

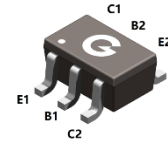
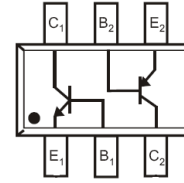
Features

- 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
MMDT3946	SOT-363	3000 pcs / Tape & Reel	K46

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}	5	-5	V
Collector Current (Continuous)	I _C	200	-200	mA
Collector Current (Peak)	I _{CM}	200	-200	mA

Thermal Characteristics

Parameter	Symbol	Value	Unit
Power Dissipation	P _D	200	mW
Thermal Resistance Junction-to-Air *1	R _{θJA}	513	°C/W
Thermal Resistance Junction-to-Case *1	R _{θJC}	322	°C/W
Thermal Resistance Junction-to-Lead *1	R _{θJL}	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 (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}$, $I_E = 0$	60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}$, $I_B = 0$	40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}$, $I_C = 0$	5	-	-	V
Collector Cut-off Current	I_{CEX}	$V_{CE} = 30\text{V}$, $V_{EB(OFF)} = 3\text{V}$	-	-	50	nA
Base Cut-off Current	I_{BL}	$V_{CE} = 30\text{V}$, $V_{EB(OFF)} = 3\text{V}$	-	-	50	nA
DC Current Gain	h_{FE}	$V_{CE} = 1\text{V}$, $I_C = 0.1\text{mA}$	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-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 10\text{mA}$, $I_B = 1\text{mA}$	-	-	0.2	V
		$I_C = 50\text{mA}$, $I_B = 5\text{mA}$	-	-	0.3	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 10\text{mA}$, $I_B = 1\text{mA}$	0.65	-	0.85	V
		$I_C = 50\text{mA}$, $I_B = 5\text{mA}$	-	-	0.95	V
Transition Frequency	f_T	$V_{CE} = 20\text{V}$, $I_C = 20\text{mA}$ $f = 100\text{MHz}$	300	-	-	MHz
Output Capacitance	C_{OBO}	$V_{CB} = 5\text{V}$, $f = 1.0\text{MHz}$, $I_E = 0$	-	-	4	pF
Input Capacitance	C_{OBI}	$I_C = 0$, $V_{EB} = 0.5\text{V}$; $f = 1\text{MHz}$	-	-	8	pF
Noise Figure	N_F	$I_C = 0.1\text{mA}$, $V_{CE} = 5\text{V}$ $R_S = 1\text{k}\Omega$, $f = 1\text{kHz}$	-	-	5	dB
Delay Time	t_D	$V_{CC} = 3\text{V}$, $V_{BE(off)} = -0.5\text{V}$	-	-	35	ns
Rise Time	t_R	$I_C = 10\text{mA}$, $I_{B1} = I_{B2} = 1\text{mA}$	-	-	35	ns
Storage Time	t_S	$V_{CC} = 3\text{V}$, $I_C = 10\text{mA}$	-	-	200	ns
Fall Time	t_F	$I_{B1} = I_{B2} = 1\text{mA}$	-	-	50	ns

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	$V_{(BR)CBO}$	$I_C = -10\mu\text{A}, I_E = 0$	-40	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -1\text{mA}, I_B = 0$	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -10\mu\text{A}, I_C = 0$	-5	-	-	V
Collector Cut-off Current	I_{CEX}	$V_{CE} = -30\text{V}, V_{EB(OFF)} = -3\text{V}$	-	-	-50	nA
Base Cut-off Current	I_{BL}	$V_{CE} = -30\text{V}, V_{EB(OFF)} = -3\text{V}$	-	-	-50	nA
DC Current Gain	h_{FE}	$V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$	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-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-	-	-0.25	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	-0.40	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-0.65	-	-0.85	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	-0.95	V
Transition Frequency	f_T	$V_{CE} = -20\text{V}, I_C = -10\text{mA}$ $f = 100\text{MHz}$	250	-	-	MHz
Output Capacitance	C_{OBO}	$V_{CB} = -5\text{V}, f = 1\text{MHz}, I_E = 0$	-	-	4.5	pF
Input Capacitance	C_{OBI}	$I_C = 0, V_{EB} = -0.5\text{V}; f = 1\text{MHz}$	-	-	10	pF
Noise Figure	N_F	$I_C = -0.1\text{mA}, V_{CE} = -5\text{V}$ $R_S = 1\text{k}\Omega, f = 1\text{kHz}$	-	-	4	dB
Delay Time	t_D	$V_{CC} = -3\text{V}, V_{BE(off)} = -0.5\text{V}$	-	-	35	ns
Rise Time	t_R	$I_C = -10\text{mA}, I_{B1} = I_{B2} = -1\text{mA}$	-	-	35	ns
Storage Time	t_S	$V_{CC} = -3\text{V}, I_C = -10\text{mA}$	-	-	225	ns
Fall Time	t_F	$I_{B1} = I_{B2} = -1\text{mA}$	-	-	75	ns

