

MMDT4413

COMPLEMENTARY NPN/PNP SMALL SIGNAL SURGACE MOUNT TRANSISTOR

VOLTAGE	40 Volt	POWER	225 mWatt
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FEATURES

- Complementary Pair
- One 4401-Type NPN
- One 4403-Type PNP
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Ultra-Small Surface Mount Package
- Also Available in Lead Free Version
- Lead free in compliance with EU RoHS 2011/65/EU directive
- Green molding compound as per IEC61249 Std. . (Halogen Free)

MECHANICAL DATA

- Case: SOT-363, Plastic
- Terminals: Solderable per MIL-STD-750, Method 2026
- Approx. Weight: 0.0002 ounces, 0.006 grams.
- Marking: M6A

SOT-363 Unit : inch(mm)

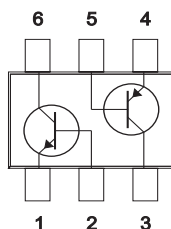
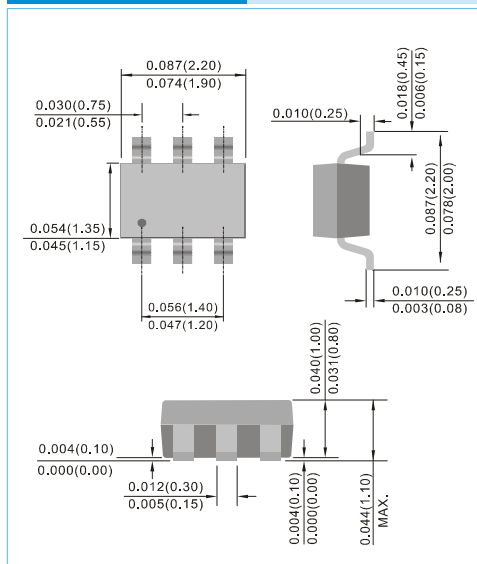


Fig.55

MAXIMUM RATINGS,TOTAL DEVICE@T_A=25°C UNLESS OTHERWISE SPECIFIED

Characteristic	Symbol	Value	Unit
Power Dissipation	P _d	225	mW
Thermal Resistance , Junction to Ambient	R _{θJA}	625	K/W
Operating and Storage and Junction Range	T _J ,T _{STG}	-55 to 150	°C



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MAXIMUM RATINGS,NPN 4401 SECTION@T_A=25°C UNLESS OTHERWISE SPECIFIED

Characteristic	Symbol	NPN4401	Unit
Collector-Base Voltage	V _{CB0}	60	V
Collector-Emitter Voltage	V _{CE0}	40	V
Emitter-Base Voltage	V _{EB0}	6.0	V
Collector Current-Continuous	I _c	600	mA

MAXIMUM RATINGS,NPN 4403 SECTION@T_A=25°C UNLESS OTHERWISE SPECIFIED

Characteristic	Symbol	PNP4403	Unit
Collector-Base Voltage	V _{CB0}	-40	V
Collector-Emitter Voltage	V _{CE0}	-40	V
Emitter-Base Voltage	V _{EB0}	-5.0	V
Collector Current-Continuous	I _c	-600	mA



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ELECTRICAL CHARACTERISTICS,NPN 4401 SECTION@TA=25°C UNLESS OTHERWISE SPECIFIED

