

## Features

- $BV_{CEO} > 40V$
- $I_C = 200mA$  Collector Current
- Epitaxial Planar Die Construction
- Ultra-Small Surface Mount Package
- Complementary PNP Type: MMST3906
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

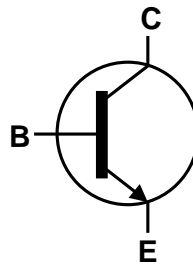
## Mechanical Data

- Case: SOT323
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.006 grams (Approximate)

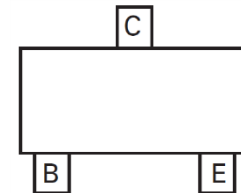
SOT323



Top View



Device Symbol



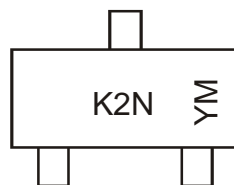
Pin-out Top View

## Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
MMST3904-7-F	AEC-Q101	K2N	7	8	3,000
MMST3904Q-7-F	Automotive	K2N	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



K2N = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: D = 2016)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Code	D	E	F	G	H	I	J	K	L	M	N

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

### Absolute 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	V
Collector Current	I <sub>C</sub>	200	mA

### Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

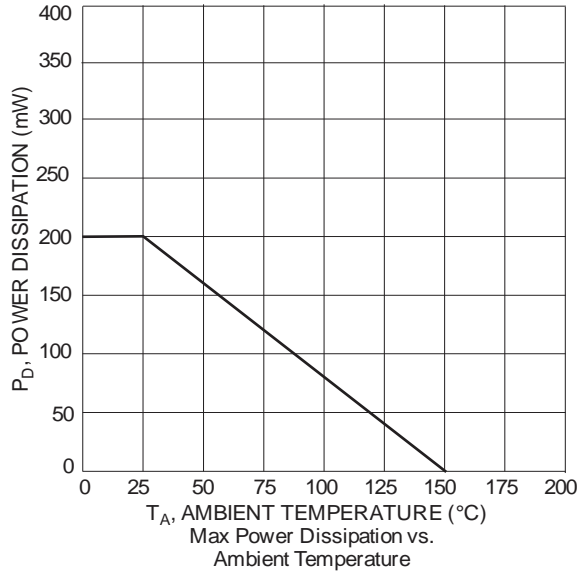
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	200	mW
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	625	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

### ESD Ratings (Note 7)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
- 6. For a device mounted with the collector lead on minimum recommended pad layout 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - 7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