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

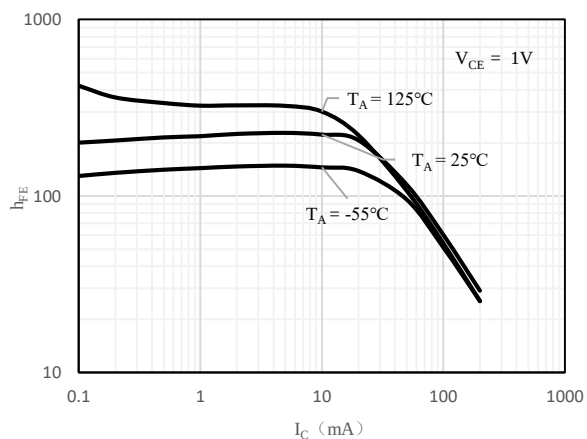


Fig 1 h_{FE} vs. I_C

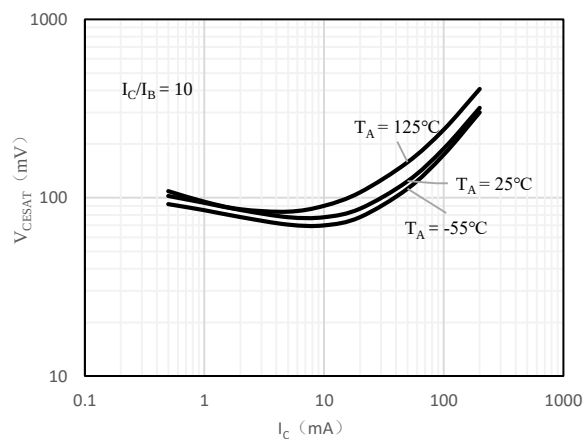


Fig 2 $V_{CE(sat)}$ vs. I_C

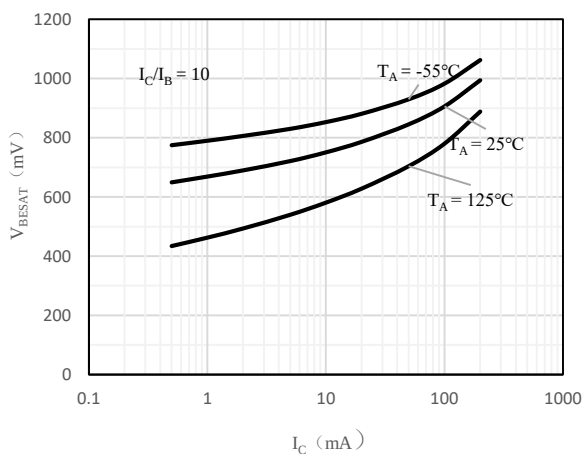


Fig 3 $V_{BE(sat)}$ vs. I_C

