

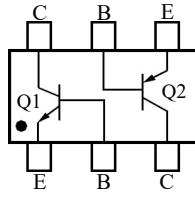
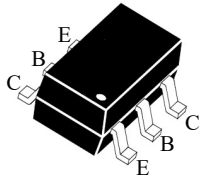


MMBT4413DWH

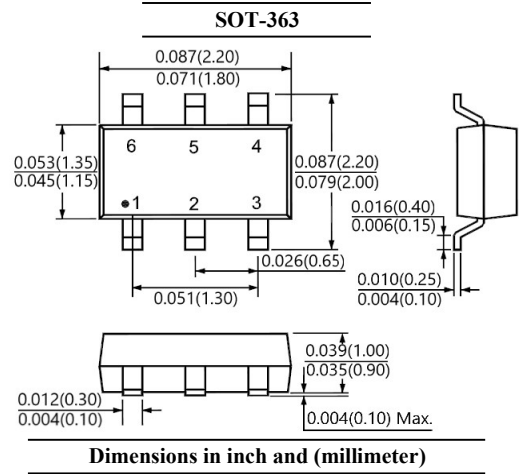
NPN + PNP TRANSISTORS

FEATURES

· Suffix "H" indicates Halogen-free parts, ex. MMBT4413DWH.



B	Base
C	Collector
E	Emitter



Q1 NPN Maximum Ratings ($T_A=25\text{ }^\circ\text{C}$ 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	600	mA

Q2 PNP Maximum Ratings ($T_A=25\text{ }^\circ\text{C}$ 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}	-5	V
Collector Current	I_C	-600	mA

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

Parameter	Symbol	Value	Unit
Power Dissipation	P_D	200	mW
Thermal Resistance from Junction to Ambient (Note 1)	$R_{\theta JA}$	625	$^\circ\text{C}/\text{W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^\circ\text{C}$

Note:

1. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.



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Q1 NPN Electrical Characteristics ($T_A = 25^\circ\text{C}$ 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}	20	-	-
	$V_{CE}=1\text{V}, I_C=1\text{mA}$		40	-	
	$V_{CE}=1\text{V}, I_C=10\text{mA}$		80	-	
	$V_{CE}=1\text{V}, I_C=150\text{mA}$		100	300	
	$V_{CE}=1\text{V}, I_C=500\text{mA}$		40	-	
Collector Base Cutoff Current	$V_{CB}=35\text{V}$	I_{CBO}	-	100	nA
Emitter Base Cutoff Current	$V_{EB}=5\text{V}$	I_{EBO}	-	100	nA
Collector Base Breakdown Voltage	$I_C=100\mu\text{A}$	$V_{(BR)CBO}$	60	-	V
Collector Emitter Breakdown Voltage	$I_C=1\text{mA}$	$V_{(BR)CEO}$	40	-	V
Emitter Base Breakdown Voltage	$I_E=100\mu\text{A}$	$V_{(BR)EBO}$	6	-	V
Collector Emitter Saturation Voltage	$I_C=150\text{mA}, I_B=15\text{mA}$	$V_{CE(sat)}$	-	0.40	V
	$I_C=500\text{mA}, I_B=50\text{mA}$		-	0.75	
Base Emitter Saturation Voltage	$I_C=150\text{mA}, I_B=15\text{mA}$	$V_{BE(sat)}$	0.75	0.95	V
	$I_C=500\text{mA}, I_B=50\text{mA}$		-	1.20	
Transition Frequency	$V_{CE}=10\text{V}, I_C=20\text{mA},$ $f=100\text{MHz}$	f_T	250	-	MHz
Collector Output Capacitance	$V_{CB}=5\text{V}, I_E=0\text{V}, f=1\text{MHz}$	C_{ob}	-	8	pF



