

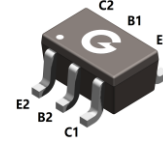
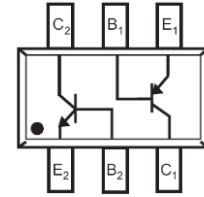
Features

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

HF

Mechanical Data

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



SOT-363

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
MMDT4413	SOT-363	3000 pcs / Tape & Reel	K13

Maximum Ratings (@ T_A = 25°C 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}	6	-5	V
Collector Current (Continuous)	I _C	0.6	-0.6	A
Collector Current (Peak)	I _{CM}	1.2	-1.2	A

Thermal Characteristics

Parameter	Symbol	Value	Unit
Power Dissipation *1	P _D	0.2	W
Thermal Resistance Junction-to-Air *1	R _{θJA}	625	°C/W
Thermal Resistance Junction-to-Air *2	R _{θJA}	350	°C/W
Thermal Resistance Junction-to-Case *2	R _{θJC}	250	°C/W
Thermal Resistance Junction-to-Lead *2	R _{θJL}	300	°C/W
Operating Junction Temperature	T _J	-55 ~ +150	°C
Storage Temperature Range	T _{STG}	-55 ~ +150	°C

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 100\mu\text{A}, I_E = 0$	60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}, I_B = 0$	40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 100\mu\text{A}, I_C = 0$	6	-	-	V
Collector Cut-off Current	I_{CBO}	$V_{CB} = 30\text{V}, I_E = 0$	-	-	100	nA
Collector Cut-off Current	I_{CEO}	$V_{CE} = 30\text{V}, I_B = 0$	-	-	100	nA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 5\text{V}, I_C = 0$	-	-	100	nA
DC Current Gain	h_{FE}	$V_{CE} = 1\text{V}, I_C = 0.1\text{mA}$	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	-
Collector-emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	0.4	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	0.75	V
Base-emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	0.75	-	0.95	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	1.2	V
Transition Frequency	f_T	$I_C = 20\text{mA}, V_{CE} = 10\text{V}$ $f = 100\text{MHz}$	250	-	-	MHz
Collector Output Capacitance	C_{OBO}	$V_{CB} = 5\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	6.5	pF
Delay Time	t_d	$V_{CC} = 30\text{V}, V_{BE(OFF)} = 2\text{V}$	-	-	15	ns
Rise Time	t_r	$I_C = 150\text{mA}, I_{B1} = 15\text{mA}$	-	-	20	ns
Storage Time	t_s	$V_{CC} = 30\text{V}, I_C = 150\text{mA}$	-	-	225	ns
Fall Time	t_f	$I_{B1} = I_{B2} = 15\text{mA}$	-	-	30	ns

Notes:

- Device mounted on a minimum recommended pad layout with 1oz copper that is on a single-sided 1.6mm FR4 PCB; the device is measured under still air conditions whilst operating in a steady-state.
- The data tested by surface mounted on a 25.4mm * 25.4mm * 1mm FR4-epoxy P.C.B

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = -100\mu\text{A}, I_E = 0$	-40	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -1\text{mA}, I_B = 0$	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -100\mu\text{A}, I_C = 0$	-5	-	-	V
Collector Cut-off Current	I_{CBO}	$V_{CB} = -30\text{V}, I_E = 0$	-	-	-100	nA
Collector Cut-off Current	I_{CEO}	$V_{CE} = -30\text{V}, I_B = 0$	-	-	-100	nA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = -5\text{V}, I_C = 0$	-	-	-100	nA
DC Current Gain	h_{FE}	$V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$	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	-
Collector-emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -150\text{mA}, I_B = -15\text{mA}$	-	-	-0.4	V
		$I_C = -500\text{mA}, I_B = -50\text{mA}$	-	-	-0.75	V
Base-emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = -150\text{mA}, I_B = -15\text{mA}$	-0.75	-	-0.95	V
		$I_C = -500\text{mA}, I_B = -50\text{mA}$	-	-	-1.3	V
Transition Frequency	f_T	$I_C = -20\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$	200	-	-	MHz
Collector Output Capacitance	C_{OBO}	$V_{CB} = -10\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	8.5	pF
Delay Time	t_d	$V_{CC} = -30\text{V}, V_{BE(OFF)} = -2\text{V}$	-	-	15	ns
Rise Time	t_r	$I_C = -150\text{mA}, I_{B1} = -15\text{mA}$	-	-	20	ns
Storage Time	t_s	$V_{CC} = -30\text{V}, I_C = -150\text{mA}$	-	-	225	ns
Fall Time	t_f	$I_{B1} = I_{B2} = -15\text{mA}$	-	-	30	ns

Notes:

- Device mounted on a minimum recommended pad layout with 1oz copper that is on a single-sided 1.6mm FR4 PCB; the device is measured under still air conditions whilst operating in a steady-state.
- The data tested by surface mounted on a 25.4mm * 25.4mm * 1mm FR4-epoxy P.C.B