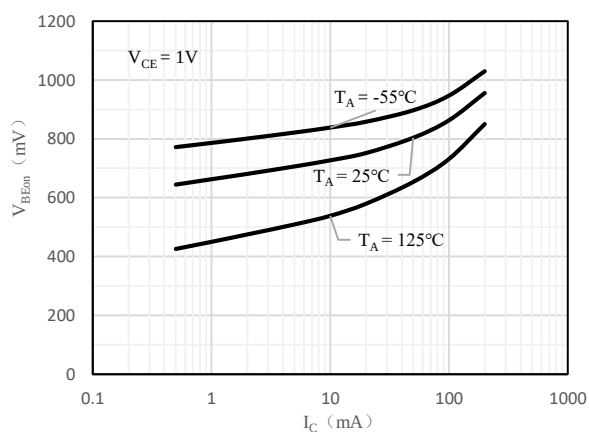
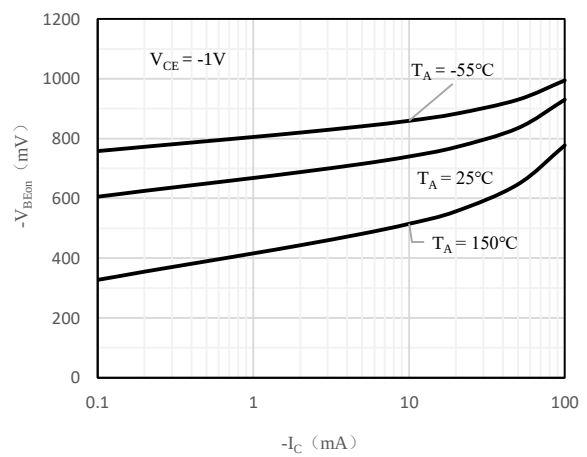
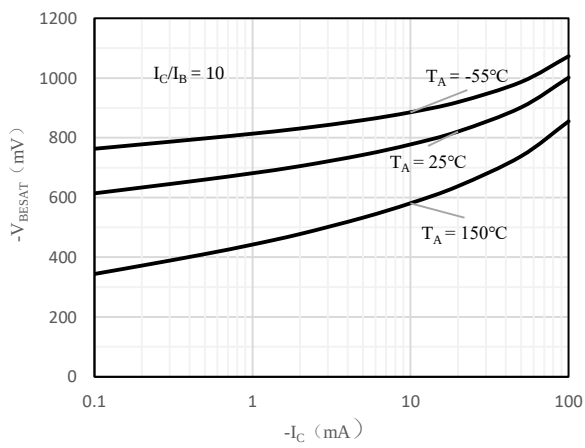
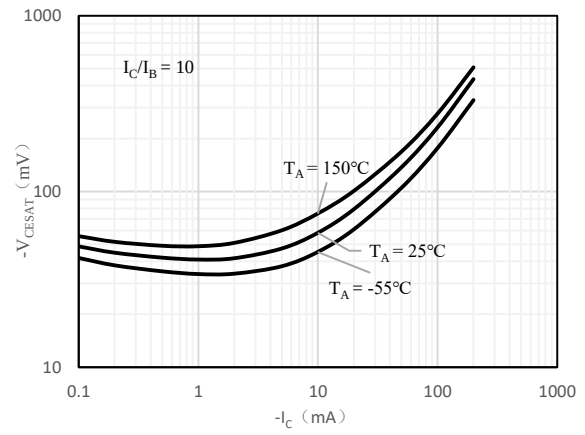
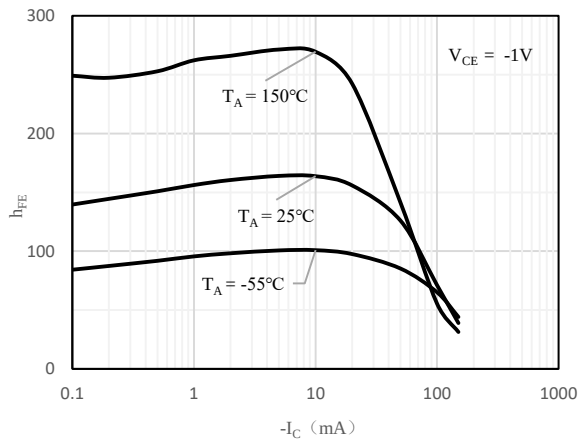
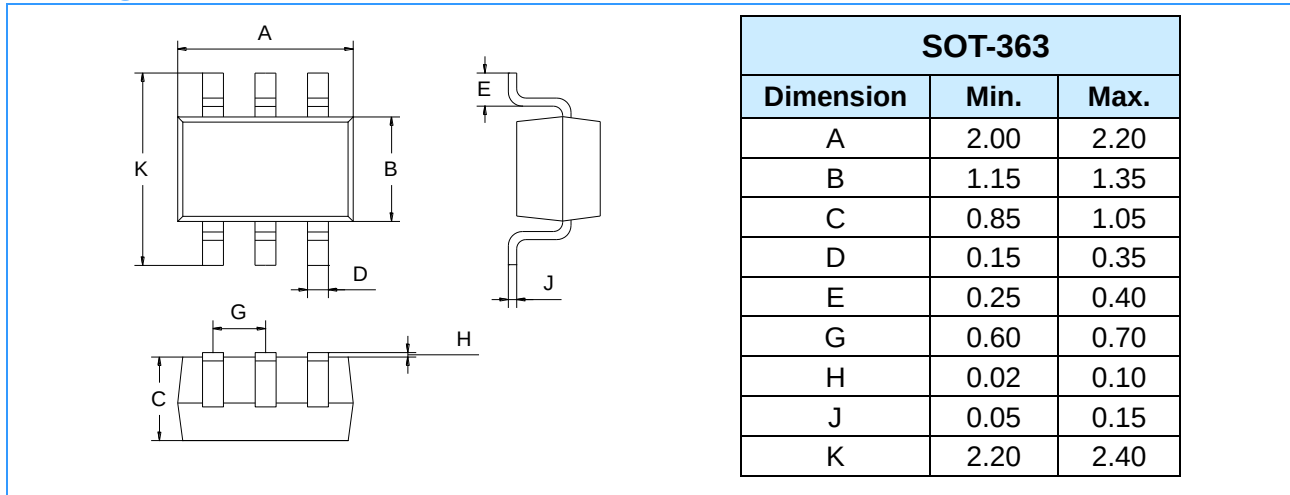


