MMBT3946DW Transistor(NPN/PNP)

Q1 MAXIMUM RATINGS (T_a=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current -Continuous	I_C	0.2	A
Power Dissipation	P_d	0.2	W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55~ +150	℃

Q2 MAXIMUM RATINGS (T_a=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-6	V
Collector Current -Continuous	I_C	-0.2	A
Power Dissipation	P_d	0.2	W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55~ +150	℃

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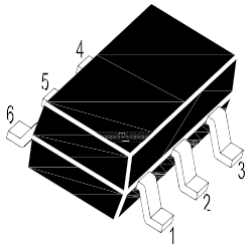
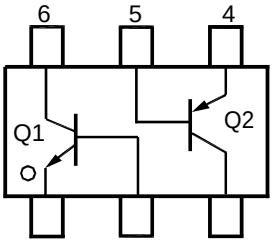


1. Emitter 2. Base
3. Collector 4. Emitter
5. Base 6. Collector



Q1 ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

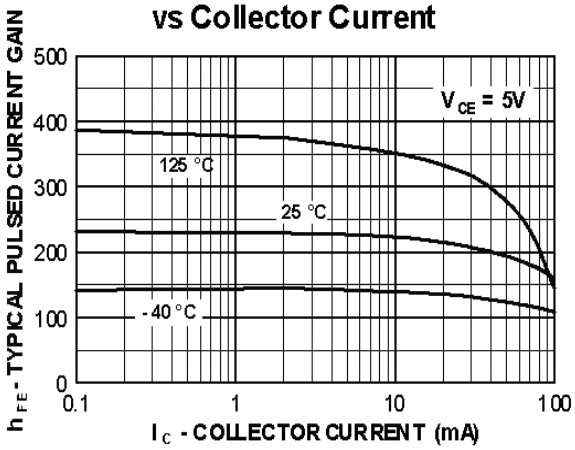
Parameter	Symbol	Test Condition	Min	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	I_C=10μA ,I_E=0	60		V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C=1mA , I_B=0	40		V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	IE=10μA,IC=0	6		V
Collector cut-off current	I_{CBO}	V_{CB}=60V, I_E=0		50	nA
Emitter cut-off current	I_{EBO}	V_{EB}=6V, I_C=0		50	nA
DC current gain	h_{FE1}	V_{CE}=1V, I_C=0.1mA	40		
	h_{FE2}	V_{CE}=1V, I_C=1mA	70		
	h_{FE3}	V_{CE}=1V, I_C=10mA	100	300	
	h_{FE4}	V_{CE}=1V, I_C=50mA	60		
	h_{FE5}	V_{CE}=1V, I_C=100mA	30		
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C=10mA, I_B=1mA		0.2	V
		I_C=50mA, I_B=5mA		0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C=10mA, I_B=1mA	0.65	0.85	V
		I_C=50mA, I_B=5mA		0.95	V
Transition frequency	f_T	V_{CE}= 20V, I_C=10mA,f=100MHz	300		MHZ
Collector Output Capacitance	C_{pd}	V_{CB}= 5V, I_E=0mA,f=1MHz		4	pF
Delay Time	t_d	V_{CC} =3V, I_C = 10mA, V_{BE}(off) =-0.5V, I_{B1}=1mA		35	ns
Rise Time	t_r			35	ns
Storage Time	t_s	V_{CC} =3V, I_C =10mA, I_{B1} = I_{B2} =1mA		200	ns
Fall Time	t_f			50	ns

