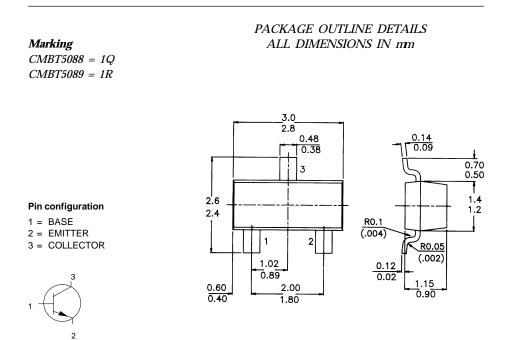


SOT-23 Formed SMD Package

CMBT5088 CMBT5089

NPN SILICON PLANAR EPITAXIAL TRANSISTORS

N-P-N transistors



ABSOLUTE MAXIMUM RATINGS

			5088		5089)
Collector-base voltage (open emitter)	V _{CB0}	max.	35		30	V
Collector-emitter voltage (open base)	V _{CE0}	max.	30		25	\overline{V}
Collector current	I_C	max.		<i>50</i>		mА
Total power dissipation up to $T_{amb} = 25 \ ^{\circ}C$	P_{tot}^*	max.		225		mW
Junction temperature	T_j	max.		150		° C
Collector-emitter saturation voltage	U					
$I_C = 10 mA; I_B = 1 mA$	V CEsat	max.		0.5		V
D.C. current gain						
$I_C = 100 \ \mu A; \ V_{CE} = 5 \ V$	h_{FE}	min.	300		400	
		max.	900		1200)
Transition frequency at $f = 20$ MHz						
$I_C = 500 \ \mu A; \ V_{CE} = 5 \ V$	f_T	min.		50	MHz	2

*FR-5 Board = $1.0 \times 0.75 \times 0.062$ in.

