

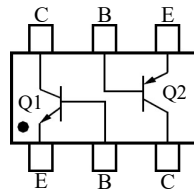
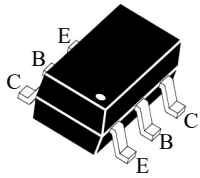


MMBT3946DWH

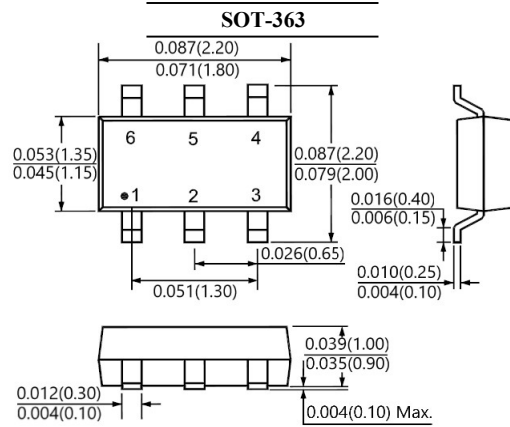
NPN / PNP TRANSISTORS

FEATURES

· Suffix "H" indicates Halogen-free parts, ex. MMBT3946DWH



B	Base
C	Collector
E	Emitter



Dimensions in inch and (millimeter)

Q1 NPN Maximum Ratings ($T_A = 25^\circ\text{C}$ 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	I_C	200	mA

Q2 PNP Maximum Ratings ($T_A = 25^\circ\text{C}$ 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	I_C	-200	mA

Q1 NPN / Q2 PNP Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Power Dissipation	P_{tot}	200	mW
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^\circ\text{C}$



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Q1 NPN Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Min.	Max.	Unit
DC Current Gain	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	h_{FE}	40	-	-
	$V_{CE}=1\text{V}, I_C=1\text{mA}$		70	-	
	$V_{CE}=1\text{V}, I_C=10\text{mA}$		100	300	
	$V_{CE}=1\text{V}, I_C=50\text{mA}$		60	-	
	$V_{CE}=1\text{V}, I_C=100\text{mA}$		30	-	
Collector Base Cutoff Current	$V_{CB}=30\text{V}$	I_{CBO}	-	50	nA
Emitter Base Cutoff Current	$V_{EB}=6\text{V}$	I_{EBO}	-	50	nA
Collector Base Breakdown Voltage	$I_C=10\mu\text{A}$	$V_{(BR)CBO}$	60	-	V
Collector Emitter Breakdown Voltage	$I_C=1\text{mA}$	$V_{(BR)CEO}$	40	-	V
Emitter Base Breakdown Voltage	$I_E=10\mu\text{A}$	$V_{(BR)EBO}$	6	-	V
Collector Emitter Saturation Voltage	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{CE(sat)}$	-	0.20	V
	$I_C=50\text{mA}, I_B=5\text{mA}$		-	0.30	
Base Emitter Saturation Voltage	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{BE(sat)}$	0.65	0.85	V
	$I_C=50\text{mA}, I_B=5\text{mA}$		-	0.95	
Transition Frequency	$V_{CE}=20\text{V}, I_C=10\text{mA},$ $f=100\text{MHz}$	f_T	300	-	MHz
Collector Output Capacitance	$V_{CB}=5\text{V}, I_E=0\text{V}, f=1\text{MHz}$	C_{ob}	-	4	pF
Delay Time	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V},$ $I_C=10\text{mA}, I_{B1}=1\text{mA}$	t_d	-	35	ns
Rise Time	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V},$ $I_C=10\text{mA}, I_{B1}=1\text{mA}$	t_r	-	35	ns
Storage Time	$V_{CC}=3\text{V}, I_C=10\text{mA},$ $I_{B1} = -I_{B2} = 1\text{mA}$	t_s	-	200	ns
Fall Time	$V_{CC}=3\text{V}, I_C=10\text{mA},$ $I_{B1} = -I_{B2} = 1\text{mA}$	t_f	-	50	ns