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
OFF CHARACTERISTIC					
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=100\mu A, I_E=0$	60	-	V
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1.0mA, I_B=0$	40	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=100\mu A, I_C=0$	6.0	-	V
Collector Cutoff Current	I_{CEX}	$V_{CE}=35V, V_{EB(OFF)}=0.4V$	-	100	nA
Base Cutoff Current	I_{BL}	$V_{CE}=35V, V_{EB(OFF)}=0.4V$	-	100	nA
ON CHARACTERISTICS					
DC Current Gain (Note 2)	h_{FE}	$I_C=100\mu A, V_{CE}=1.0V$ $I_C=1.0mA, V_{CE}=1.0V$ $I_C=10mA, V_{CE}=1.0V$ $I_C=150mA, V_{CE}=1.0V$ $I_C=500mA, V_{CE}=2.0V$	20 40 80 100 40	- - - 300 -	-
Collector - Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C=150mA, I_B=15mA$ $I_C=500mA, I_B=50mA$	-	0.40 0.75	V
Base - Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C=150mA, I_B=15mA$ $I_C=500mA, I_B=50mA$	0.75 -	0.95 1.20	V
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{cb}	$V_{CB}=5V, I_E=0, f=1.0MHz$	-	6.5	pF
Input Capacitance	C_{eb}	$V_{EB}=0.5V, I_C=0, f=1MHz$	-	30	pF
Input Impedance	h_{ie}	$V_{CE}=10V, I_C=1.0mA, f=1.0KHz$	1.0	15	k Ω
Voltage Feedback Ratio	h_{re}		0.1	8.0	$\times 10^{-4}$
Small Signal Current Gain	h_{fe}		40	500	-
Output Admittance	h_{oe}		1.0	30	μS
Current Gain - Bandwidth Product	f_T	$V_{CE}=10V, I_C=20mA, f=100MHz$	250	-	MHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	$V_{CC}=30V, V_{BE(OFF)}=2.0V,$ $I_C=150mA, I_{B1}=15mA$	-	15	ns
Rise Time	t_r		-	20	ns
Storage Time	t_s	$V_{CC}=30V, I_C=150mA$ $I_{B1}=I_{B2}=15mA$	-	225	ns
Fall Time	t_f		-	30	ns



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ELECTRICAL CHARACTERISTICS,NPN 4403 SECTION@TA=25°C UNLESS OTHERWISE SPECIFIED

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
OFF CHARACTERISTIC					
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=-100\mu A, I_E=0$	-40	-	V
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=-1.0mA, I_B=0$	-40	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=-100\mu A, I_C=0$	-5.0	-	V
Collector Cutoff Current	I_{CEX}	$V_{CE}=-35V, V_{EB(OFF)}=-0.4V$	-	-100	nA
Base Cutoff Current	I_{BL}	$V_{CE}=-35V, V_{EB(OFF)}=-0.4V$	-	-100	nA
ON CHARACTERISTICS					
DC Current Gain (Note 2)	h_{FE}	$I_C=-100\mu A, V_{CE}=-1.0V$ $I_C=-1.0mA, V_{CE}=-1.0V$ $I_C=-10mA, V_{CE}=-1.0V$ $I_C=-150mA, V_{CE}=-2.0V$ $I_C=-500mA, V_{CE}=-2.0V$	30 60 100 100 20	- - - 300 -	-
Collector - Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C=-150mA, I_B=-15mA$ $I_C=-500mA, I_B=-50mA$	-	-0.40 -0.75	V
Base - Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C=-150mA, I_B=-15mA$ $I_C=-500mA, I_B=-50mA$	-0.75 -	-0.95 -1.30	V
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{cb}	$V_{CB}=-10V, I_E=0, f=1.0MHz$	-	8.5	pF
Input Capacitance	C_{eb}	$V_{EB}=-0.5V, I_C=0, f=1MHz$	-	30	pF
Input Impedance	h_{ie}	$V_{CE}=-10V, I_C=-1.0mA, f=1.0KHz$	1.5	15	k Ω
Voltage Feedback Ratio	h_{re}		0.1	8.0	$\times 10^{-4}$
Small Signal Current Gain	h_{fe}		60	500	-
Output Admittance	h_{oe}		1.0	100	μS
Current Gain - Bandwidth Product	f_T	$V_{CE}=-10V, I_C=-20mA, f=100MHz$	200	-	MHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	$V_{CC}=-30V, V_{BE(OFF)}=-2.0V, I_C=-150mA, I_{B1}=-15mA$	-	15	ns
Rise Time	t_r		-	20	ns
Storage Time	t_s	$V_{CC}=-30V, I_C=-150mA, I_{B1}=I_{B2}=-15mA$	-	225	ns
Fall Time	t_f		-	30	ns