Q2 ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

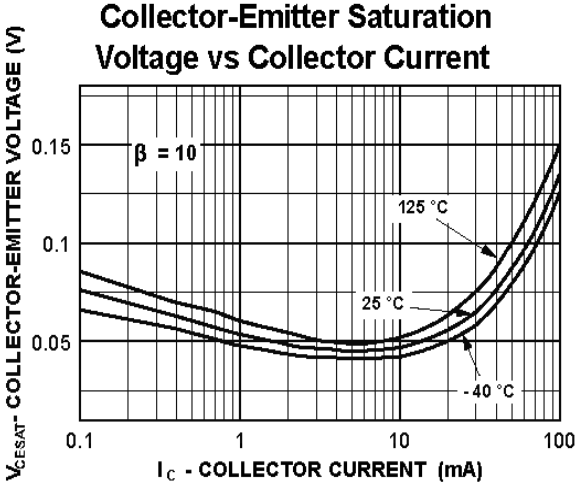
Parameter	Symbol	Test Condition	Min	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	IC=-10μA ,IE=0	-40		V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	IC=-1mA , IB=0	-40		V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	IE=-10μA,IC=0	-6		V
Collector cut-off current	I_{CBO}	VCB=-30V, IE=0		-50	nA
Emitter cut-off current	I_{EBO}	VCE=-30V, VEB(OFF)=-3V		-50	nA
DC current gain	h_{FE1}	VCE=-1V, IC=-0.1mA	60		
	h_{FE2}	VCE=-1V, IC=-1mA	80		
	h_{FE3}	VCE=-1V, IC=-10mA	100	300	
	h_{FE4}	VCE=-1V, IC=-50mA	60		
	h_{FE5}	VCE=-1V, IC=-100mA	30		
Collector-emitter saturation voltage	$V_{CE(sat)}$	IC=-10mA, IB= -1mA		-0.25	V
		IC=-50mA, IB= -5mA		-0.4	V
Base-emitter saturation voltage	$V_{BE(sat)}$	IC=-10mA, IB= -1mA	-0.65	-0.85	V
		IC=-50mA, IB= -5mA		-0.95	V
Transition frequency	f_T	VCE= -20V, IC=-10mA, f =100MHz	250		MHZ
Output Capacitance	C_{obo}	VCB =-5.0V, f = 1.0MHz, IE = 0		4.5	pf
Delay Time	t_d	VCC =-3.0V, IC = -10mA, VBE(off) = 0.5V, IB1 = -1.0mA		35	ns
Rise Time	t_r			35	ns
Storage Time	t_s	VCC = -3.0V, IC = -10mA, IB1 = IB2 = -1.0mA		225	ns
Fall Time	t_f			75	ns

Typical Characteristics (Q1)

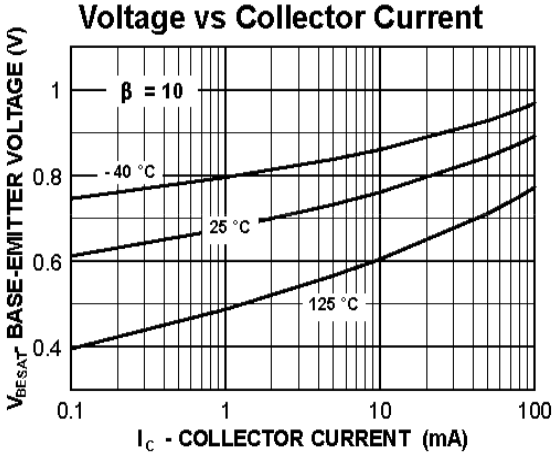
Typical Pulsed Current Gain vs Collector Current



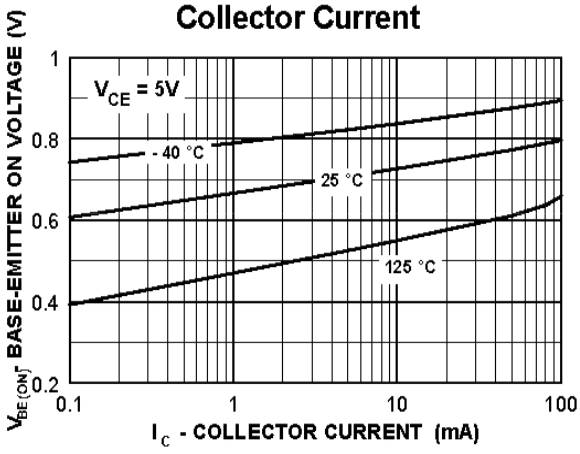
Collector-Emitter Saturation Voltage vs Collector Current