MMBT3946DW

NPN / PNP TRANSISTOR

Q2 PNP Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Min.	Max.	Unit
DC Current Gain	$V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$	h_{FE}	60	-	-
	$V_{CE} = -1\text{V}, I_C = -1\text{mA}$		80	-	
	$V_{CE} = -1\text{V}, I_C = -10\text{mA}$		100	300	
	$V_{CE} = -1\text{V}, I_C = -50\text{mA}$		60	-	
	$V_{CE} = -1\text{V}, I_C = -100\text{mA}$		30	-	
Collector Base Cutoff Current	$V_{CB} = -30\text{V}$	I_{CBO}	-	-50	nA
Emitter Base Cutoff Current	$V_{EB} = -6\text{V}$	I_{EBO}	-	-50	nA
Collector Base Breakdown Voltage	$I_C = -10\mu\text{A}$	$V_{(BR)CBO}$	-40	-	V
Collector Emitter Breakdown Voltage	$I_C = -1\text{mA}$	$V_{(BR)CEO}$	-40	-	V
Emitter Base Breakdown Voltage	$I_E = -10\mu\text{A}$	$V_{(BR)EBO}$	-6	-	V
Collector Emitter Saturation Voltage	$I_C = -10\text{mA}, I_B = -1\text{mA}$	$V_{CE(sat)}$	-	-0.25	V
	$I_C = -50\text{mA}, I_B = -5\text{mA}$		-	-0.40	
Base Emitter Saturation Voltage	$I_C = -10\text{mA}, I_B = -1\text{mA}$	$V_{BE(sat)}$	-0.65	-0.85	V
	$I_C = -50\text{mA}, I_B = -5\text{mA}$		-	-0.95	
Transition Frequency	$V_{CE} = -20\text{V}, I_C = -10\text{mA},$ $f = 100\text{MHz}$	f_T	250	-	MHz
Collector Output Capacitance	$V_{CB} = -5\text{V}, I_E = 0\text{V}, f = 1\text{MHz}$	C_{obo}	-	4.5	pF
Delay Time	$V_{CC} = -3\text{V}, V_{BE} = -0.5\text{V},$ $I_C = -10\text{mA}, I_{B1} = -1\text{mA}$	t_d	-	35	ns
Rise Time	$V_{CC} = -3\text{V}, V_{BE} = -0.5\text{V},$ $I_C = -10\text{mA}, I_{B1} = -1\text{mA}$	t_r	-	35	ns
Storage Time	$V_{CC} = -3\text{V}, I_C = -10\text{mA},$ $I_{B1} = -I_{B2} = -1\text{mA}$	t_s	-	225	ns
Fall Time	$V_{CC} = -3\text{V}, I_C = -10\text{mA},$ $I_{B1} = -I_{B2} = -1\text{mA}$	t_f	-	75	ns



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RATINGS AND CHARACTERISTIC CURVES