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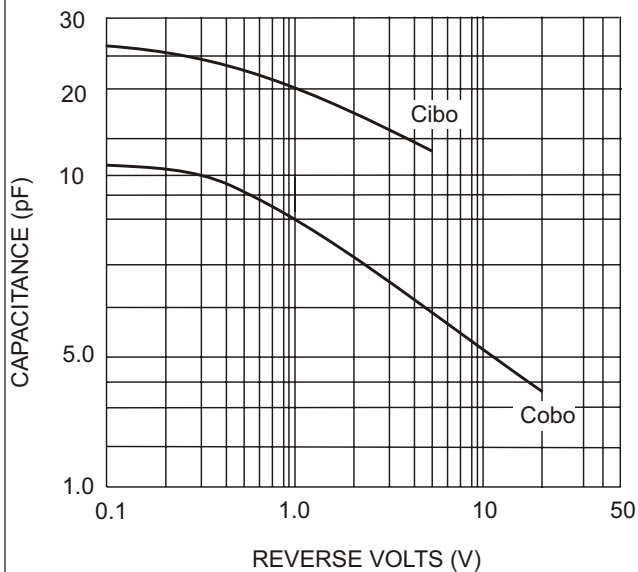


Fig. 1 Typical Capacitance (4401)

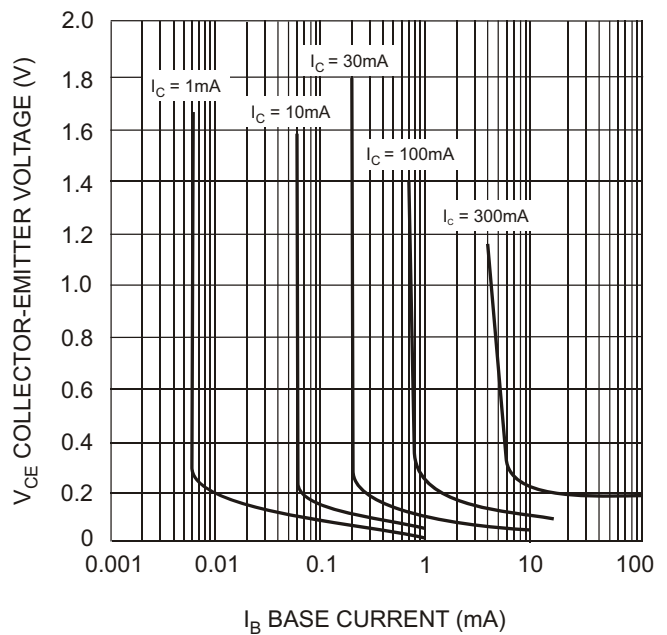
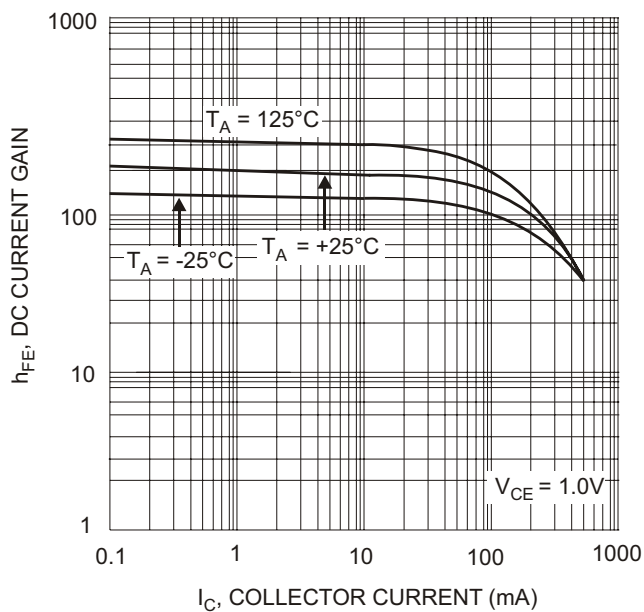
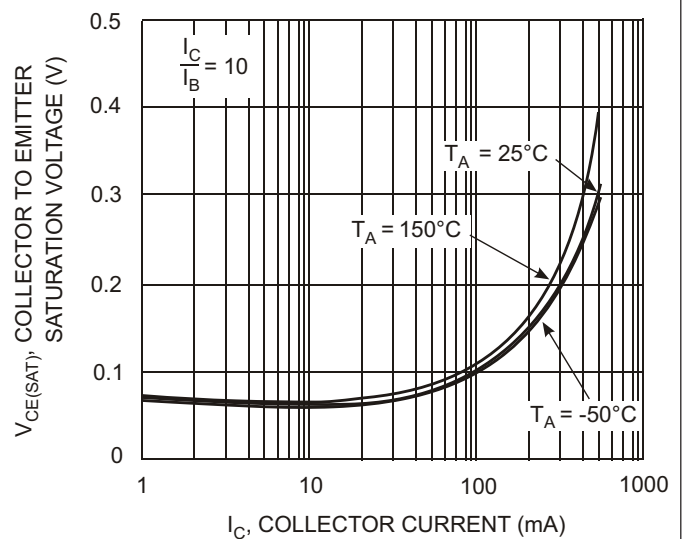


