



**THE DATASHEET OF  
MMST3904-TP**



## Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available MMST3906
- Ultra-Small Surface Mount Package
- Halogen Free. "Green" Device (Note 1)
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings @ 25°C Unless Otherwise Specified

- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C

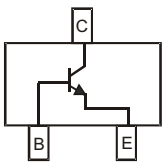
Parameter	Symbol	Rating	Unit
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	200	mA
Collector Power Dissipation <sup>(2)</sup>	$P_C$	200	mW

Note: 1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

2. Valid provided that terminals are kept at ambient temperature.

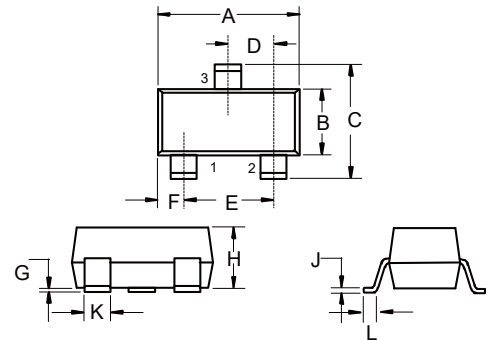
**Marking: K2N**

**Internal Structure**



## NPN Small Signal Transistors

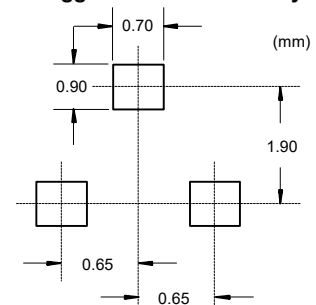
### SOT-323



#### DIMENSIONS

DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.071	0.087	1.80	2.20	
B	0.045	0.053	1.15	1.35	
C	0.083	0.096	2.10	2.45	
D	0.026		0.65		TYP.
E	0.047	0.055	1.20	1.40	
F	0.012	0.016	0.30	0.40	
G	0.000	0.004	0.00	0.10	
H	0.035	0.044	0.90	1.10	
J	0.002	0.010	0.05	0.25	
K	0.006	0.016	0.15	0.40	
L	0.010	0.018	0.26	0.46	

#### Suggested Solder Pad Layout



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

Parameter	Symbol	Min	Typ	Max	Units	Conditions
Collector-Base Breakdown Voltage <sup>(3)</sup>	$V_{(BR)CBO}$	60			V	$I_C=10\mu A, I_E=0$
Collector-Emitter Breakdown Voltage <sup>(3)</sup>	$V_{(BR)CEO}$	40			V	$I_C=1mA, I_B=0$
Emitter-Base Breakdown Voltage <sup>(3)</sup>	$V_{(BR)EBO}$	5			V	$I_E=10\mu A, I_C=0$
Base Cutoff Current <sup>(3)</sup>	$I_{BL}$			50	nA	$V_{CE}=30V, V_{EB(OFF)}=3V$
Collector Cutoff Current <sup>(3)</sup>	$I_{CEX}$			50	nA	$V_{CE}=30V, V_{EB(OFF)}=3V$
DC Current Gain <sup>(3)</sup>	$h_{FE(1)}$	40				$V_{CE}=1V, I_C=0.1mA$
	$h_{FE(2)}$	70				$V_{CE}=1V, I_C=1mA$
	$h_{FE(3)}$	100		300		$V_{CE}=1V, I_C=-10mA$
	$h_{FE(4)}$	60				$V_{CE}=1V, I_C=50mA$
	$h_{FE(5)}$	30				$V_{CE}=1V, I_C=500mA$
Collector-Emitter Saturation Voltage <sup>(3)</sup>	$V_{CE(sat)}$			0.25	V	$I_C=10mA, I_B=1mA$
				0.3	V	$I_C=50mA, I_B=5mA$
Base-Emitter Saturation Voltage <sup>(3)</sup>	$V_{BE(sat)}$	0.65		0.85	V	$I_C=10mA, I_B=1mA$
				0.95	V	$I_C=50mA, I_B=5mA$
Output Capacitance	$C_{cbo}$			4.0	pF	$V_{CB}=5V, I_E=0, f=1MHz,$
Input Capacitance	$C_{ibo}$			8.0	pF	$V_{BE}=0.5V, I_C=0, f=1MHz,$
Input Impedance	$h_{ie}$	1		10	K $\Omega$	$V_{CE}=10V, I_C=1mA, f=1KHz$
Voltage Feedback Ratio	$h_{re}$	0.5		8	$\times 10^4$	
Small Signal Current Gain	$h_{fe}$	100		400		
Output Admittance	$h_{oe}$	1		40	$\mu S$	
Transition Frequency	$f_T$	300			MHz	$V_{CE}=20V, I_C=10mA, f=100MHz$
Noise Figure	NF			5	dB	$V_{CE}=5V, I_C=0.1mA$ $R_S=1K\Omega, f=1KHz$
Delay Time	$t_d$			35	ns	$V_{CC}=3V, I_C=0.1mA$
Rise Time	$t_r$			35	ns	$V_{BE(OFF)}=-0.5V, I_{B1}=1mA$