Ratings and Characteristic Curves-NPN (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

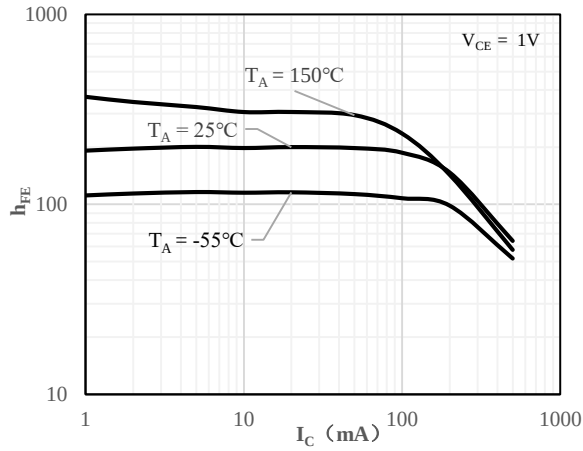


Fig 1 h_{FE} vs. I_C

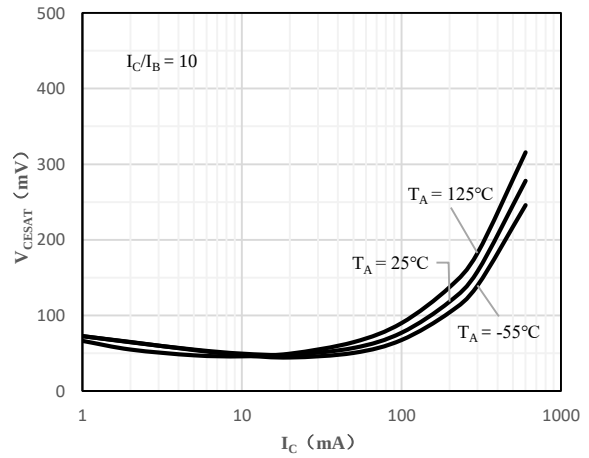


Fig 2 $V_{CE(sat)}$ vs. I_C

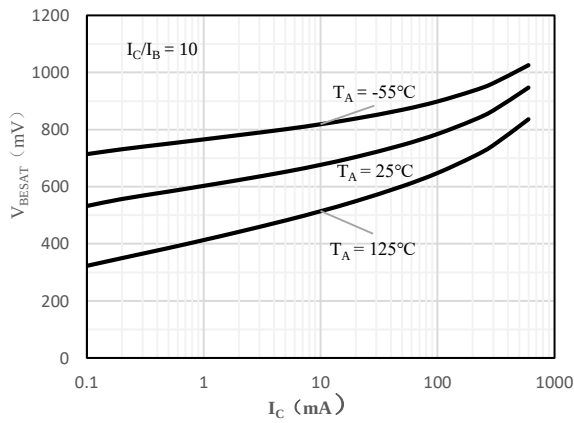


Fig 3 $V_{BE(sat)}$ vs. I_C

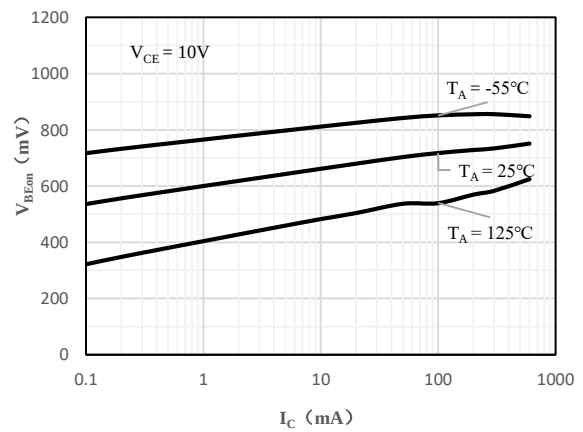


Fig 4 $V_{BE(on)}$ vs. I_C

Ratings and Characteristic Curves-PNP (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

