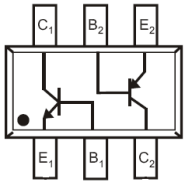
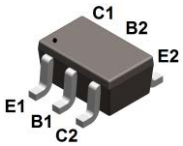
MMDT3946

Dual Bipolar Transistor(NPN+PNP)

Features

- Epitaxial planar die construction
- Two internal isolated NPN/PNP transistors in one package
- Ultra-small surface mount package





SOT-363

Mechanical Data

- Case: SOT-363
- Molding compo und: UL flammability classification rating 94V-0
- Terminals: Tin-plated; solderability per MIL-STD-202, Method 208

Maximum Ratings (@ T_A = 25℃ unless otherwise specified)

Parameter	Symbol	NPN	PNP	Unit
Collector-Base Voltage	V_{CBO}	60	-40	V
Collector-Emitter Voltage	V_{CEO}	40	-40	V
Emitter-Base Voltage	V_{EBO}	5	-5	V
Collector Current (Continuous)	I_C	200	-200	mA

Thermal Characteristics

Parameter	Symbol	Value	Unit
Power Dissipation	P_D	200	mW
Thermal Resistance Junction-to-Air *1	$R_{\theta JA}$	513	°C/W
Thermal Resistance Junction-to-Case *1	$R_{\theta JC}$	322	°C/W
Thermal Resistance Junction-to-Lead *1	$R_{\theta JL}$	404	°C/W
Operating Junction Temperature	T_J	-55 ~ +150	°C
Storage Temperature Range	T_{STG}	-55 ~ +150	°C

Note 1: The data tested by surface mounted on a 15mm * 15mm * 1mm FR4-epoxy P.C.B

Electrical Characteristics of NPN Transistor (@ T_A = 25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	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	$V_{(BR)EBO}$	I_E = 10μA, I_C = 0	5	-	-	V
Collector Cut-off Current	I_{CEX}	V_{CE} = 30V, $V_{EB(OFF)}$ = 3V	-	-	50	nA
Base Cut-off Current	I_{BL}	V_{CE} = 30V, $V_{EB(OFF)}$ = 3V	-	-	50	nA
DC Current Gain	h_{FE}	V_{CE} = 1V, I_C = 0.1mA	40	-	-	-
		V_{CE} = 1V, I_C = 1mA	70	-	-	-
		V_{CE} = 1V, I_C = 10mA	100	-	300	-
		V_{CE} = 1V, I_C = 50mA	60	-	-	-
		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 = 20mA f = 100MHz	300	-	-	MHz
Output Capacitance	C_{OBO}	V_{CB} = 5V, f = 1.0MHz, I_E = 0	-	-	4	pF
Input Capacitance	C_{OBI}	I_C = 0, V_{EB} = 0.5V; f =1MHz	-	-	8	pF
Noise Figure	N_F	I_C = 0.1mA, V_{CE} = 5V R_S = 1kΩ, f = 1kHz	-	-	5	dB
Delay Time	t_D	V_{CC} = 3V, $V_{BE(off)}$ = -0.5V I_C = 10mA, I_{B1} = I_{B2} = 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

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Electrical Characteristics of PNP Transistor (@ T_A = 25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = -10μA, I_E = 0	-40	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = -1mA, I_B = 0	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = -10μA, I_C = 0	-5	-	-	V
Collector Cut-off Current	I_{CEX}	V_{CE} = -30V, $V_{EB(OFF)}$ = -3V	-	-	-50	nA
Base Cut-off Current	I_{BL}	V_{CE} = -30V, $V_{EB(OFF)}$ = -3V	-	-	-50	nA
DC Current Gain	h_{FE}	V_{CE} = -1V, I_C = -0.1mA	60	-	-	-
		V_{CE} = -1V, I_C = -1mA	80	-	-	-
		V_{CE} = -1V, I_C = -10mA	100	-	300	-
		V_{CE} = -1V, I_C = -50mA	60	-	-	-
		V_{CE} = -1V, I_C = -100mA	30	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = -10mA, I_B = -1mA	-	-	-0.25	V
		I_C = -50mA, I_B = -5mA	-	-	-0.40	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	250	-	-	MHz
Output Capacitance	C_{OBO}	V_{CB} = -5V, f = 1MHz, I_E = 0	-	-	4.5	pF
Input Capacitance	C_{OBI}	I_C = 0, V_{EB} = -0.5V; f =1MHz	-	-	10	pF
Noise Figure	N_F	I_C = -0.1mA, V_{CE} = -5V R_S = 1kΩ, f = 1kHz	-	-	4	dB
Delay Time	t_D	V_{CC} = -3V, $V_{BE(off)}$ = -0.5V I_C = -10mA, I_{B1} = I_{B2} = -1mA	-	-	35	ns
Rise Time	t_R		-	-	35	ns
Storage Time	t_S	V_{CC} = -3V, I_C = -10mA I_{B1} = I_{B2} = -1mA	-	-	225	ns
Fall Time	t_F		-	-	75	ns