Fig. 2 Typical Collector Saturation Region (4401)



I_C , COLLECTOR CURRENT (mA)
Fig. 3 Typical DC Current Gain vs
Collector Current (4401)



I_C , COLLECTOR CURRENT (mA)
Fig. 4 Collector Emitter Saturation Voltage
vs. Collector Current (4401)

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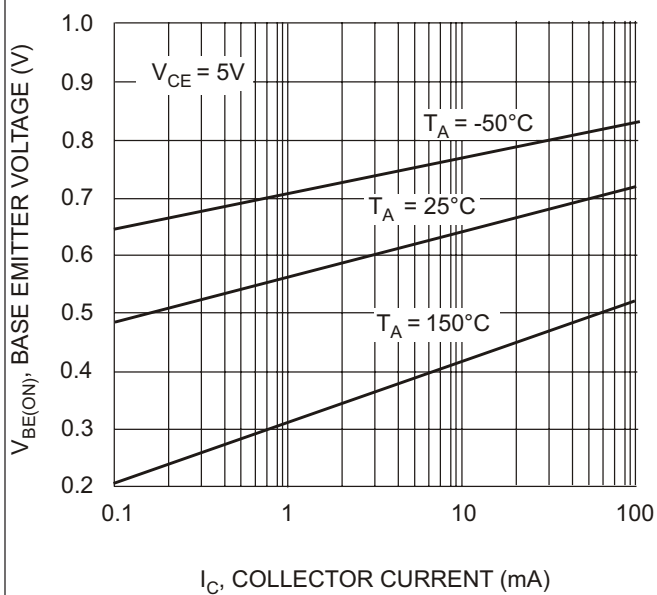


Fig. 5 Base Emitter Voltage vs. Collector Current (4401)

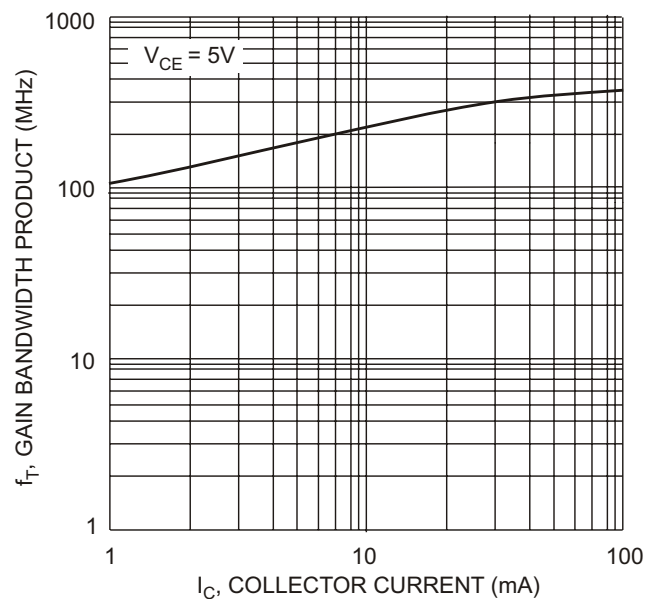


Fig. 6 Gain Bandwidth Product vs. Collector Current (4401)