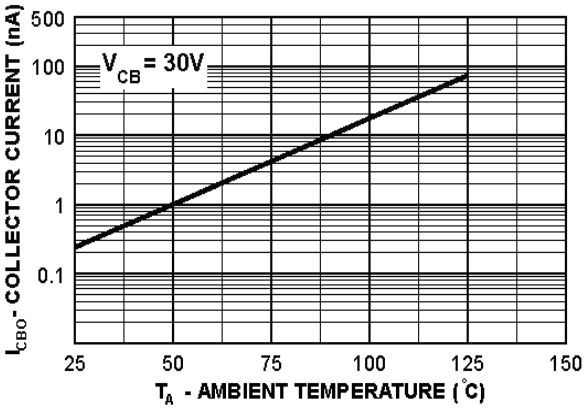
Base-Emitter Saturation Voltage vs Collector Current



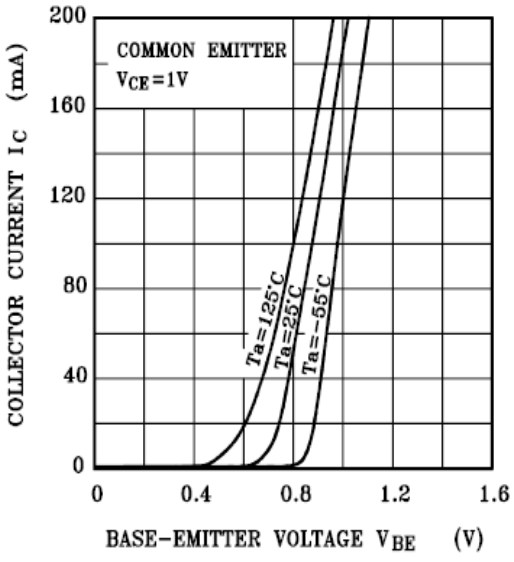
Base-Emitter ON Voltage vs Collector Current



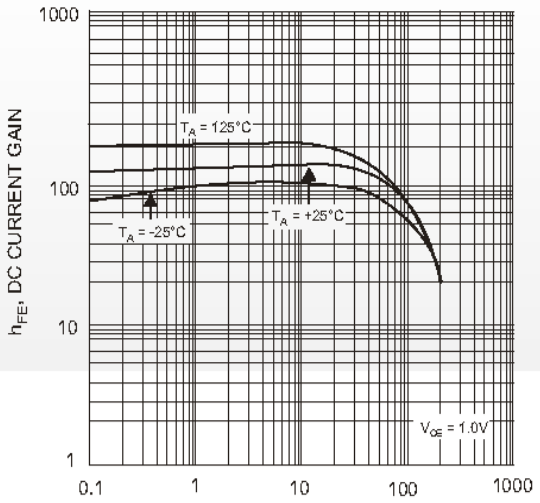
Collector-Cutoff Current vs Ambient Temperature



