	15	k $\Omega$
Voltage Feedback Ratio ( $I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ )	$h_{re}$	0.1	8.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ )	$h_{fe}$	40	500	-
Output Admittance ( $I_C = 10\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ )	$h_{oe}$	1.0	30	$\mu\text{s}$

**SWITCHING CHARACTERISTICS**

Delay Time Rise Time	( $V_{CC} = 30\text{Vdc}$ , $V_{BE} = 2\text{Vdc}$ , $I_C = 150\text{mA}$ , $I_{B1} = 15\text{mA}$ )	$t_d$ $t_r$	- -	15 20	ns
Storage Time Fall Time	( $V_{CC} = 30\text{Vdc}$ , $I_C = 150\text{mA}$ , $I_{B1} = I_{B2} = 15\text{mA}$ )	$t_s$ $t_f$	- -	225 30	ns

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