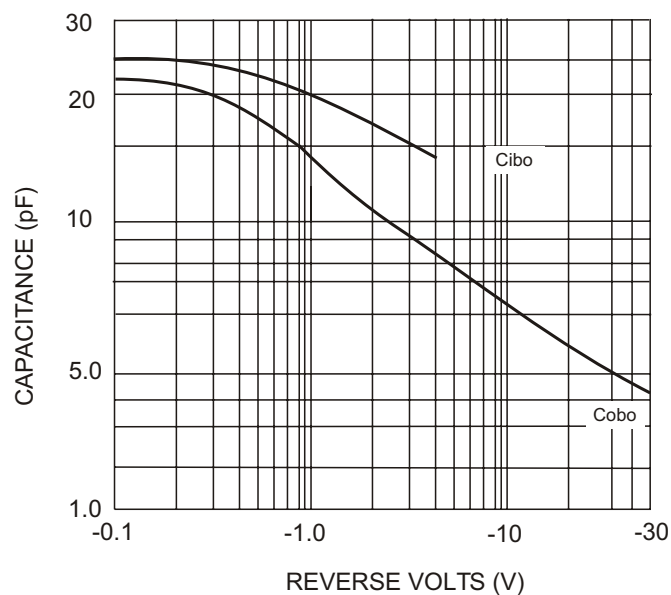


Fig. 7 Typical Capacitance (4403)

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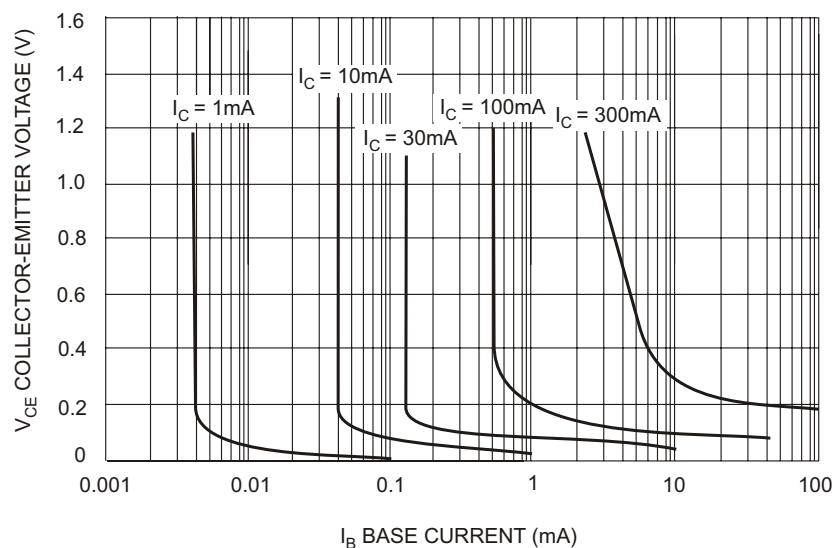


Fig. 8 Typical Collector Saturation Region (4403)

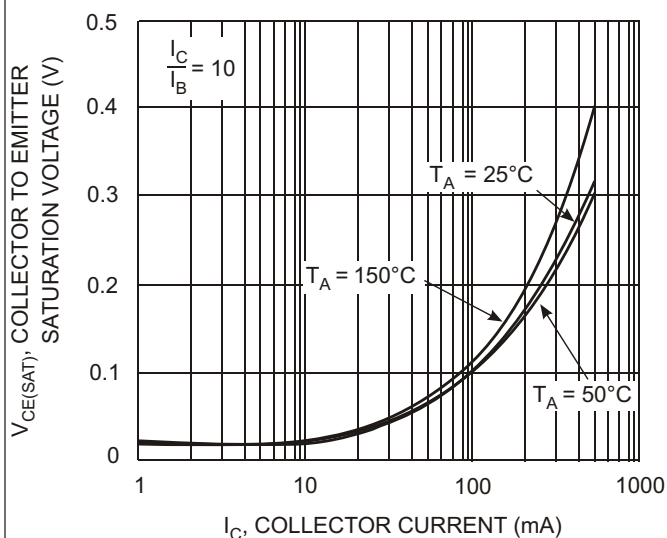


Fig. 9 Collector Emitter Saturation Voltage vs. Collector Current (4403)