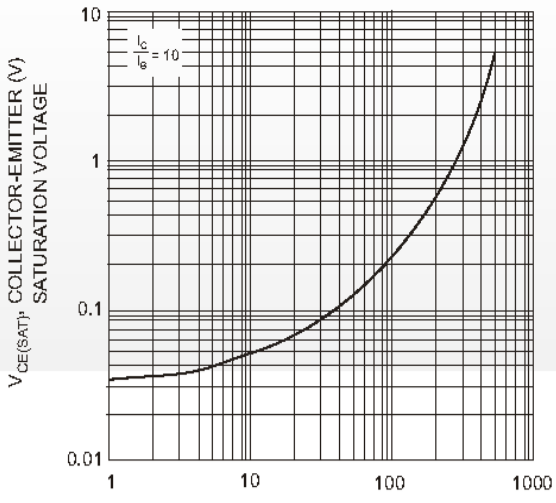
I_C – V_{BE}



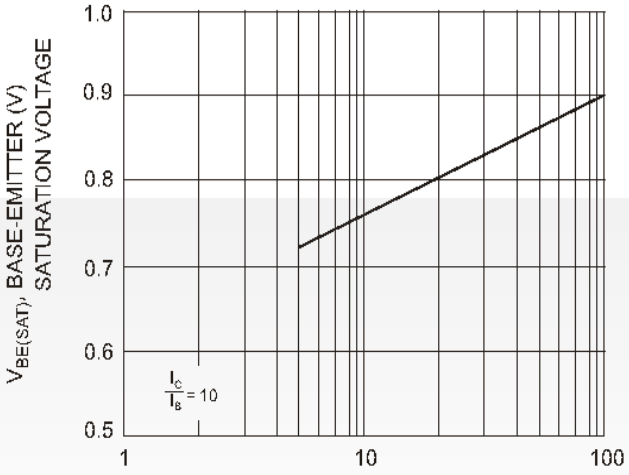
Typical Characteristics (Q2)



Typical DC Current Gain vs Collector Current



Typical Collector-Emitter Saturation Voltage vs. Collector Current



Typical Base-Emitter Saturation Voltage vs. Collector Current

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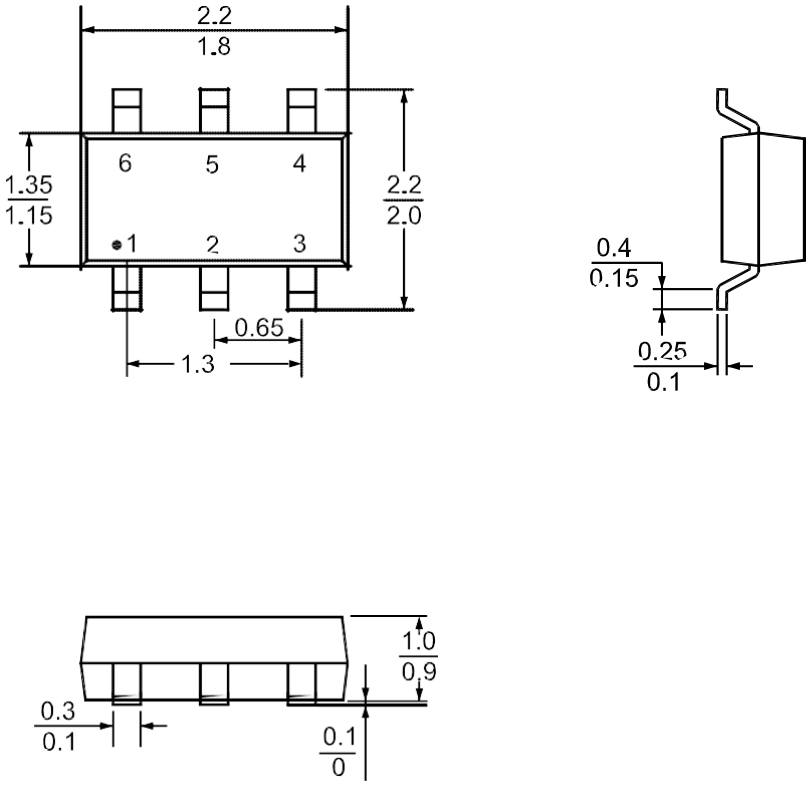
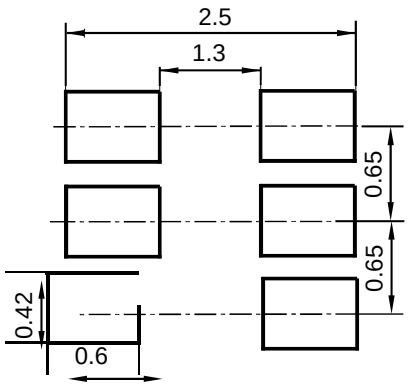


RECOMMENDED SOLDERING FOOTPRINT



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