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Q2 PNP Electrical Characteristics ($T_A = 25^\circ\text{C}$ 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}	30	-	-
	$V_{CE} = -1\text{V}, I_C = -1\text{mA}$		60	-	
	$V_{CE} = -1\text{V}, I_C = -10\text{mA}$		100	-	
	$V_{CE} = -2\text{V}, I_C = -150\text{mA}$		100	300	
	$V_{CE} = -2\text{V}, I_C = -500\text{mA}$		20	-	
Collector Base Cutoff Current	$V_{CB} = -35\text{V}$	I_{CBO}	-	-100	nA
Emitter Base Cutoff Current	$V_{EB} = -5\text{V}$	I_{EBO}	-	-100	nA
Collector Base Breakdown Voltage	$I_C = -100\mu\text{A}$	$V_{(BR)CBO}$	-40	-	V
Collector Emitter Breakdown Voltage	$I_C = -1\text{mA}$	$V_{(BR)CEO}$	-40	-	V
Emitter Base Breakdown Voltage	$I_E = -100\mu\text{A}$	$V_{(BR)EBO}$	-5	-	V
Collector Emitter Saturation Voltage	$I_C = -150\text{mA}, I_B = -15\text{mA}$	$V_{CE(sat)}$	-	-0.40	V
	$I_C = -500\text{mA}, I_B = -50\text{mA}$		-	-0.40	
Base Emitter Saturation Voltage	$I_C = -150\text{mA}, I_B = -15\text{mA}$	$V_{BE(sat)}$	-0.75	-0.95	V
	$I_C = -500\text{mA}, I_B = -50\text{mA}$		-	-1.30	
Transition Frequency	$V_{CE} = -10\text{V}, I_C = -20\text{mA},$ $f = 100\text{MHz}$	f_T	200	-	MHz
Collector Output Capacitance	$V_{CB} = -10\text{V}, I_E = 0\text{V}, f = 1\text{MHz}$	C_{ob}	-	8.5	pF



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RATINGS AND CHARACTERISTIC CURVES