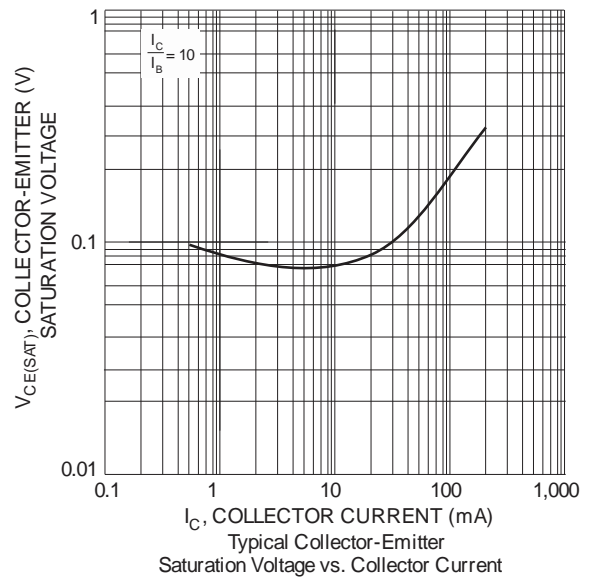
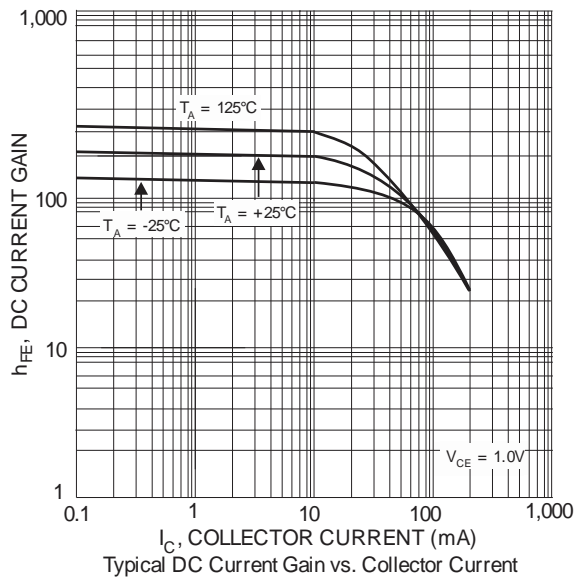
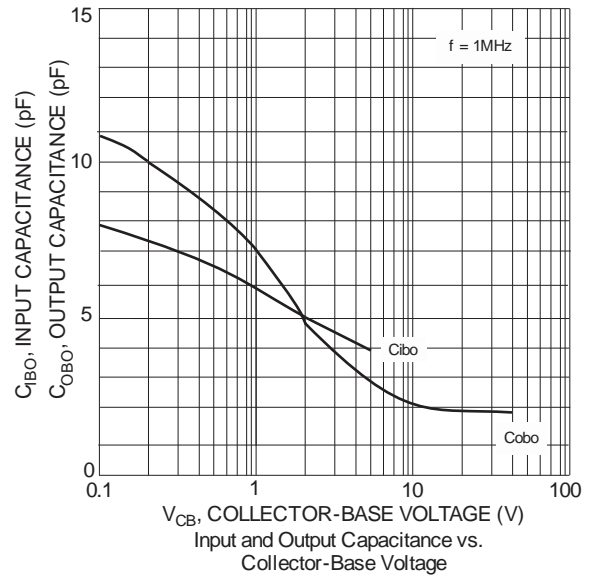
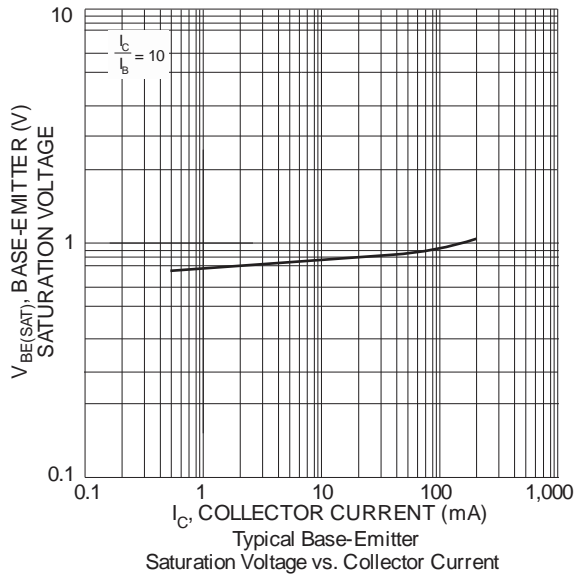