Fig 4 $V_{BE(on)}$ vs. I_C

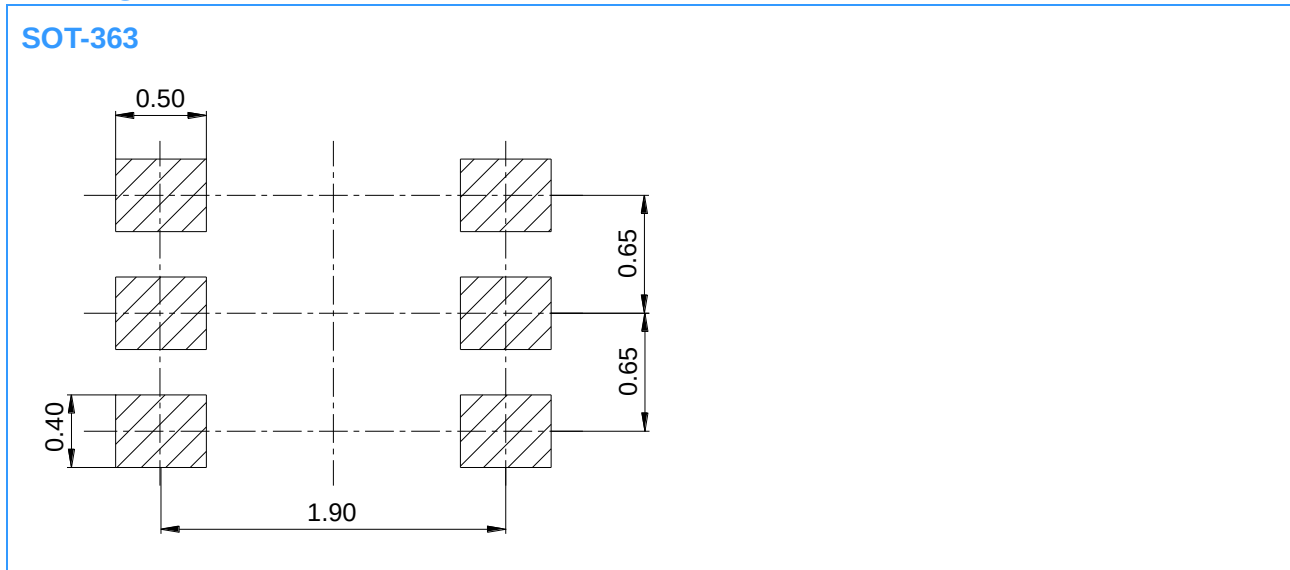
Ratings and Characteristic Curves-PNP (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)



Package Outline Dimensions (Unit: mm)



Package Outline Dimensions (Unit: mm)



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