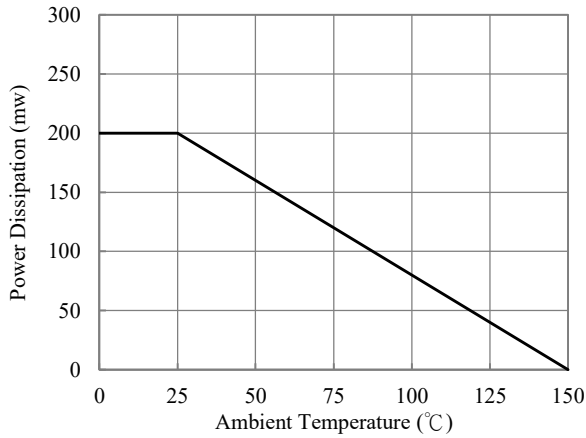


Fig. 1-Power Derating Curve

Q1 NPN

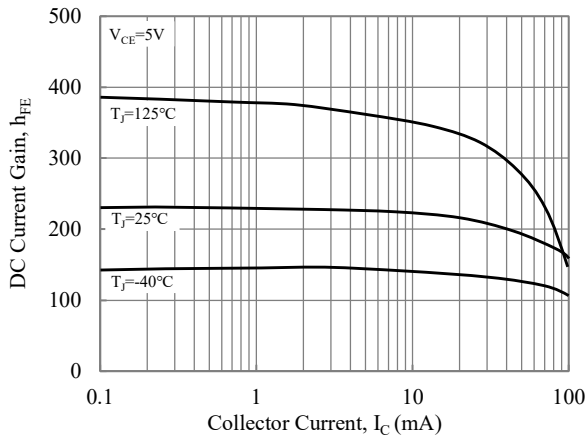


Fig. 2-Current Gain vs Collector Current

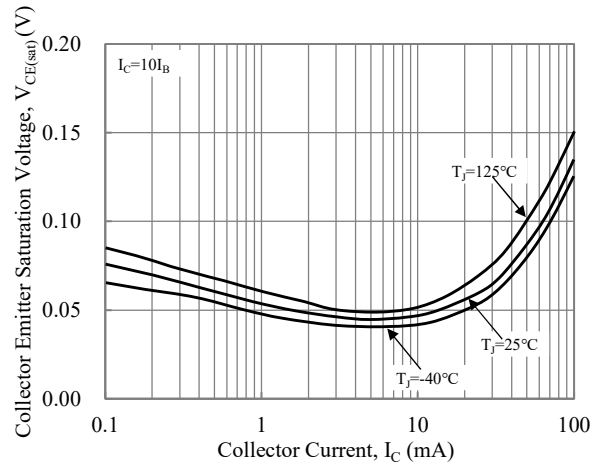


Fig. 3-Collector Emitter Saturation Voltage vs. Collector Current

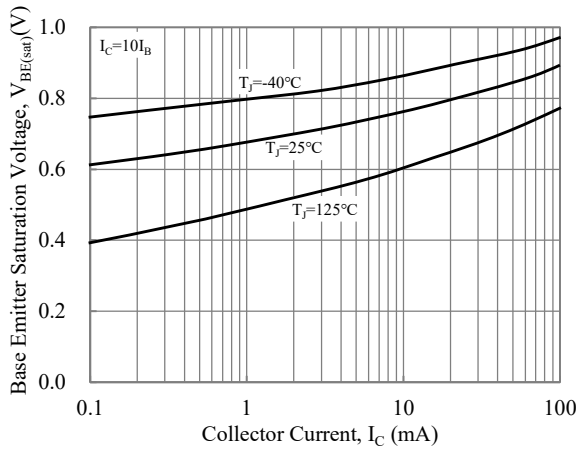


Fig. 4-Base Emitter Saturation Voltage vs. Collector Current

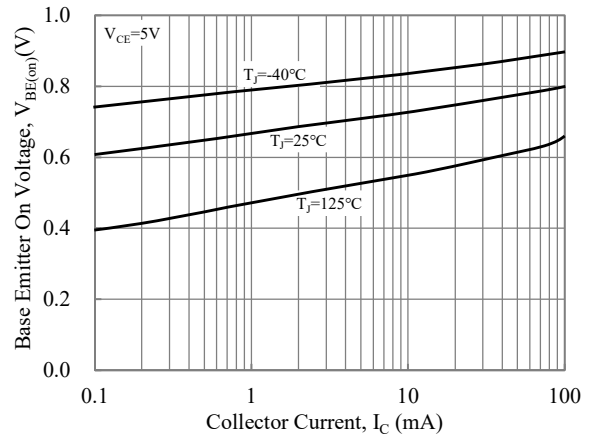


Fig. 5-Base Emitter On Voltage vs. Collector Current



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Q2 PNP

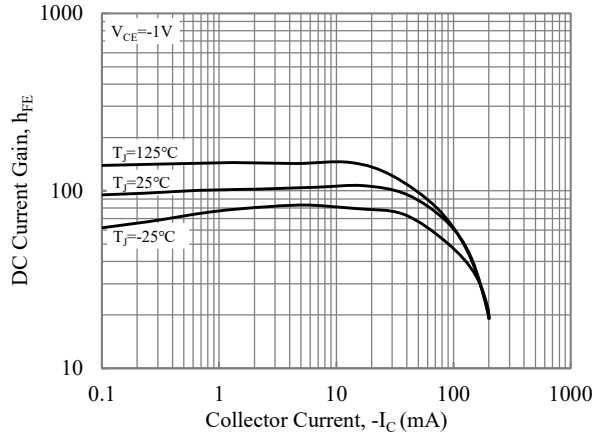


