

# SOT-363 Plastic-Encapsulate Transistors

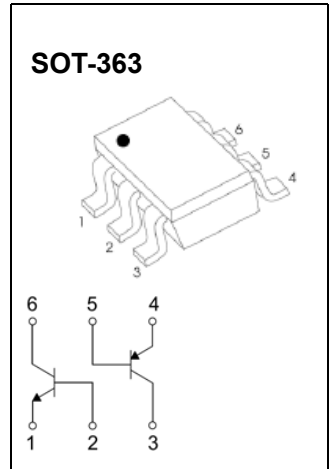
## MMDT4413 DUAL TRANSISTOR (NPN+PNP)

### FEATURES

- Complementary Pair
- One 4401-Type NPN  
One 4403-Type PNP
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching

### MAKING: K13

Maximum Ratings, NPN 4401 Section (Ta = 25°C unless otherwise specified)



Symbol	Parameter	Value	Units
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>CEO</sub>	Collector-Emitter Voltage	40	V
V <sub>EBO</sub>	Emitter-Base Voltage	6	V
I <sub>C</sub>	Collector Current -Continuous	0.6	A
P <sub>C</sub>	Collector Power Dissipation	0.2	W
R <sub>θJA</sub>	Thermal Resistance from Junction to Ambient	625	°C/W
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>stg</sub>	Storage Temperature	-55 to +150	°C

### NPN 4401 ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Max	Unit
Collector-base breakdown voltage	V <sub>(BR)CBO</sub>	I <sub>C</sub> = 100 μA, I <sub>E</sub> =0	60		V
Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 1mA, I <sub>B</sub> =0	40		V
Emitter-base breakdown voltage	V <sub>(BR)EBO</sub>	I <sub>E</sub> = 100 μA, I <sub>C</sub> =0	6		V
Collector cut-off current	I <sub>CBO</sub>	V <sub>CB</sub> = 50 V, I <sub>E</sub> =0		0.1	μA
Collector cut-off current	I <sub>CEO</sub>	V <sub>CE</sub> = 35 V, I <sub>B</sub> =0		0.5	μA
Emitter cut-off current	I <sub>EBO</sub>	V <sub>EB</sub> = 5V, I <sub>C</sub> =0		0.1	μA
DC current gain	h <sub>FE(1)</sub>	V <sub>CE</sub> = 1V, I <sub>C</sub> = 0.1mA	20		
	h <sub>FE(2)</sub>	V <sub>CE</sub> = 1V, I <sub>C</sub> = 1mA	40		
	h <sub>FE(3)</sub>	V <sub>CE</sub> = 1V, I <sub>C</sub> = 10mA	80		
	h <sub>FE(4)</sub>	V <sub>CE</sub> = 1V, I <sub>C</sub> = 150mA	100	300	
	h <sub>FE(5)</sub>	V <sub>CE</sub> = 2V, I <sub>C</sub> = 500mA	40		
Collector-emitter saturation voltage	V <sub>CE(sat)1</sub>	I <sub>C</sub> =150 mA, I <sub>B</sub> = 15mA		0.4	V
	V <sub>CE(sat)2</sub>	I <sub>C</sub> =500 mA, I <sub>B</sub> = 50mA		0.75	V
Base-emitter saturation voltage	V <sub>BE(sat)1</sub>	I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15mA	0.75	0.95	V
	V <sub>BE(sat)2</sub>	I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50mA		1.2	V
Transition frequency	f <sub>T</sub>	V <sub>CE</sub> = 10V, I <sub>C</sub> = 20mA, f=100MHz	250		MHz
Output Capacitance	C <sub>ob</sub>	V <sub>CB</sub> =5V, I <sub>E</sub> = 0, f=1MHz		6.5	pF
Delay time	t <sub>d</sub>	V <sub>CC</sub> =30V,		15	nS
Rise time	t <sub>r</sub>	V <sub>BE</sub> =2.0V, I <sub>C</sub> =150mA, I <sub>B1</sub> =15mA		20	nS
Storage time	t <sub>s</sub>	V <sub>CC</sub> =30V, I <sub>C</sub> =150mA, I <sub>B1</sub> =- I <sub>B2</sub> = 15mA		225	nS
Fall time	t <sub>f</sub>			30	nS