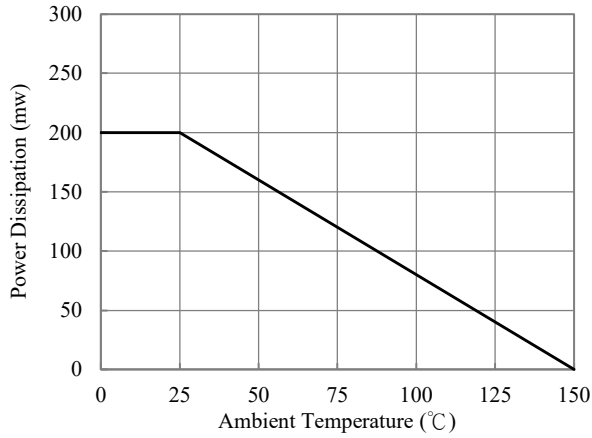


Fig. 1-Power Derating Curve

Q1 NPN

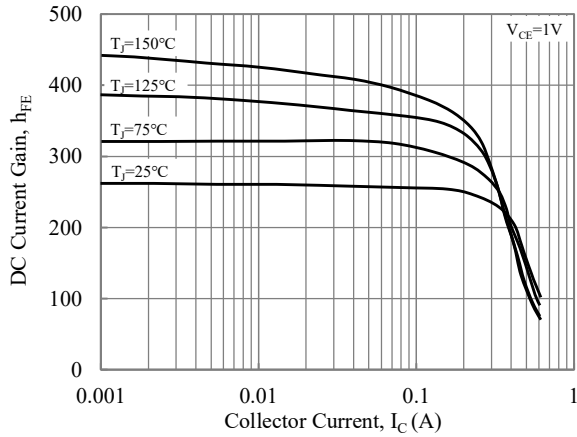


Fig. 2-Current Gain vs. Collector Current

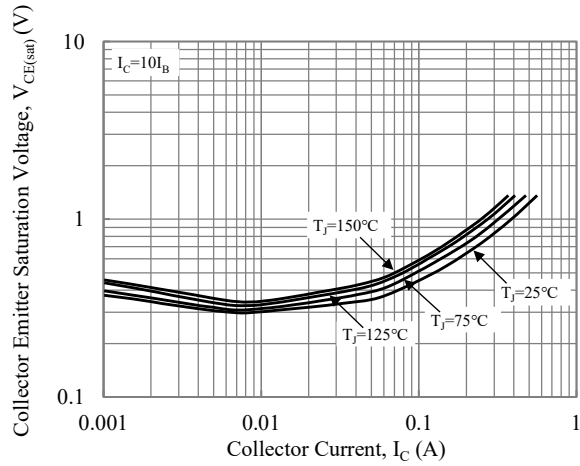


Fig. 3-Collector Emitter Saturation Voltage vs. Collector Current

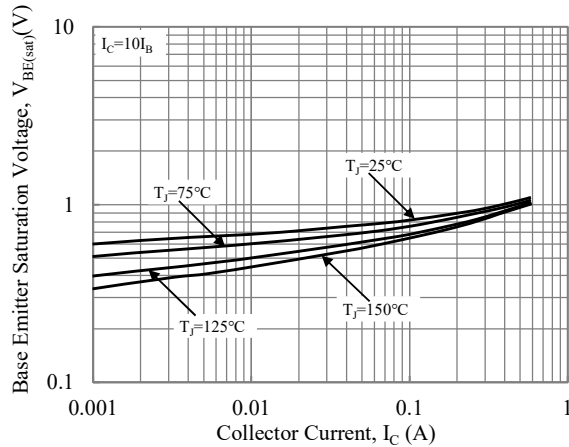


Fig. 4-Base Emitter Saturation Voltage vs. Collector Current

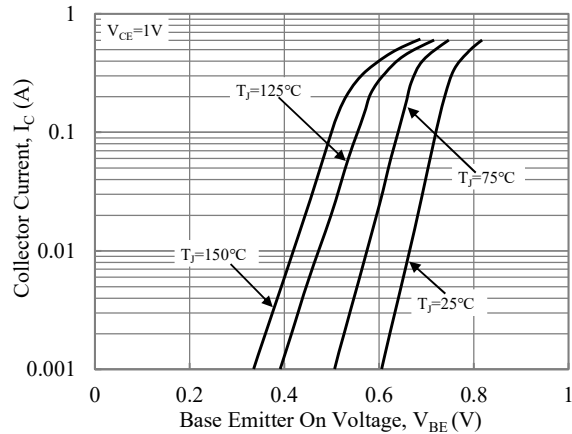


Fig. 5-Base Emitter Voltage vs. Collector Current



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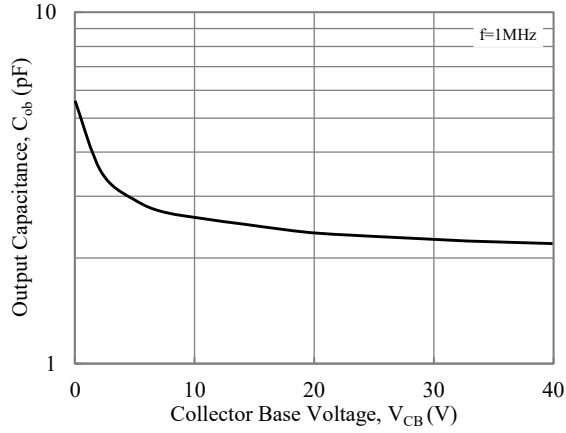