Fig. 6-Current Gain vs Collector Current

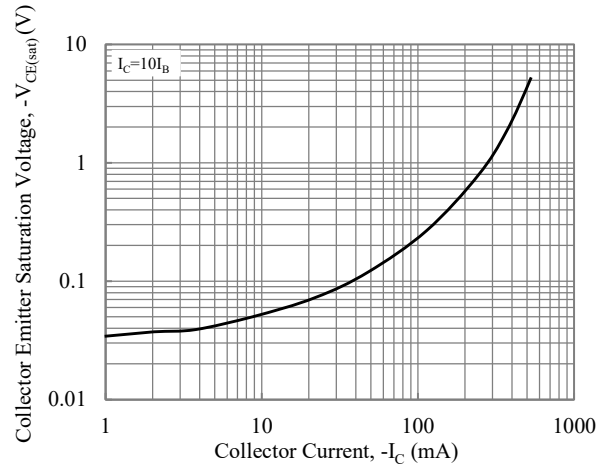


Fig. 7-Collector Emitter Saturation Voltage vs. Collector Current

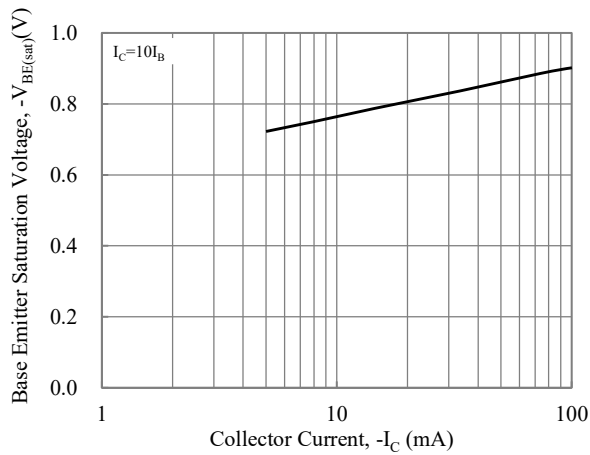


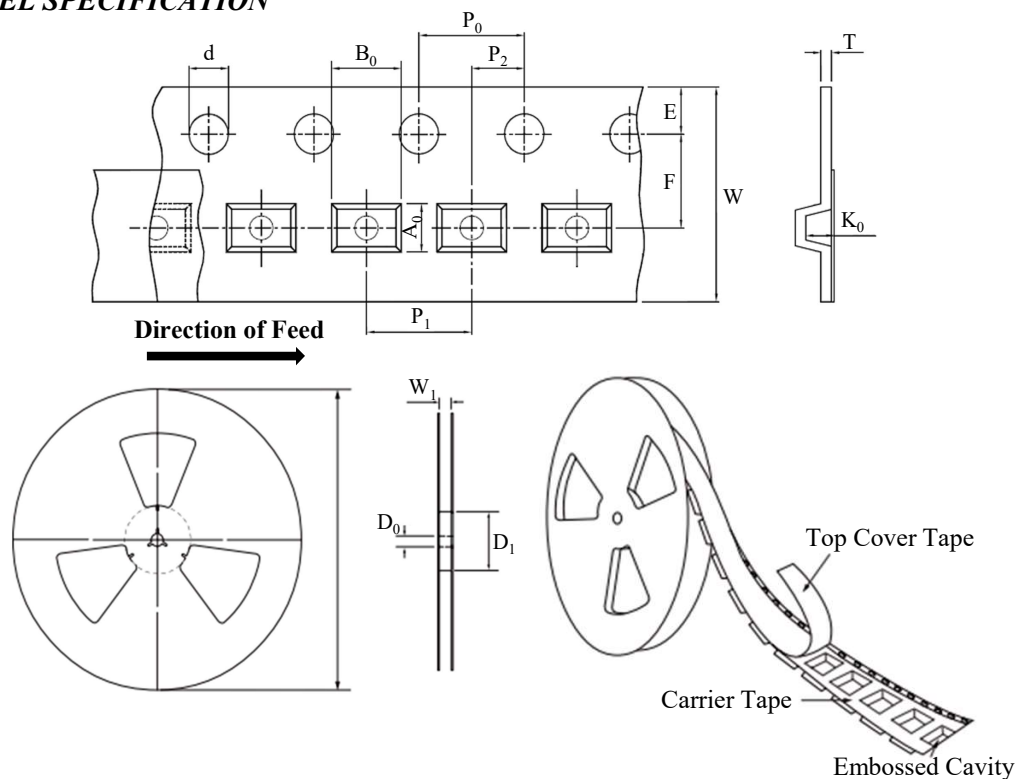
Fig. 8-Base Emitter Saturation Voltage vs. Collector Current



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TAPE & REEL SPECIFICATION



Item	Symbol	SOT-363
Carrier width	A ₀	2.35 ± 0.10
Carrier length	B ₀	2.35 ± 0.10
Carrier depth	K ₀	1.25 ± 0.10
Sprocket hole	d	1.50 ± 0.10
Reel outside diameter	D	178.00 ± 2.00
Feed hole width	D ₀	13.00 ± 0.50
