MMST4401

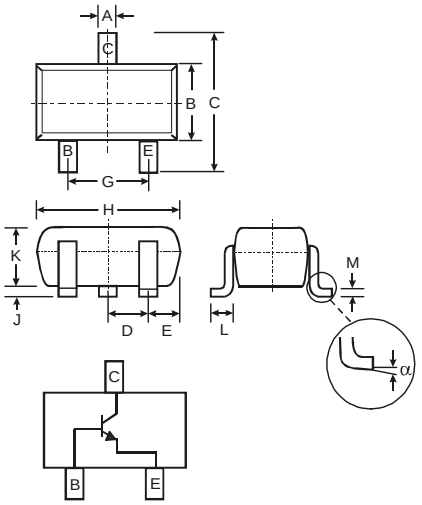
NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMST4403)
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 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
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Marking Information: K3X - See Page 4
- Ordering & Date Code Information: See Page 4
- Weight: 0.006 grams (approximate)



SOT-323		
Dim	**Min**	**Max**
A	0.25	0.40
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
E	0.30	0.40
G	1.20	1.40
H	1.80	2.20
J	0.0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.18
α	0°	8°
All Dimensions in mm		

Maximum Ratings @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current – Continuous (Note 1)	I_C	600	mA
Power Dissipation (Note 1)	P_d	200	mW
Thermal Resistance, Junction to Ambient (Note 1)	$R_{\theta JA}$	625	°C/W
Operating and Storage Temperature Range	T_j, T_{STG}	-55 to +150	°C

Notes:
1. 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.
2. No purposefully added lead.
3. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
4. 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_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 5)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	I_C = 100μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	I_C = 1.0mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	I_E = 100μA, I_C = 0
Collector Cutoff Current	I_{CEX}	—	100	nA	V_{CE} = 35V, $V_{EB(OFF)}$ = 0.4V
Base Cutoff Current	I_{BL}	—	100	nA	V_{CE} = 35V, $V_{EB(OFF)}$ = 0.4V
ON CHARACTERISTICS (Note 5)					
DC Current Gain	h_{FE}	20 40 80 100 40	— — — 300 —	—	I_C = 100μA, V_{CE} = 1.0V I_C = 1.0mA, V_{CE} = 1.0V I_C = 10mA, V_{CE} = 1.0V I_C = 150mA, V_{CE} = 1.0V I_C = 500mA, V_{CE} = 2.0V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.40 0.75	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75 —	0.95 1.2	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{ob}	—	8.5	pF	V_{CB} = 5.0V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{eb}	—	30	pF	V_{EB} = 0.5V, f = 1.0MHz, I_C = 0
Input Impedance	h_{ie}	1.0	15	kΩ	V_{CE} = 10V, I_C = 1.0mA, f = 1.0MHz
Voltage Feedback Ratio	h_{re}	0.1	8.0	x 10^{-4}	
Small Signal Current Gain	h_{fe}	40	500	—	
Output Admittance	h_{oe}	1.0	30	μS	
Current Gain-Bandwith Product	f_T	250	—	MHz	V_{CE} = 10V, I_C = 20mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	15	ns	V_{CC} = 30V, I_C = 150mA, $V_{BE(OFF)}$ = 2.0V, I_{B1} = 15mA
Rise Time	t_r	—	20	ns	
Storage Time	t_s	—	225	ns	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA
Fall Time	t_r	—	30	ns	