Fig. 6-Output Capacitance

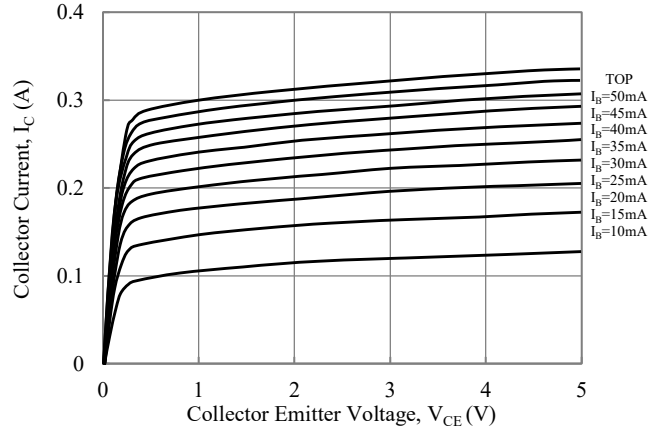


Fig. 7-Output Characteristics Curve

Q2 PNP

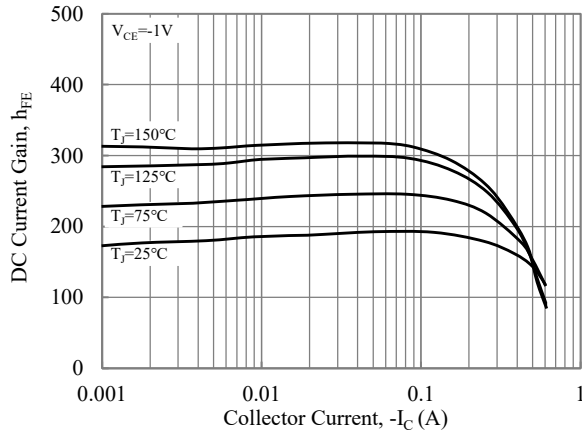


Fig. 8-Current Gain vs. Collector Current

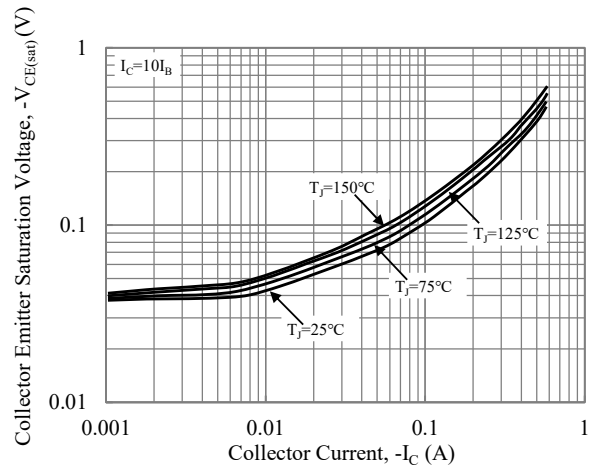


Fig. 9-Collector Emitter Saturation Voltage vs. Collector Current

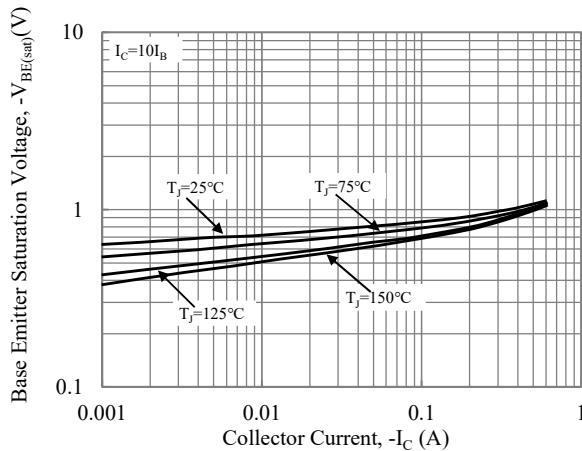


Fig. 10-Base Emitter Saturation Voltage vs. Collector Current

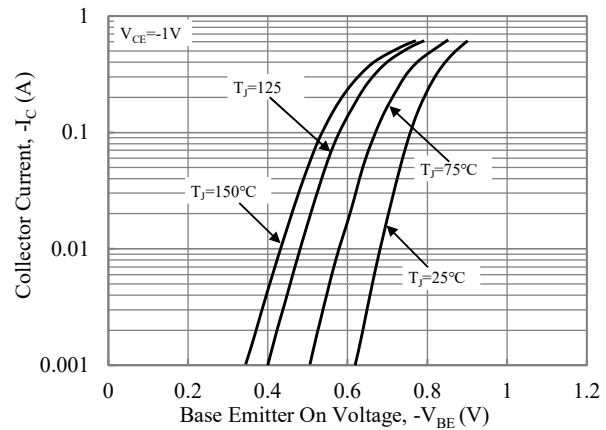


Fig. 11-Base Emitter Voltage vs. Collector Current



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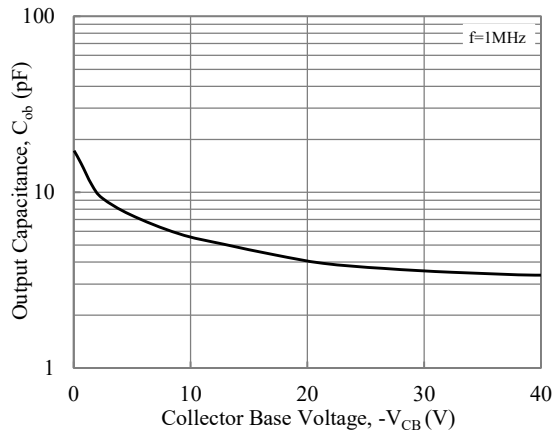