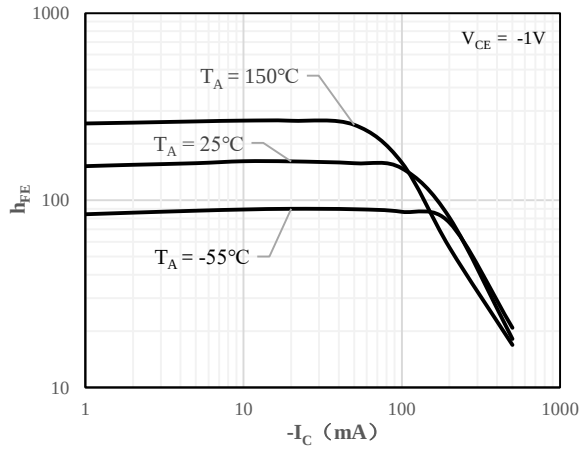


Fig 1 h_{FE} vs. I_C

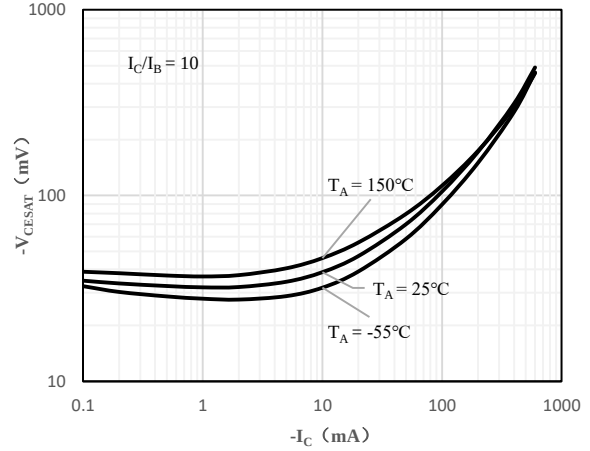


Fig 2 $V_{CE(sat)}$ vs. I_C

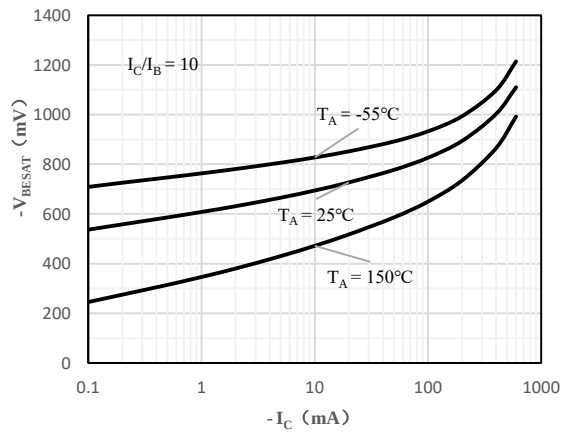


Fig 3 $V_{BE(sat)}$ vs. I_C

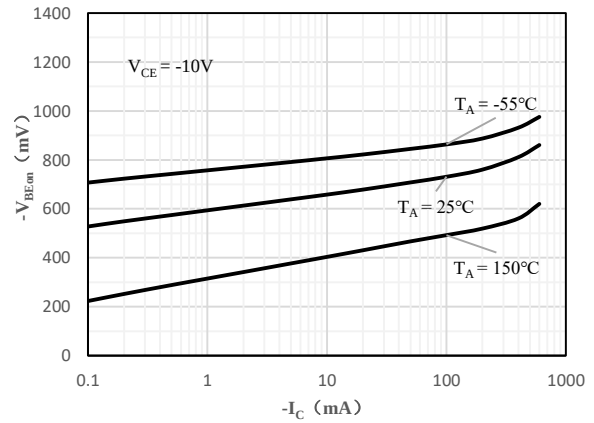
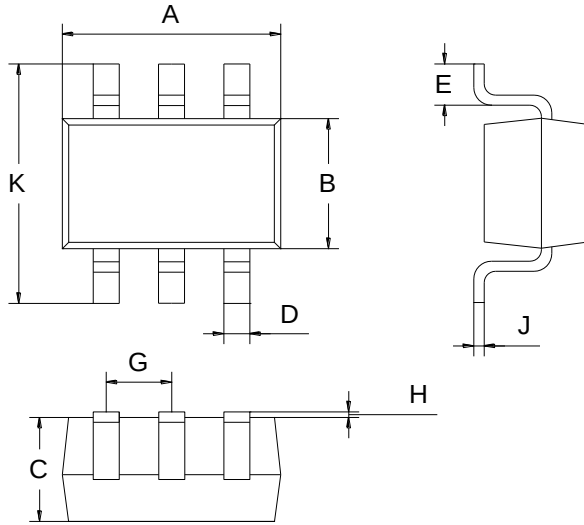


Fig 4 $V_{BE(on)}$ vs. I_C

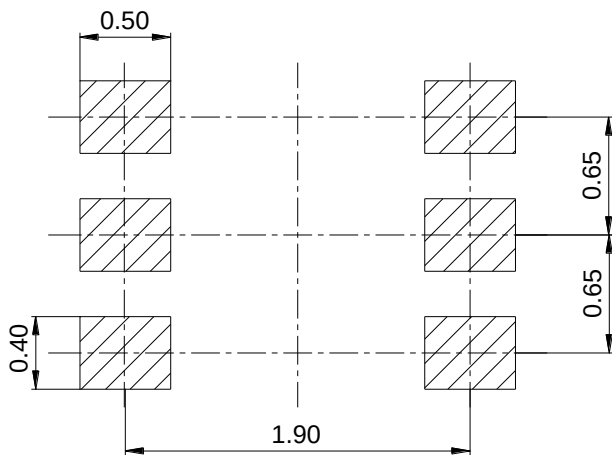
Package Outline Dimensions (Unit: mm)



SOT-363		
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

Mounting Pad Layout (Unit: mm)

SOT-363



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