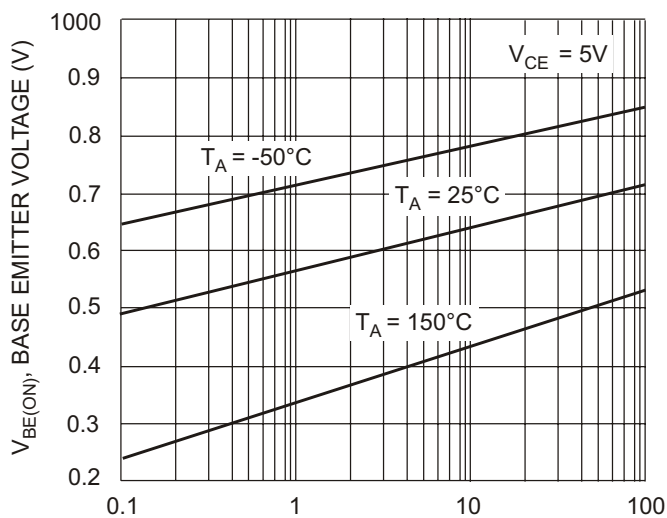


Fig. 10 Base-Emitter Voltage vs. Collector Current (4403)

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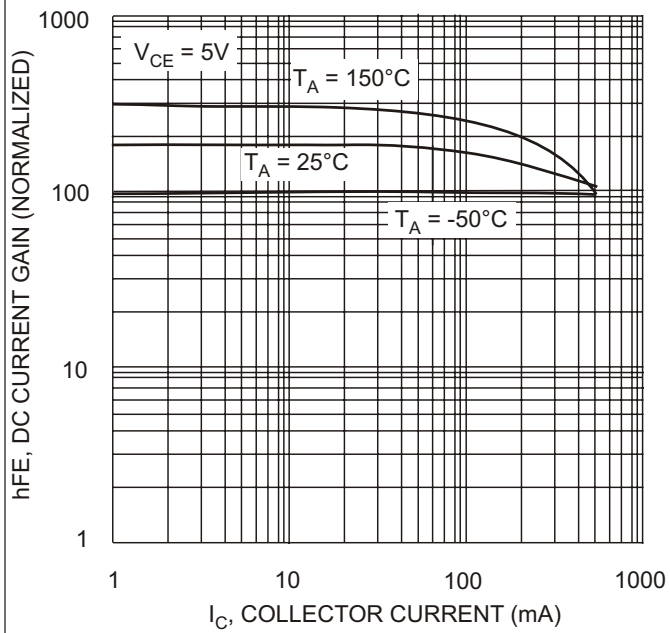


Fig. 11 DC Current Gain vs. Collector Current (4403)

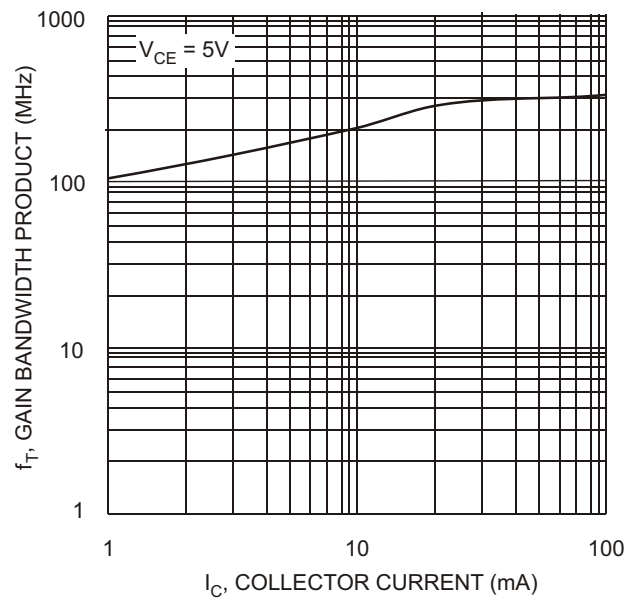


Fig. 12 Gain Bandwidth Product vs. Collector Current (4403)