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	RATINGS (at $T_A = 25^{\circ}C$ unless otherwise spe	cified)				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Limiting values			5088		<i>5089</i>
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		V_{CBO}	max.	35		30 V
	Collector-emitter voltage (open base)	V_{CEO}	max.	. 30		25 V
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Emitter-base voltage (open collector)	VEBO	max		4.5	V
Storage temperature T_{stg} -55 to $+150$ $^{\circ}C$ Junction temperature T_{j} max. 150 $^{\circ}C$ THERMAL RESISTANCE From junction to ambient $R_{th j-a}$ 417 $^{\circ}C$ CHARACTERISTICS $T_{arnb} = 25$ $^{\circ}C$ unless otherwise specified 5088 5089 Collector cut-off current $I_E = 0$; $V_{CB} = 20$ I_{CBO} 50 $-nA$ $I_E = 0$; $V_{CB} = 15V$ $<$ $ 50$ nAEmitter cut-off current I_{EBO} 50 $-nA$ $I_C = 0$; $V_{EB} = 4.5V$ $<$ $ 100$ nASaturation voltages $I_C = 10$ mA; $I_B = 1$ mA V_{CEsat} 500 $I_C = 0$; $V_{EB} = 5V$ C_{cb} 4.0 pF Emitter guarded $I_C = 0$; $V_{CB} = 5V$ C_{cb} 4.0 $I_C = 0$; $V_{CB} = 5V$ C_{cb} 4.0 pF Emitter guarded $I_C = 0.1$ μA ; $V_{CE} = 5$ h_{FE} 300 $I_C = 0.1$ μA ; $V_{CE} = 5$ h_{FE} 300 400 Small signal current gain $I_C = 10$ mA; $V_{CE} = 5$ h_{FE} 350 $I_C = 10$ mA; $V_{CE} = 5$ h_{FE} 350 450 $I_C = 10$ mA; $V_{CE} = 5$ h_{FE} 300 400 Small signal current gain $I_C = 10$ $I_C = 50$ H_{FZ} $I_C = 10$ mA; $V_{CE} = 5$ I_T h_F 350 450 $I_C = 10$ mA; $V_{CE} = 5$ I_T I_T $S0$ MHZ $I_C = 10$ mA; $V_$	Collector current (d.c.)	I_C	max.		50	mA
Junction temperatureTjmax.150° CTHERMAL RESISTANCE From junction to ambient $R_{th j-a}$ 417CWCHARACTERISTICS $T_{amb} = 25$ °C unless otherwise specified50885089Collector cut-off current $I_{E = 0; V_{CB} = 20 V$ I_{CBO} $-nA$ $I_E = 0; V_{CB} = 15V$ $<$ $ 50 nA$ Emitter cut-off current I_{EBO} $<$ 50 $-nA$ $I_C = 0; V_{EB} = 3 V$ I_{EBO} $<$ $ 100 nA$ Saturation voltages $I_C = 10 mA; I_B = 1 mA$ V_{CEsat} $<$ $800 mV$ Collector capacitance at $f = 100 KHz$ $I_E = 0; V_{CB} = 5V$ C_{cb} $<$ $4.0 pF$ Emitter guarded $I_E = 0; V_{CB} = 5V$ C_{cb} $<$ $10 pF$ Envitter guarded $I_C = 0; V_{EB} = 0.5V$ C_{cb} $<$ $10 pF$ Envitter guarded $I_C = 0; V_{CB} = 5V$ h_{FE} 300 400 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 300 400 Small signal current gain $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 100 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 $I_C = 10 mA; V_{CE} = 5 V$ h_{FE} 350 450 $I_C = 10 mA; V_{CE} = 5 V$ <td>Total power dissipation up to $T_{amb} = 25 \ ^{\circ}C$</td> <td>P_{tot}^*</td> <td>max</td> <td></td> <td>225</td> <td>mW</td>	Total power dissipation up to $T_{amb} = 25 \ ^{\circ}C$	P_{tot}^*	max		225	mW
THERMAL RESISTANCE From junction to ambient I_{th} I_{th} I_{th} THERMAL RESISTANCE From junction to ambient $R_{th j-a}$ 417 °CWCHARACTERISTICS Callector cut-off current $I_E = 0; V_{CB} = 20$ V I_{CBO} 5088 5089 Collector cut-off current $I_C = 0; V_{EB} = 3$ V I_{CBO} 50 $-nA$ $I_C = 0; V_{EB} = 3$ V I_{EBO} 50 $-nA$ $I_C = 0; V_{EB} = 4.5V$ < 100 nASaturation voltages $I_C = 10$ mA; $I_B = 1$ mA V_{CEsat} 800 mVCollector capacitance at $f = 100$ KHz KHz Emitter guarded $I_E = 0; V_{CB} = 5V$ C_{cb} 4.0 pF Emitter guarded $I_C = 0.1$ μ A; $V_{CE} = 5$ V h_{FE} $300-900$ $I_C = 0.1$ μ A; $V_{CE} = 5$ V h_{FE} 300 $I_C = 10$ mA; $V_{CE} = 5$ V h_{FE} 300 $I_C = 10$ mA; $V_{CE} = 5$ V h_{FE} 300 $I_C = 10$ mA; $V_{CE} = 5$ V h_{FE} 300 $I_C = 10$ mA; $V_{CE} = 5$ V h_{FE} 300 $I_C = 10$ mA; $V_{CE} = 5$ V h_{FE} $350-1400$ $I_C = 500$ μ A; $V_{CE} = 5$ V f_T > 50MHz $I_C = 100$ μ A; $V_{CE} = 5$ V f_T $I_C = 500$ μ A; $V_{CE} = 5$ V f_T > 50MHzNoise figure at $R_S = 10$ k Ω $I_C = 100$ μ A; $V_{CE} = 5$ V	Storage temperature	Tstg		-55	to +	-150 ° C
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Junction temperature	T_j	max.		150	° C