 Note: 3.Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2.0\%$

**Curve Characteristics**

Fig. 1 - Static Characteristics

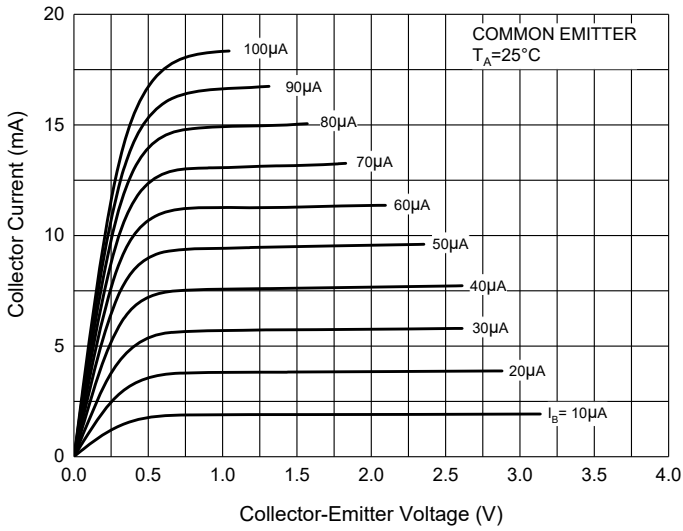


Fig. 2 - DC Current Gain Characteristics

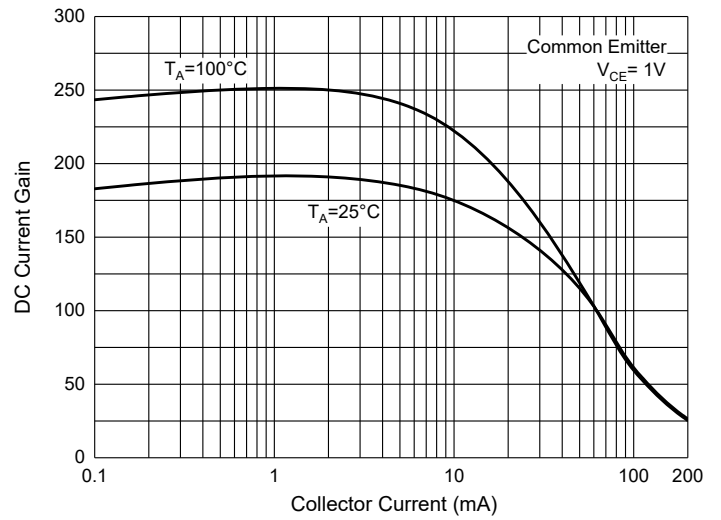


Fig. 3 - Collector-Emitter Saturation Voltage Characteristics

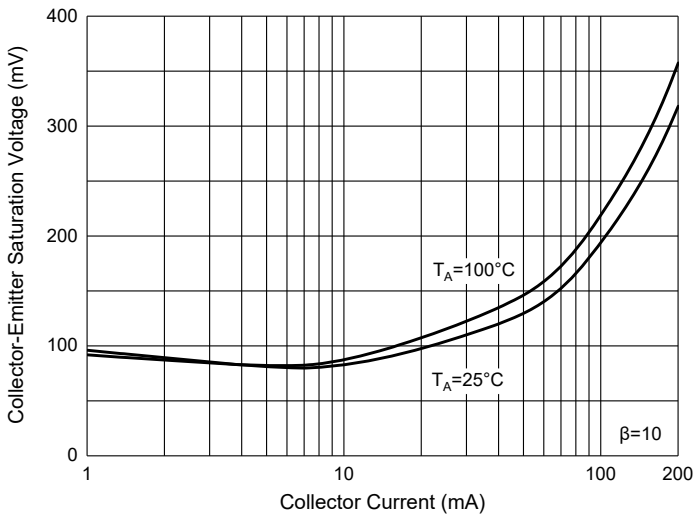


