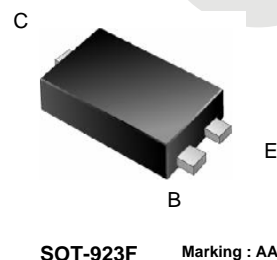


# MMBT3904SL

## NPN Epitaxial Silicon Transistor

### Features

- General purpose amplifier transistor.
- Ultra small surface mount package for all types(max 0.43mm tall)
- Suitable for general switching & amplification
- Well suited for portable application
- As complementary type, PNP MMBT3906SL is recommended
- Pb free



SOT-923F Marking : AA

### Absolute Maximum Ratings $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	60	V
$V_{CEO}$	Collector-Emitter Voltage	40	V
$V_{EBO}$	Emitter-Base Voltage	6	V
$I_C$	Collector Current	200	mA
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 ~ 150	$^\circ\text{C}$

\* 1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.  
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

### Thermal Characteristics\* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Max	Unit
$P_C$	Collector Power Dissipation, by $R_{\theta JA}$	227	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	550	$^\circ\text{C}/\text{W}$

\* Minimum land pad.

### Electrical Characteristics\* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Condition	Min.	Max.	Unit
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\mu\text{A}, I_E = 0$	60		V
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1\text{mA}, I_B = 0$	40		V
$BV_{EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\mu\text{A}, I_C = 0$	6		V
$I_{CEX}$	Collector Cut-off Current	$V_{CE} = 60\text{V}, V_{EB(OFF)} = 3\text{V}$		50	nA
$h_{FE}$	DC Current Gain	$V_{CE} = 1\text{V}, I_C = 0.1\text{mA}$ $V_{CE} = 1\text{V}, I_C = 1\text{mA}$ $V_{CE} = 1\text{V}, I_C = 10\text{mA}$ $V_{CE} = 1\text{V}, I_C = 50\text{mA}$ $V_{CE} = 1\text{V}, I_C = 100\text{mA}$	40 70 100 60 30	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$		0.2 0.3	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$	0.65	0.85 0.95	V V
$f_T$	Current Gain Bandwidth Product	$V_{CE} = 20\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$	300		MHz
$C_{ob}$	Output Capacitance	$V_{CB} = 5\text{V}, I_E = 0, f = 1\text{MHz}$		6	pF
$C_{ib}$	Input Capacitance	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$		15	pF
$t_d$	Delay Time	$V_{CC} = 3\text{V}, I_C = 10\text{mA}$ $I_{B1} = - I_{B2} = 1\text{mA}$		35	ns
$t_r$	Rise Time			35	ns
$t_s$	Storage Time			200	ns
$t_f$	Fall Time			50	ns

\* DC item are tested by Pulse Test : Pulse Width $\leq$ 300us, Duty Cycle $\leq$ 2%