CHARACTERISTICS $T_{anb} = 25 ^{\circ}C$ unless otherwise specified 5088 5089 Collector cut-off current $I_E = 0; V_{CB} = 20 V$ $I_{CBO} < 50$ $-nA$ $I_E = 0; V_{CB} = 15V$ $< 50 nA$ Emitter cut-off current $I_{CBO} < 50$ $-nA$ $I_C = 0; V_{EB} = 3 V$ $I_{EBO} < 50$ $-nA$ $I_C = 0; V_{EB} = 4.5V$ $< 100 nA$ Saturation voltages $< 100 nA$ $I_C = 10 mA; I_B = 1 mA$ $V_{CEsat} < 500$ mV VBEsat < 800 mV Collector capacitance at $f = 100 \text{KHz}$ Emitter guarded $I_C = 0; V_{CB} = 5V$ $C_{cb} < 4.0 pF$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ $C_{cb} < 4.0 pF$ pF D.C. current gain $I_C = 0; V_{EB} = 0.5V$ $C_{eb} < 10 pF$ pF D.C. current gain $I_C = 10 mA; V_{CE} = 5 V$ $h_{FE} > 350 450$ 450 $I_C = 10 mA; V_{CE} = 5 V$ $h_{FE} > 300 400$ 50.1200 400.1200 $I_C = 10 mA; V_{CE} = 5 V$ $h_{FE} > 350 450$ 450 $I_C = 10 mA; V_{CE} = 5 V$ $h_F = 350.1400 450.$	THERMAL RESISTANCE					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	From junction to ambient	R _{th j-a}			417	CW
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	CHARACTERISTICS					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	T _{amb} = 25 °C unless otherwise specified			<i>5088</i>		<i>5089</i>
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Collector cut-off current					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$I_E = 0; V_{CB} = 20 V$	I _{CBO}	<	50		- nA
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$I_E = 0; V_{CB} = 15V$		<	-		50 nA
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Emitter cut-off current					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$I_{C} = 0; V_{EB} = 3 V$	I _{EBO}	<	50		- nA
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$I_{C} = 0; V_{EB} = 4.5V$		<	-		100 nA
$V_{BEsat} < 800 \text{ mV}$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_E = 0; V_{CB} = 5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Emitter guarded $I_C = 0; V_{EB} = 0.5V$ Collector capacitance at $f = 100 \text{ KHz}$ Figure at $R_S = 10 \text{ k}\Omega$ $I_C = 100 \mu\text{A}; V_{CE} = 5 V$ Neve the set of t	Saturation voltages					
	$I_C = 10 \ mA; \ I_B = 1 \ mA$	V _{CEsat}	<		500	mV
$\begin{array}{l lllllllllllllllllllllllllllllllllll$		V _{BEsat}	<		800	mV
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Collector capacitance at $f = 100 \text{ KHz}$					
$\begin{array}{l lllllllllllllllllllllllllllllllllll$	Emitter guarded					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$I_E = 0; V_{CB} = 5V$	C _{cb}	<		4.0	pF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Emitter capacitance at f = 100 KHz					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Emitter guarded					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$I_C = 0; V_{EB} = 0.5V$	C_{eb}	<		10	pF
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	D.C. current gain					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$I_C = 0.1 \ \mu A; \ V_{CE} = 5 \ V$	h_{FE}		300-900		400-1200
	$I_C = 1.0 \ mA; \ V_{CE} = 5 \ V$	h_{FE}	>	350		450
$\begin{array}{c c} I_{C} = 1 \ \text{mA; } V_{CE} = 5V; \ f = 1 \ \text{KHz} & h_{fe} & 350\text{-}1400 & 450\text{-}1800 \\ \hline \\ Transition \ frequency \ at \ f = 20 \ \text{MHz} & & \\ I_{C} = 500 \ \mu\text{A; } V_{CE} = 5 \ V & f_{T} & > 50 \ \text{MHz} \\ \hline \\ Noise \ figure \ at \ R_{S} = 10 \ \text{k}\Omega & & \\ I_{C} = 100 \ \mu\text{A; } V_{CE} = 5 \ V & N_{F} & < 3.0 & 2.0 \ \text{dB} \end{array}$	$I_C = 10 \text{ mA}; V_{CE} = 5 V$	h_{FE}	>	300		400
Transition frequency at $f = 20$ MHz $I_C = 500 \ \mu A; \ V_{CE} = 5 \ V$ $f_T > 50$ MHz Noise figure at $R_S = 10 \ k\Omega$ $I_C = 100 \ \mu A; \ V_{CE} = 5 \ V$ $N_F < 3.0$ $2.0 \ dB$	Small signal current gain					
$\begin{split} I_C &= 500 \ \mu A; \ V_{CE} &= 5 \ V & f_T > 50 & \text{MHz} \\ Noise figure at R_S &= 10 \ \text{k}\Omega & & \\ I_C &= 100 \ \mu A; \ V_{CE} &= 5 \ V & N_F < 3.0 & 2.0 \ \text{dB} \end{split}$	$I_C = 1 mA; V_{CE} = 5V; f = 1 KHz$	h _{fe}		350-1400		450-1800
Noise figure at $R_S = 10 \ k\Omega$ $I_C = 100 \ \mu A; \ V_{CE} = 5 \ V$ N_F 3.0 2.0 \ dB	Transition frequency at $f = 20 MHz$					
$I_C = 100 \ \mu A; \ V_{CE} = 5 \ V \qquad N_F < 3.0 \qquad 2.0 \ dB$	$I_C = 500 \ \mu A; \ V_{CE} = 5 \ V$	f_T	>		50	MHz
$I_C = 100 \ \mu A; \ V_{CE} = 5 \ V \qquad N_F < 3.0 \qquad 2.0 \ dB$						
$f = 10 \ Hz$ to 15.7 Hz	$I_C = 100 \ \mu A; \ V_{CE} = 5 \ V$	N_F	<	3.0		2.0 dB
	f = 10 Hz to 15.7 Hz					

*FR-5 Board = $1.0 \times 0.75 \times 0.62$ in.

Customer Notes

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Data Sheet

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