Fig. 4 - Base-Emitter Saturation Voltage Characteristics

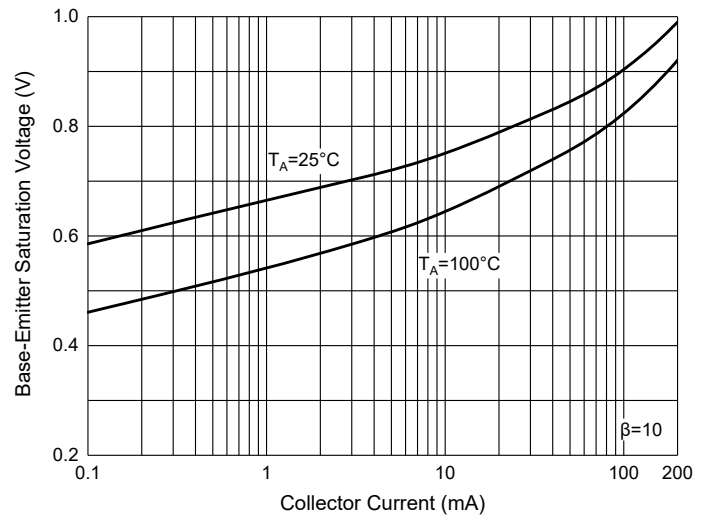


Fig. 5 - Base-Emitter Voltage Characteristics

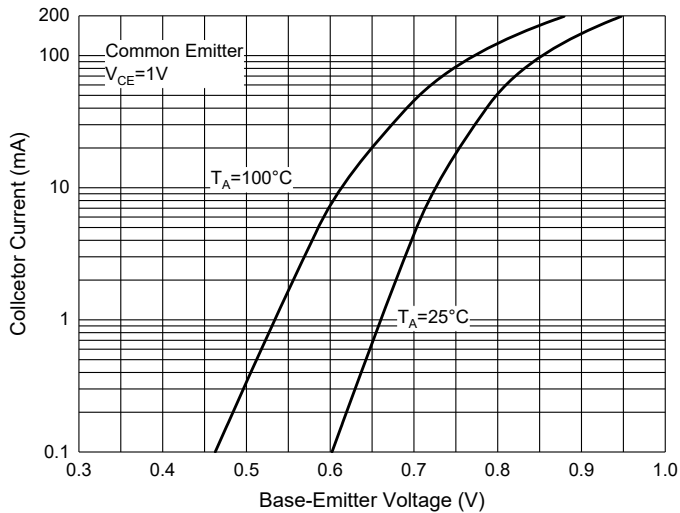
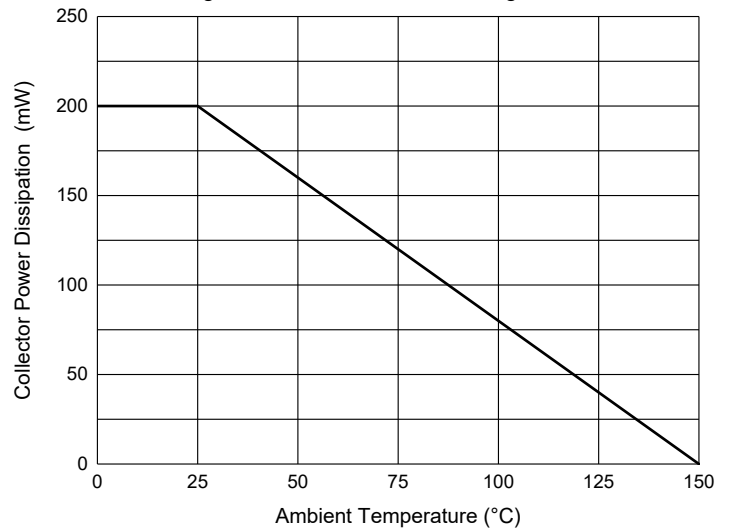


Fig. 6 - Collector Power Derating Curve



## Ordering Information

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

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