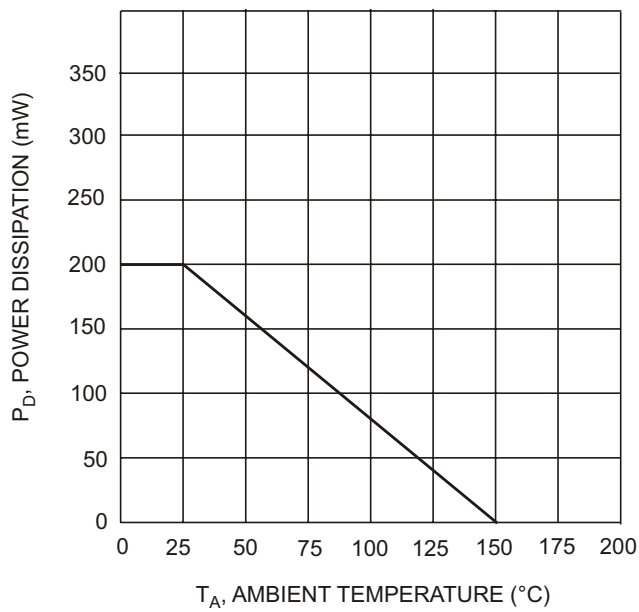


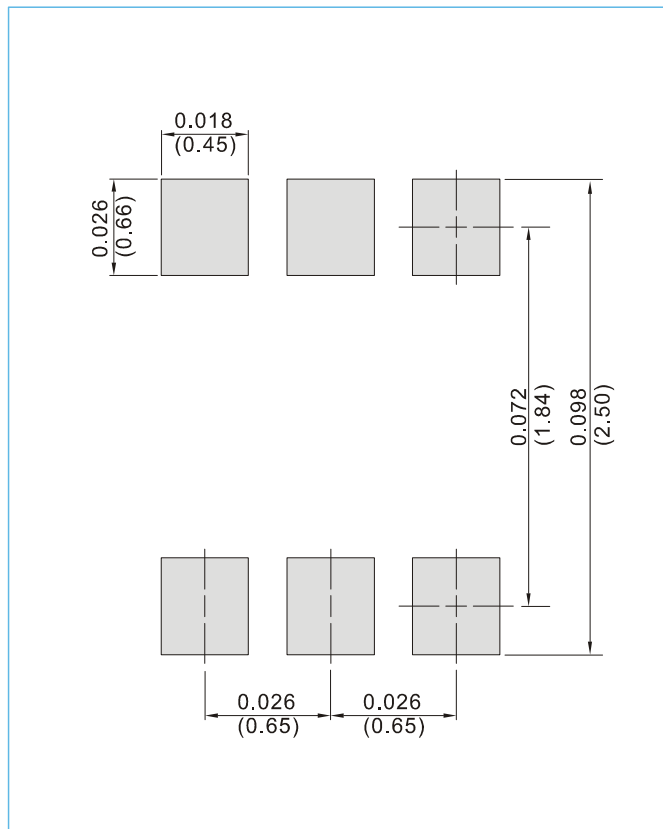
Fig. 13, Max Power Dissipation vs Ambient Temperature (4403)

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MOUNTING PAD LAYOUT

SOT-363

Unit : inch(mm)



ORDER INFORMATION

- Packing information
 - T/R - 10K per 13" plastic Reel
 - T/R - 3K per 7" plastic Reel

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Part No_packing code_Version

MMDT4413_R1_00001

MMDT4413_R2_00001

For example :

RB500V-40_R2_00001

Part No.

Serial number

Version code means HF

Packing size code means 13"

Packing type means T/R

Packing Code XX				Version Code XXXXX		
Packing type	1 st Code	Packing size code	2 nd Code	HF or RoHS	1 st Code	2 nd ~5 th Code
Tape and Ammunition Box (T/B)	A	N/A	0	HF	0	serial number
Tape and Reel (T/R)	R	7"	1	RoHS	1	serial number
Bulk Packing (B/P)	B	13"	2			
Tube Packing (T/P)	T	26mm	X			
Tape and Reel (Right Oriented) (TRR)	S	52mm	Y			
Tape and Reel (Left Oriented) (TRL)	L	PANASERT T/B CATHODE UP (PBCU)	U			
FORMING	F	PANASERT T/B CATHODE DOWN (PBCD)	D			



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