



Micro Commercial Components



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## MMST3904

### Features

- Epitaxial Planar Die Construction
- Complementary PNP Type available (MMST3906)
- Ultra-small surface mount package
- Marking : K2N
- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- Halogen free available upon request by adding suffix "-HF"

### Maximum Ratings

Symbol	Rating	Rating	Unit
$V_{CEO}$	Collector-Emitter Voltage	40	V
$V_{CBO}$	Collector-Base Voltage	60	V
$V_{EBO}$	Emitter-Base Voltage	6.0	V
$I_C$	Collector Current-Continuous <sup>(1)</sup>	200	mA
$P_C$	Power dissipation <sup>(1)</sup>	200	mW
$T_J$	Junction Temperature	-55 to +150	°C
$T_{STG}$	Storage Temperature	-55 to +150	°C

### Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Max	Units
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#### OFF CHARACTERISTICS <sup>(2)</sup>

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ( $I_C=1.0mA$ , $I_B=0$ )	40	---	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ( $I_C=10uA$ , $I_E=0$ )	60	---	Vdc
$V_{(BR)EBO}$	Collector-Emitter Breakdown Voltage ( $I_C=10uA$ , $I_C=0$ )	5.0	---	Vdc
$I_{CEX}$	Collector-Base Cutoff Current ( $V_{CE}=30Vdc$ , $V_{EB(OFF)}=3.0Vdc$ )	---	50	nAdc
$I_{BL}$	Emitter-Base Cutoff Current ( $V_{CE}=30Vdc$ , $V_{EB(OFF)}=3.0Vdc$ )	---	50	nAdc

#### ON CHARACTERISTICS <sup>(2)</sup>

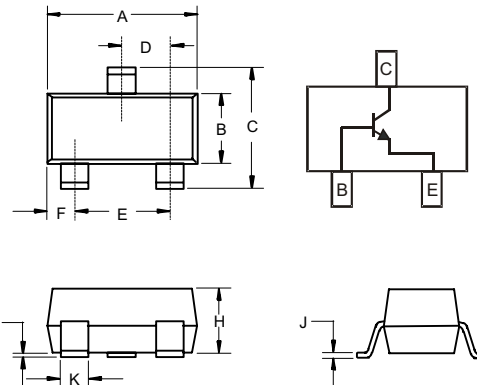
$h_{FE}$	DC Current Gain ( $I_C=100uA$ , $V_{CE}=1.0Vdc$ ) ( $I_C=1.0mA$ , $V_{CE}=1.0Vdc$ ) ( $I_C=10mA$ , $V_{CE}=1.0Vdc$ ) ( $I_C=50mA$ , $V_{CE}=1.0Vdc$ ) ( $I_C=500mA$ , $V_{CE}=1.0Vdc$ )	40 70 100 60 30	---	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ( $I_C=10mA$ , $I_B=1.0mA$ ) ( $I_C=50mA$ , $I_B=5.0mA$ )	---	0.25 0.30	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage ( $I_C=10mA$ , $I_B=1.0mA$ ) ( $I_C=50mA$ , $I_B=5.0mA$ )	0.65 ---	0.85 0.95	Vdc

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

2. Pulse test: Pulse width<300us, duty cycle<2%

## NPN Small Signal Transistors

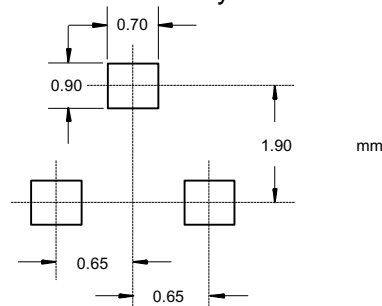
### SOT-323



#### DIMENSIONS

DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.071	.087	1.80	2.20	
B	.045	.053	1.15	1.35	
C	.083	.096	2.10	2.45	
D	.026 Nominal		0.65Nominal		
E	.047	.055	1.20	1.40	
F	.012	.016	.30	.40	
G	.000	.004	.000	.100	
H	.035	.039	.90	1.00	
J	.004	.010	.100	.250	
K	.006	.016	.15	.40	

#### Suggested Solder Pad Layout



**SMALL SIGNAL CHARACTERISTICS**

C <sub>obo</sub>	Output Capacitance (V <sub>CB</sub> =5.0Vdc, f=1.0MHz, I <sub>E</sub> =0)		---	4.0	pF
C <sub>ibo</sub>	Input Capacitance (V <sub>EB</sub> =0.5Vdc, f=1.0MHz, I <sub>C</sub> =0)		---	8.0	pF
h <sub>ie</sub>	Input Impedance	V <sub>CE</sub> =10Vdc, I <sub>C</sub> =1.0mAdc, f=1.0KHz	1.0	10	kohms
h <sub>re</sub>	Voltage Feedback Ratio		0.5	8.0	X 10 <sup>-4</sup>
h <sub>fe</sub>	Small Signal Current Gain		100	400	---
h <sub>oe</sub>	Output Admittance		1.0	40	uS
f <sub>T</sub>	Current Gain-Bandwidth Product (V <sub>CE</sub> =20Vdc, I <sub>C</sub> =10mAdc, f=100MHz)		300	---	NHz
NF	Noise Figure (V <sub>CE</sub> =5.0Vdc, I <sub>C</sub> =100uAdc, R <sub>C</sub> =1.0KOHMS, f=1.0KHz)		---	5.0	dB

**SWITCHING CHARACTERISTICS**

$t_d$	Delay Time	$V_{CC}=3.0Vdc$ , $I_C=100\mu A$ , $V_{BE(off)}=0.5Vdc$ , $I_{B1}=1.0mA$	---	35	ns
$t_r$	Rise Time		---	35	ns

## Ordering Information :

Device	Packing
Part Number-TP	Tape&Reel; 3Kpcs/Reel

Note : Adding "-HF" suffix for halogen free, eg. Part Number-TP-HF

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