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

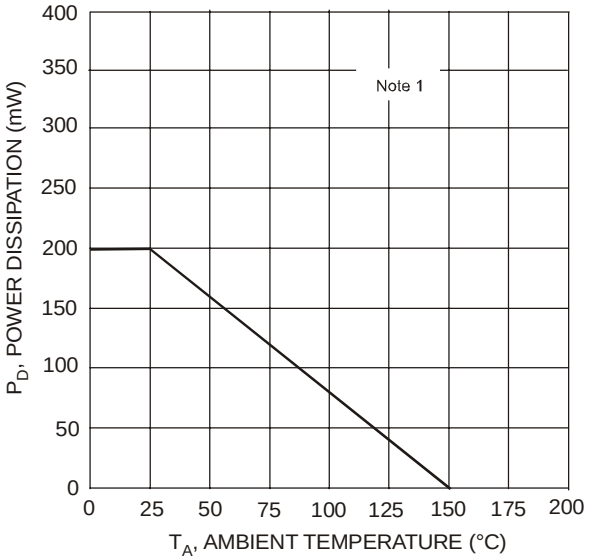


Fig. 1, Max Power Dissipation vs Ambient Temperature

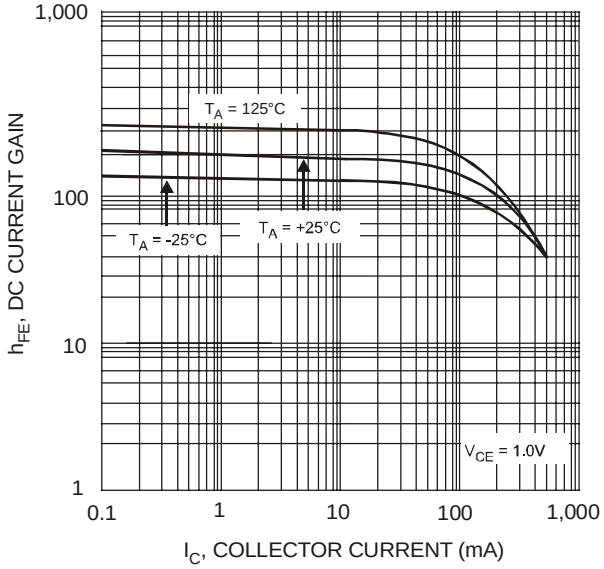


Fig. 2 Typical DC Current Gain vs Collector Current

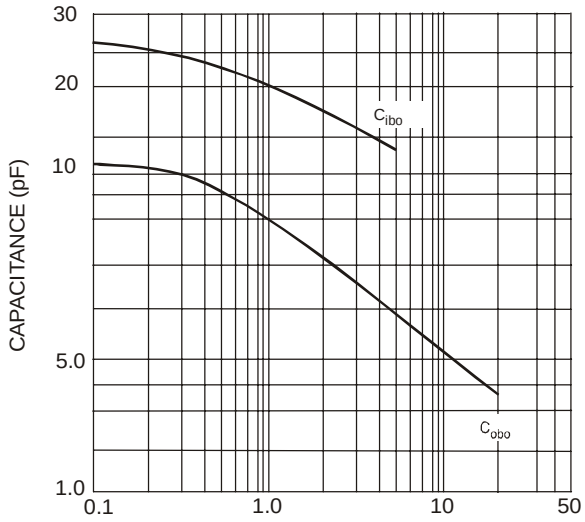


Fig. 3 Typical Capacitance

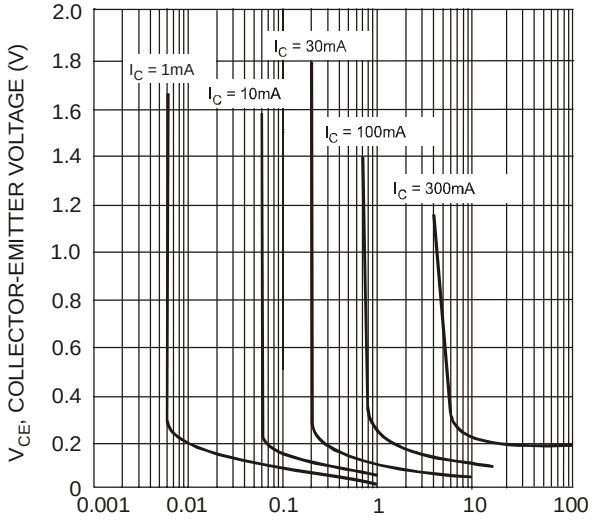


Fig. 4 Typical Collector Saturation Region

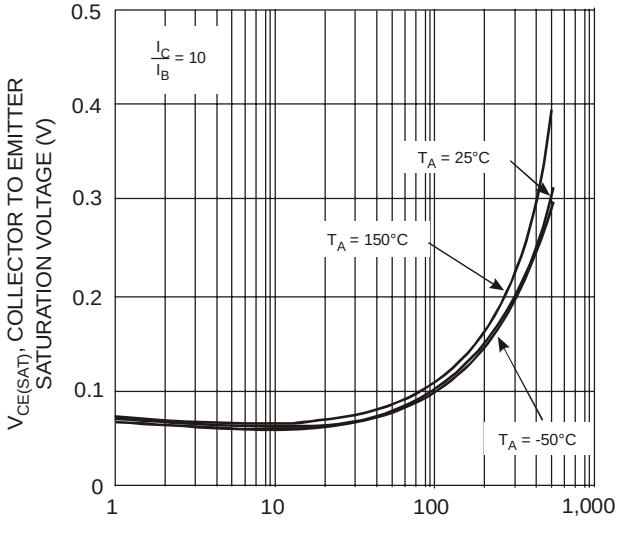


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

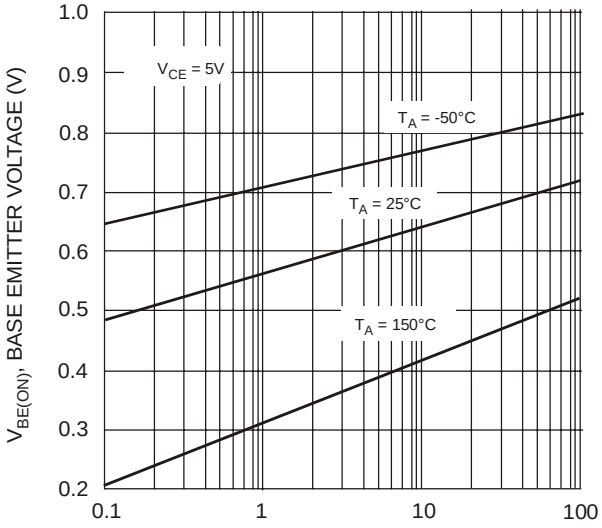