## Typical Performance Characteristics

Figure 1. DC Current Gain

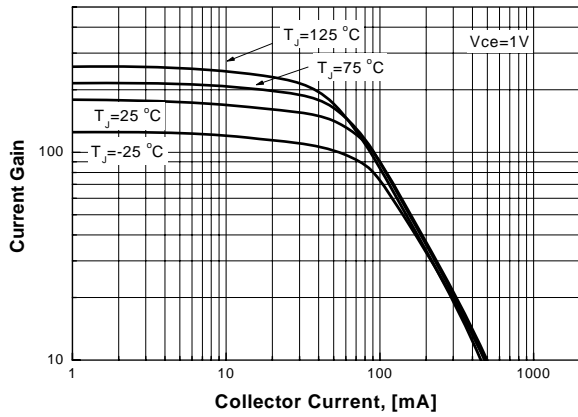


Figure 2. Collector-Emitter Saturation Voltage

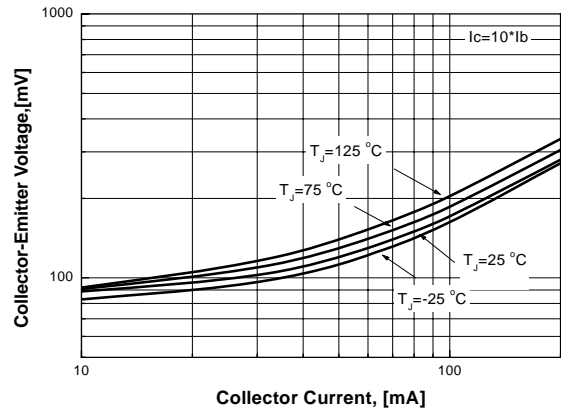


Figure 3. Base- Emitter Saturation Voltage

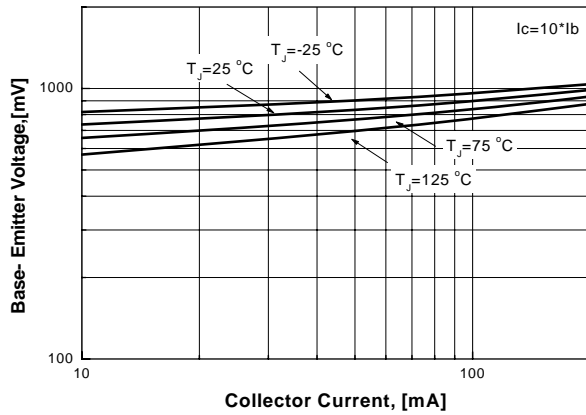


Figure 4. Collector- Base Leakage Current

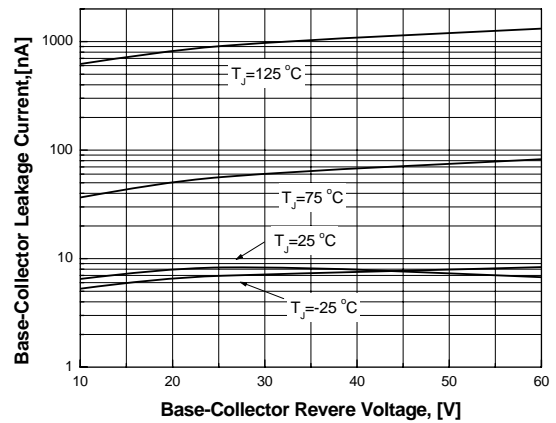


Figure 5. Collector- Base Capacitance

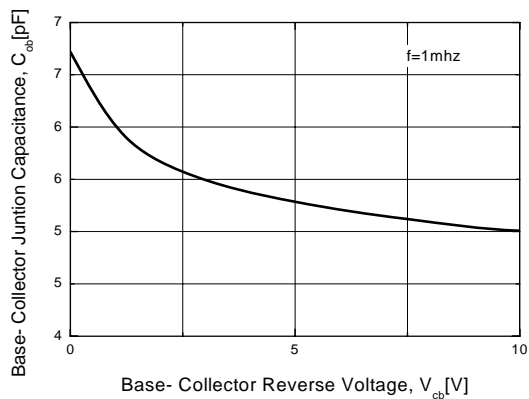
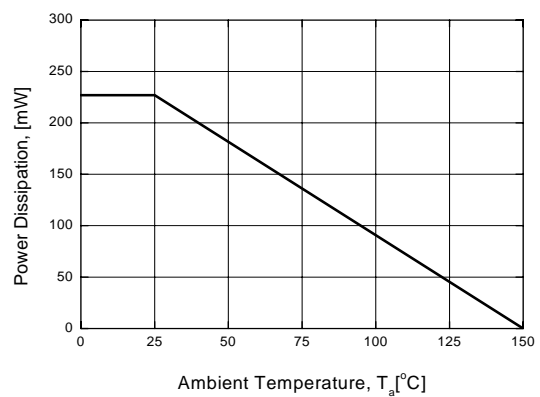


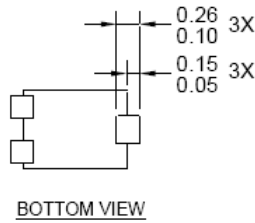
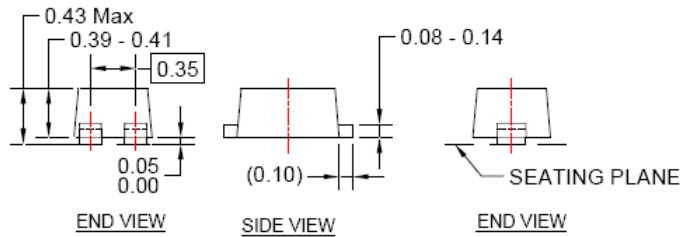
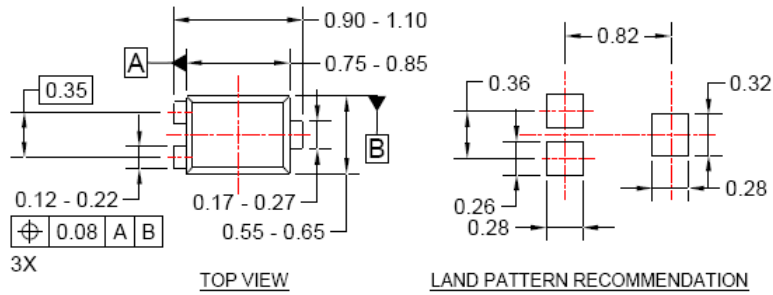
Figure 6. Power Derating



# Package Dimensions

## SOT-923F

- Case : SOT-923F
- Case Material(Molded Plastic): KTMC1060SC
- UL Flammability classification rating : "V0"
- Moisture Sensitivity level per JESD22-A1113B : MSL 1
- Lead terminals solderable per MIL-STD7502026 /JESD22A121
- Lead Free Plating : Pure Tin(Matte)






Dimensions in Millimeters



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FPST <sup>™</sup>		SuperSOT <sup>™</sup> -3	VCX <sup>™</sup>
FRFET <sup>®</sup>	PDP-SPM <sup>™</sup>	SuperSOT <sup>™</sup> -6	
Global Power Resource <sup>SM</sup>	Power220 <sup>®</sup>		

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