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition	
<b>OFF CHARACTERISTICS (Note 8)</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	60	—	V	I <sub>C</sub> = 10μA, I <sub>E</sub> = 0	
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	40	—	V	I <sub>C</sub> = 1mA, I <sub>B</sub> = 0	
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	5	—	V	I <sub>E</sub> = 10μA, I <sub>C</sub> = 0	
Collector Cutoff Current	I <sub>CEX</sub>	—	50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3V	
Base Cutoff Current	I <sub>BL</sub>	—	50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3V	
<b>ON CHARACTERISTICS (Note 8)</b>						
DC Current Gain	h <sub>FE</sub>	40	—	—	I <sub>C</sub> = 100μA, V <sub>CE</sub> = 1V	
		70	—			I <sub>C</sub> = 1mA, V <sub>CE</sub> = 1V
		100	300			I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1V
		60	—			I <sub>C</sub> = 50mA, V <sub>CE</sub> = 1V
		30	—			I <sub>C</sub> = 100mA, V <sub>CE</sub> = 1V
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	0.25 0.30	V	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1mA I <sub>C</sub> = 50mA, I <sub>B</sub> = 5mA	
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	0.65 —	0.85 0.95	V	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1mA I <sub>C</sub> = 50mA, I <sub>B</sub> = 5mA	
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Output Capacitance	C <sub>obo</sub>	—	4	pF	V <sub>CB</sub> = 5V, f = 1.0MHz, I <sub>E</sub> = 0	
Input Capacitance	C <sub>ibo</sub>	—	8	pF	V <sub>EB</sub> = 0.5V, f = 1.0MHz, I <sub>C</sub> = 0	
Input Impedance	h <sub>ie</sub>	1	10	kΩ	V <sub>CE</sub> = 10V, I <sub>C</sub> = 1mA, f = 1.0MHz	
Voltage Feedback Ratio	h <sub>re</sub>	0.5	8.0	x 10 <sup>-4</sup>		
Small Signal Current Gain	h <sub>fe</sub>	100	400	—		
Output Admittance	h <sub>oe</sub>	1	40	μS		
Current Gain-Bandwidth Product	f <sub>T</sub>	300	—	MHz		
Noise Figure	NF	—	5	dB	V <sub>CC</sub> = 5V, I <sub>C</sub> = 100μA, R <sub>S</sub> = 1kΩ, f = 1MHz	
<b>SWITCHING CHARACTERISTICS</b>						
Delay Time	t <sub>D</sub>	—	35	ns	V <sub>CC</sub> = 3V, I <sub>C</sub> = 10mA,	
Rise Time	t <sub>R</sub>	—	35	ns	V <sub>BE(OFF)</sub> = -0.5V, I <sub>B1</sub> = 1mA	

Notes: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

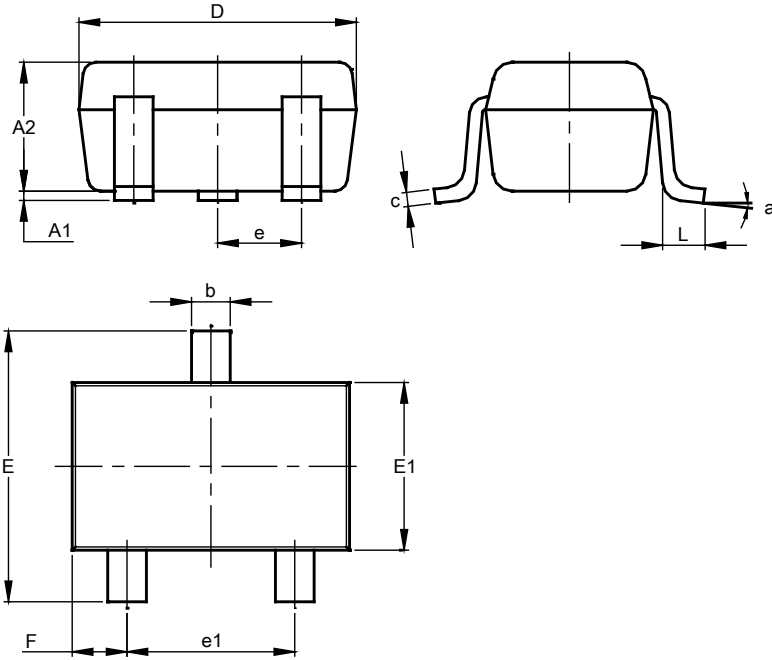
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT323**

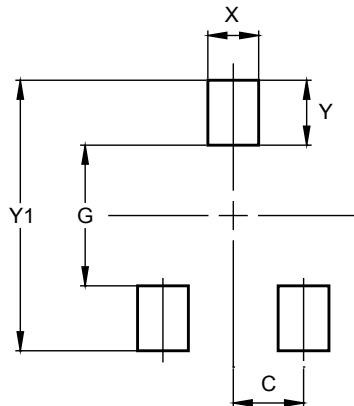


SOT323			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.25	0.40	0.30
c	0.10	0.18	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
e1	1.20	1.40	1.30
F	0.375	0.475	0.425
L	0.25	0.40	0.30
a	0°	8°	--
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT323**



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.470
Y	0.600
Y1	2.500

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