



# MMST3904

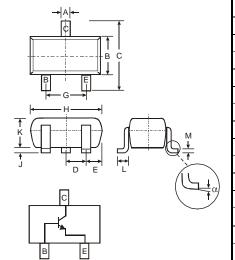
### NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

# **Features**

- **Epitaxial Planar Die Construction**
- Complementary PNP Type Available (MMST3906)
- Ultra-Small Surface Mount Package
- Lead Free/RoHS Compliant (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability
- "Green" Device (Notes 3 and 4)

## **Mechanical Data**

- Case: SOT-323
- Case Material: Molded Plastic, "Green" Molding Compound, Note 4. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminal Connections: See Diagram
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Marking Information: K2N See Page 4
- Ordering & Date Code Information: See Page 4
- Weight: 0.006 grams (approximate)



SOT-323									
Dim	Min	Max							
Α	0.25	0.40							
В	1.15	1.35							
С	<b>C</b> 2.00 2.20								
D 0.65 Nominal									
E	0.30	0.40							
G	1.20	1.40							
Н	1.80	2.20							
J	0.0	0.10							
K	0.90	1.00							
L	0.25	0.40							
М	0.10	0.18							
α	0°	8°							
All Dimensions in mm									

# **Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	60	V
Collector-Emitter Voltage	V <sub>CEO</sub>	40	V
Emitter-Base Voltage	V <sub>EBO</sub>	6.0	V
Collector Current – Continuous (Note 1)	Ic	200	mA
Power Dissipation (Note 1)	Pd	200	mW
Thermal Resistance, Junction to Ambient (Note 1)	$R_{ hetaJA}$	625	°C/W
Operating and Storage Temperature Range	T <sub>j</sub> , T <sub>STG</sub>	-55 to +150	°C

Notes:

- Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
- No purposefully added lead.
- Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com./products/lead\_free/index.php.
- Product manufactured with Date Code 0627 (week 27, 2006) and newer are built with Green Molding Compound. Product manufactured prior to Date Code 0627 are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

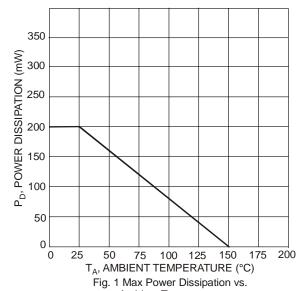


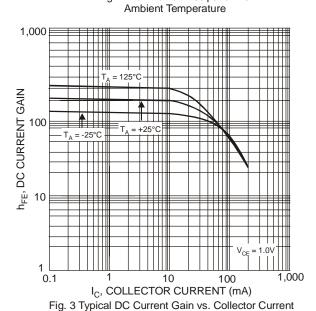
# Electrical Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

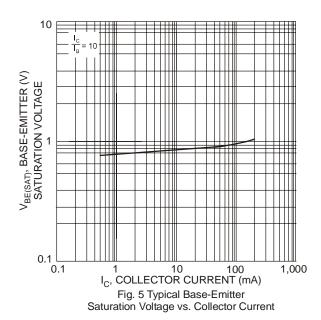
Characteristic	Symbol	Min	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 5)	1	•		•		
Collector-Base Breakdown Voltage	V <sub>(BR)CBO</sub>	60	_	V	$I_C = 10\mu A, I_E = 0$	
Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	40	_	V	I <sub>C</sub> = 1.0mA, I <sub>B</sub> = 0	
Emitter-Base Breakdown Voltage	V <sub>(BR)EBO</sub>	5.0	_	V	$I_E = 10\mu A, I_C = 0$	
Collector Cutoff Current	I <sub>CEX</sub>		50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V	
Base Cutoff Current	I <sub>BL</sub>		50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V	
ON CHARACTERISTICS (Note 5)						
DC Current Gain	h <sub>FE</sub>	40 70 100 60 30	 300  	_	$I_C = 100\mu\text{A}, V_{CE} = 1.0V$ $I_C = 1.0\text{mA}, V_{CE} = 1.0V$ $I_C = 10\text{mA}, V_{CE} = 1.0V$ $I_C = 50\text{mA}, V_{CE} = 1.0V$ $I_C = 100\text{mA}, V_{CE} = 1.0V$	
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	_	0.25 0.30	V	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$	
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	0.65 —	0.85 0.95	V	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$	
SMALL SIGNAL CHARACTERISTICS						
Output Capacitance	C <sub>obo</sub>	_	4.0	pF	$V_{CB} = 5.0V$ , $f = 1.0MHz$ , $I_E = 0$	
Input Capacitance	C <sub>ibo</sub>		8.0	pF	V <sub>EB</sub> = 0.5V, f = 1.0MHz, I <sub>C</sub> = 0	
Input Impedance	h <sub>ie</sub>	1.0	10	kΩ		
Voltage Feedback Ratio	h <sub>re</sub>	0.5	8.0	x 10 <sup>-4</sup>	$V_{CE} = 10V, I_{C} = 1.0mA,$	
Small Signal Current Gain	h <sub>fe</sub>	100	400	_	f = 1.0MHz	
Output Admittance	h <sub>oe</sub>	1.0	40	μS		
Current Gain-Bandwith Product	f <sub>T</sub>	300	_	MHz	V <sub>CE</sub> = 20V, I <sub>C</sub> = 10mA, f = 100MHz	
Noise Figure	NF		5.0	dB	$V_{CC}$ = 5.0V, $I_{C}$ = 100μA, R <sub>S</sub> = 1.0kΩ, f = 1.0MHz	
SWITCHING CHARACTERISTICS						
Delay Time	t <sub>d</sub>	_	35	ns	V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA,	
Rise Time	t <sub>r</sub>	_	35	ns	$V_{BE(OFF)} = -0.5V, I_{B1} = 1.0mA$	

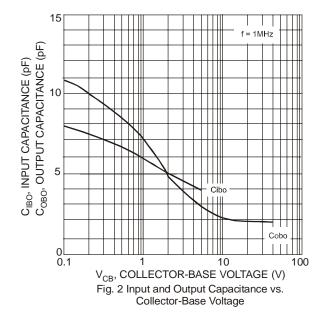
Notes: 5. Short duration pulse test used to minimize self-heating effect.

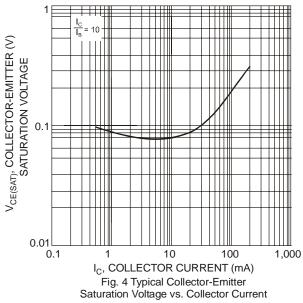












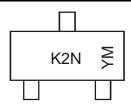


#### **Ordering Information** (Notes 4 and 6)

Device	Packaging	Shipping			
MMST3904-7-F	SOT-323	3000/Tape & Reel			

Notes: 6. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

# **Marking Information**



K2N = Product Type Marking Code YM = Date Code Marking Y = Year ex: N = 2002

M = Month ex: 9 = September

Date Code Key

	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Code	J	K	L	М	N	Р	R	S	Т	U	V	W	Х	Υ	Z
Γ	Month	Ja	n Fe	eb l	Mar	Apr	Mav	Ju	n	Jul	Aug	Sep	Oc	t I	Nov	Dec

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	N	D
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