Fig. 6 Base Emitter Voltage vs. Collector Current

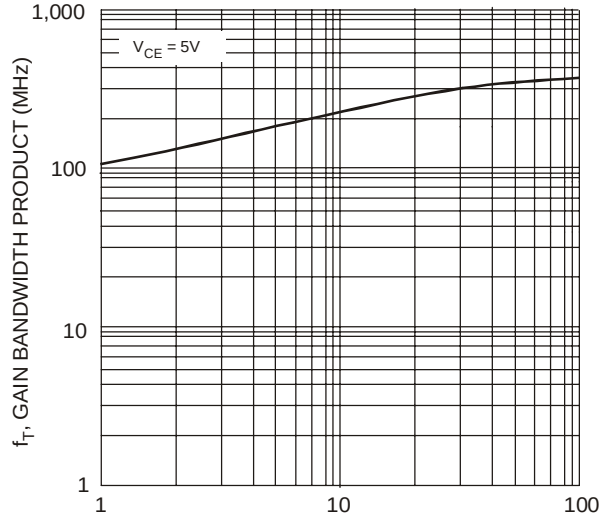


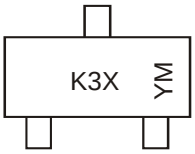
Fig. 7 Gain Bandwidth Product vs. Collector Current

Ordering Information (Note 4 & 6)

Device	Packaging	Shipping
MMST4401-7-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



K3X = 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	M	N	P	R	S	T	U	V	W	X	Y	Z

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

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MMST4401-7-F