Fig. 12-Output Capacitance

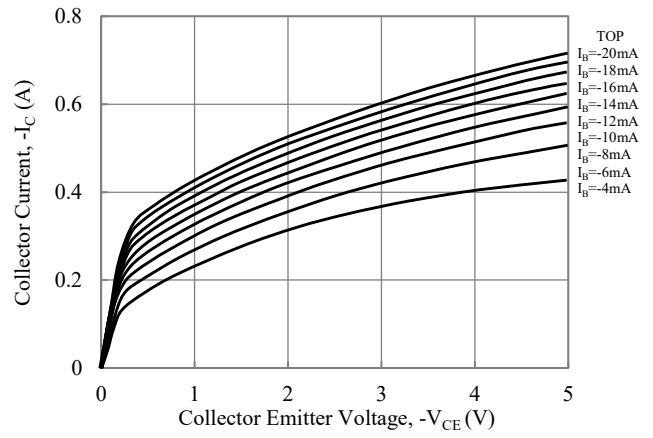


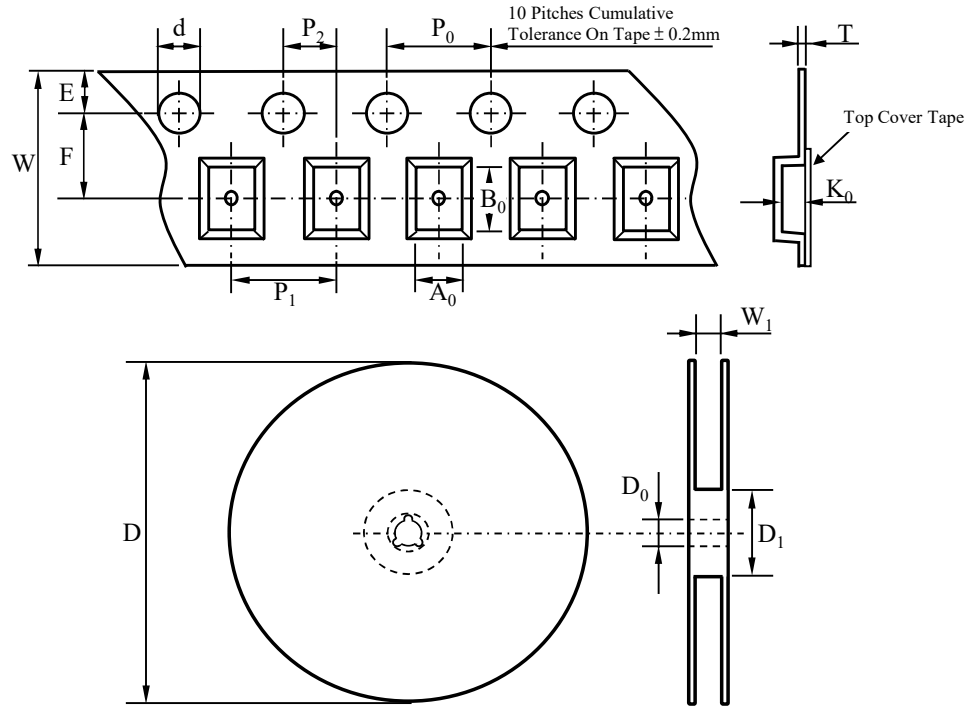
Fig. 13-Output Characteristics Curve



MMBT4413DWH

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TAPE & REEL SPECIFICATION



Item	Symbol	SOT-363
Carrier width	A_0	*
Carrier length	B_0	
Carrier depth	K_0	
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

Note *: A_0 , B_0 , and K_0 are determined by component size. The clearance between the components and the cavity must be within 0.05 mm min. to 0.5 mm max.

ORDER INFORMATION

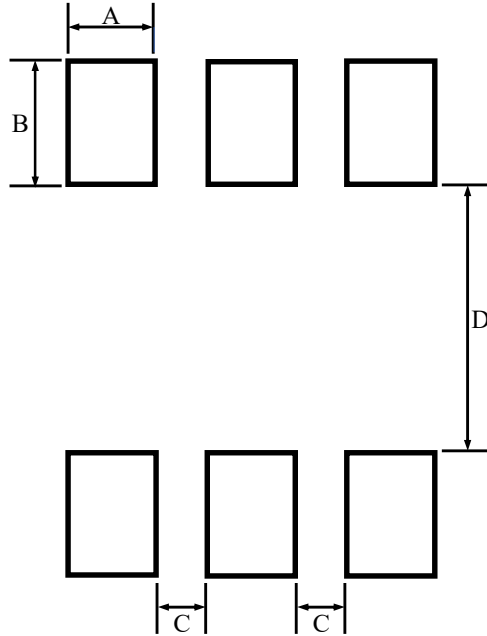
Part Number	Marking Code	Reel Size	Quantity
MMBT4413DWH	DA	7"	3,000



MMBT4413DWH

NPN + PNP TRANSISTORS

SUGGESTED SOLDER PAD LAYOUT



Unit :mm

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