Ratings and Characteristic Curves-NPN (@ T_A = 25℃ unless otherwise specified)

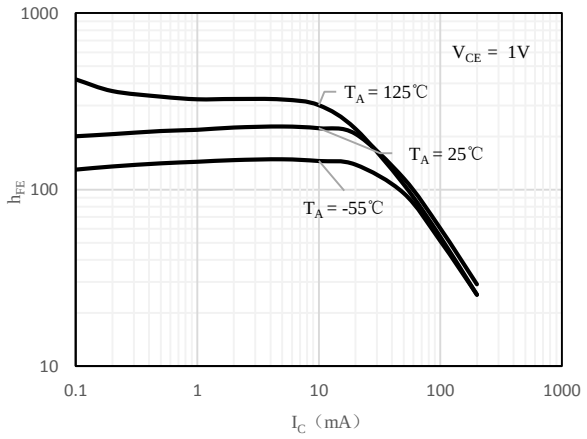

Fig 1 h_{FE} vs. I_C

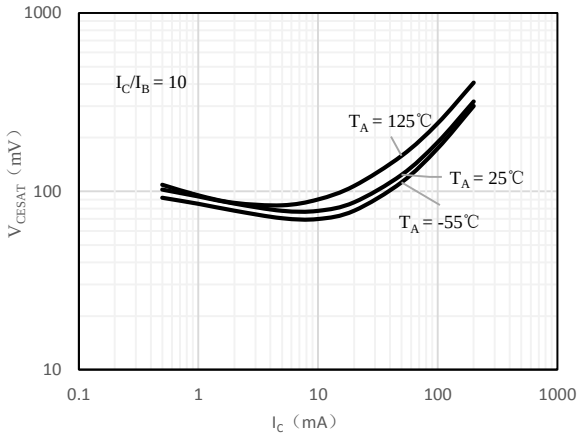

Fig 2 $V_{CE(sat)}$ vs. I_C

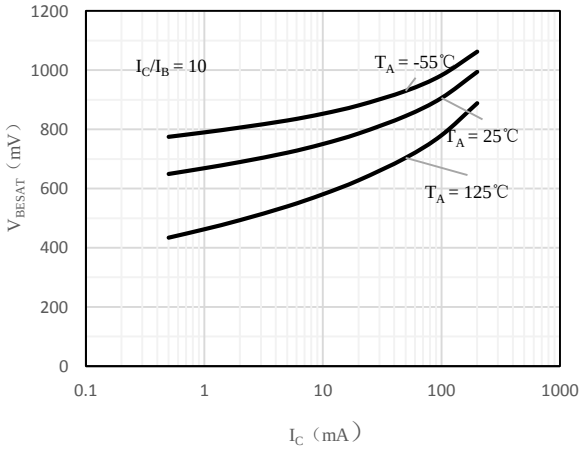

Fig 3 $V_{BE(sat)}$ vs. I_C

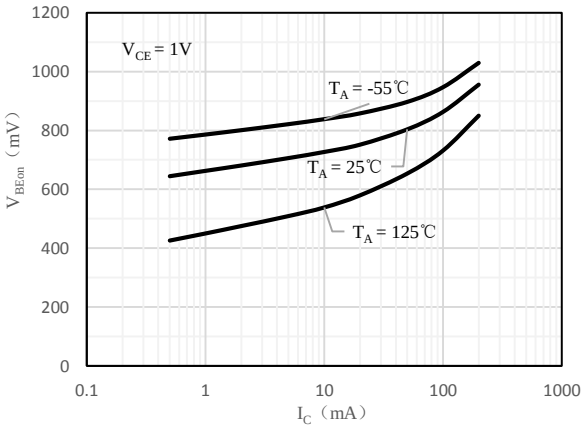

Fig 4 $V_{BE(ON)}$ vs. I_C

Ratings and Characteristic Curves-PNP (@ T_A = 25℃ unless otherwise specified)