Reel inner diameter	D ₁	MIN. 50.00
Sprocket hole position	E	1.75 ± 0.10
Punch hole position	F	3.50 ± 0.10
Sprocket hole pitch	P ₀	4.00 ± 0.10
Punch hole pitch	P ₁	4.00 ± 0.10
Embossment center	P ₂	2.00 ± 0.10
Overall tape thickness	T	0.60 ± 0.10
Tape width	W	8.00 ± 0.30
Reel width	W1	MAX. 10.00

ORDER INFORMATION

Package	Reel Size	Quantity
SOT-363	7"	3,000

MARKING CODE

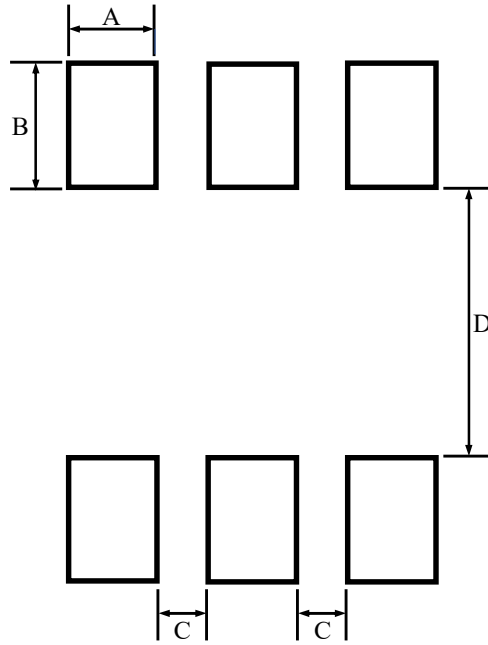
Part Number	Marking Code
MMBT3946DWH	DE



MMBT3946DWH

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SUGGESTED SOLDER PAD LAYOUT



Unit :mm

PACKAGE	A	B	C	D
SOT-363	0.42	0.60	0.23	1.30