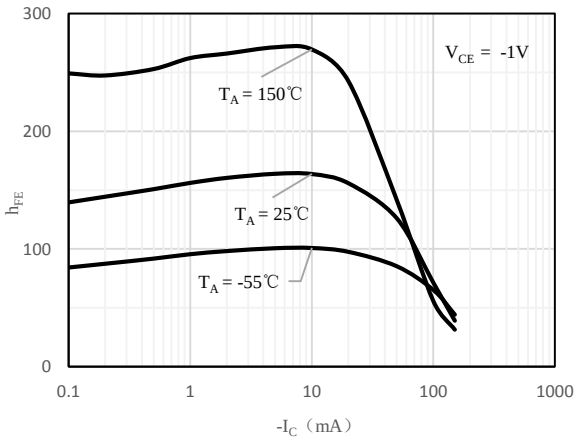

Fig 1 h_{FE} vs. I_C

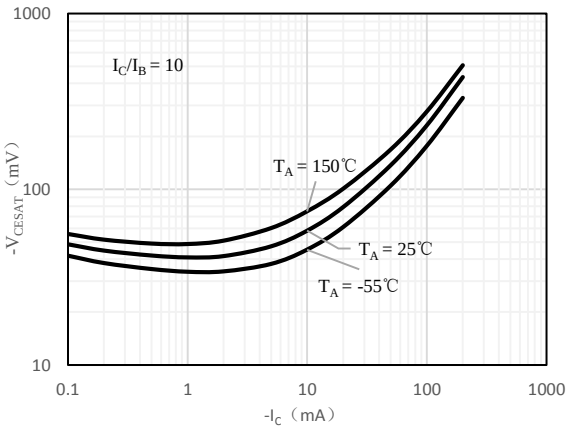

Fig 2 $V_{CE(sat)}$ vs. I_C

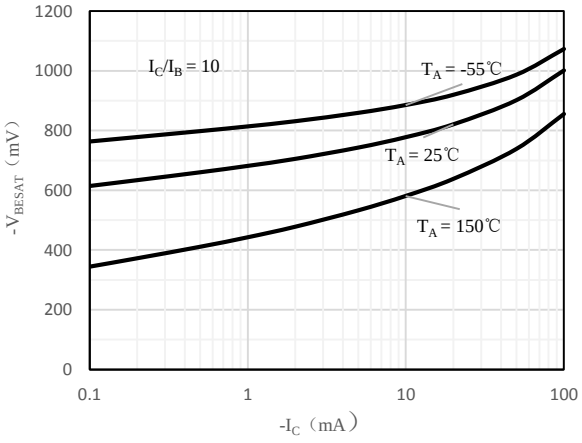

Fig 3 $V_{BE(sat)}$ vs. I_C

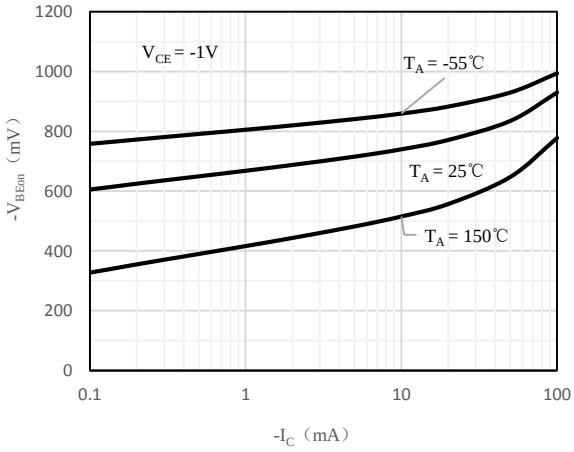

Fig 4 $V_{BE(ON)}$ vs. I_C

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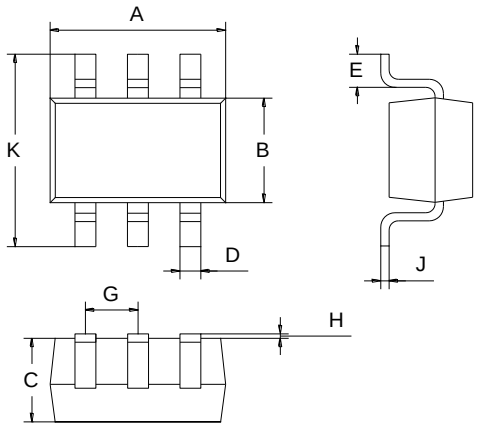
Package Outline Dimensions (Unit: mm)



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Dimension	**Min.**	**Max.**
A	2.00	2.20
B	1.15	1.35
C	0.85	1.05
D	0.15	0.35
E	0.25	0.40
G	0.60	0.70
H	0.02	0.10
J	0.05	0.15
K	2.20	2.40

Package Outline Dimensions (Unit: mm)

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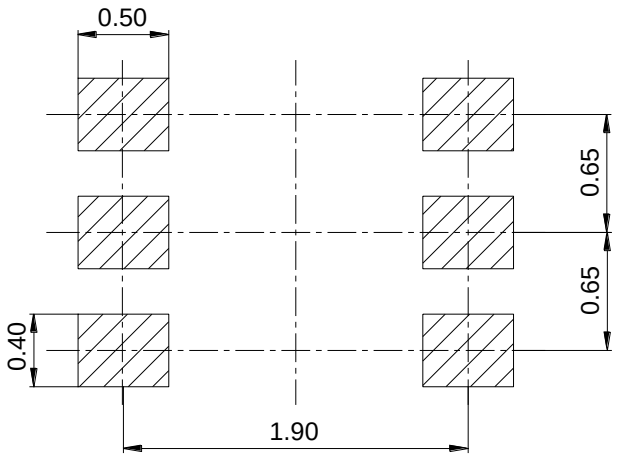

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
MMDT3946	SOT-363	3000 pcs / Tape & Reel	K46