**Maximum Ratings, PNP 4403 Section (Ta = 25°C unless otherwise specified)**

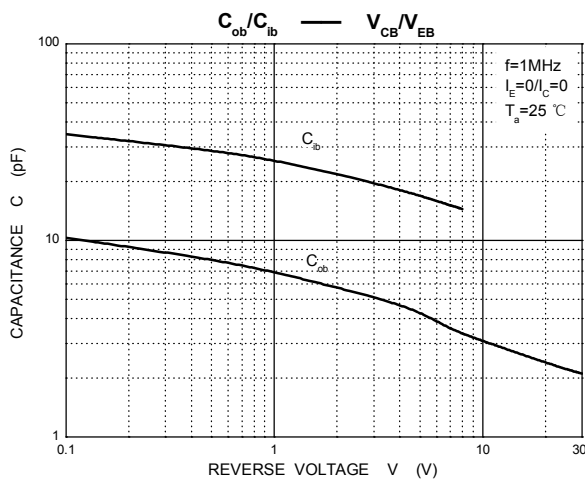
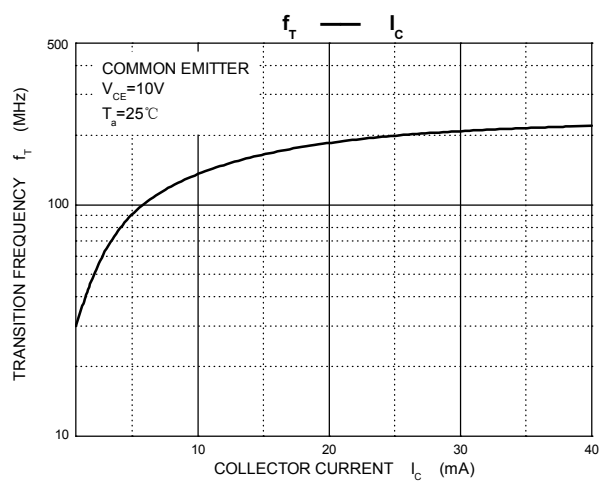
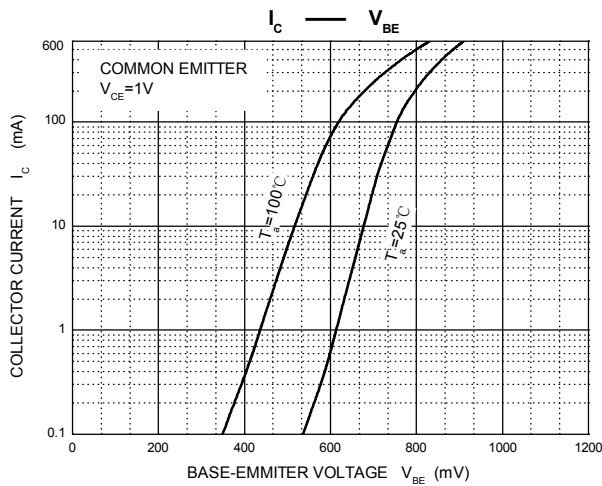
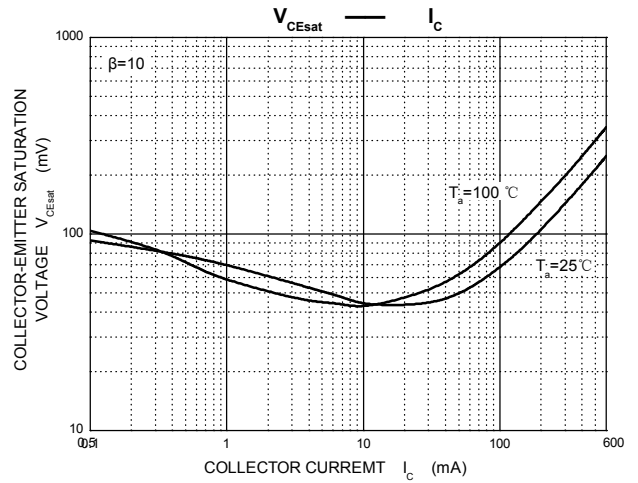
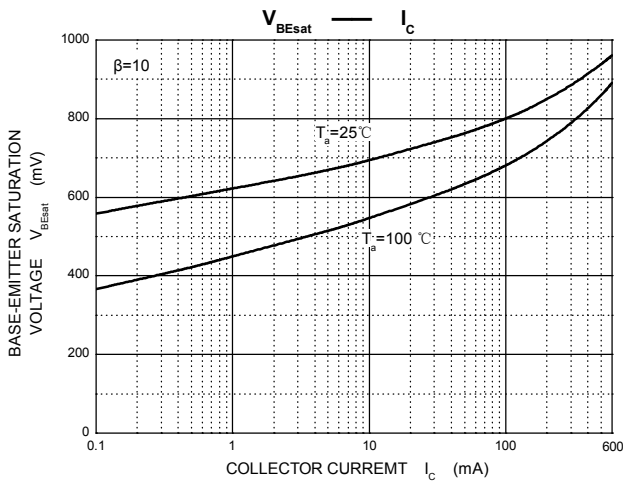
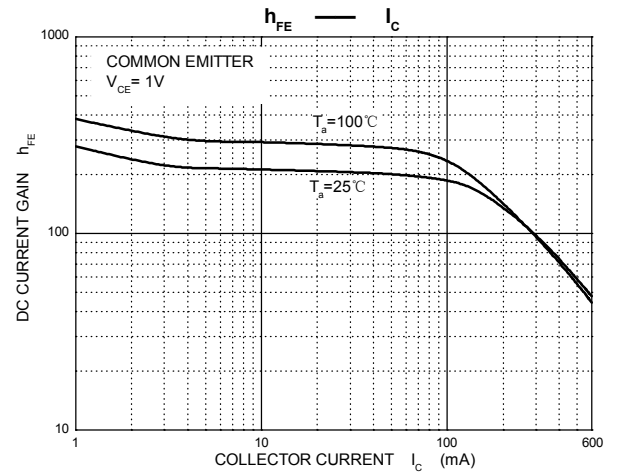
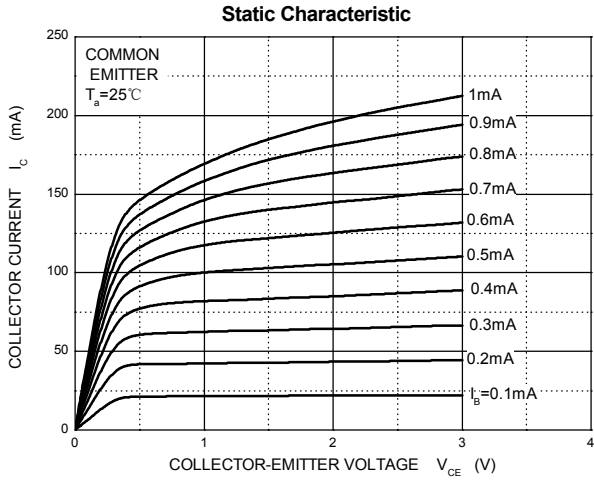
Symbol	Parameter	Value	Units
V <sub>CBO</sub>	Collector-Base Voltage	-40	V
V <sub>CEO</sub>	Collector-Emitter Voltage	-40	V
V <sub>EBO</sub>	Emitter-Base Voltage	-5	V
I <sub>C</sub>	Collector Current -Continuous	-0.6	A
P <sub>C</sub>	Collector Power Dissipation	0.2	W
R <sub>θJA</sub>	Thermal Resistance from Junction to Ambient	625	°C/W
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>stg</sub>	Storage Temperature	-55 to +150	°C

**PNP 4403 ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)**

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	V <sub>(BR)CBO</sub>	I <sub>C</sub> = -100μA, I <sub>E</sub> = 0	-40			V
Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = -1mA, I <sub>B</sub> = 0	-40			V
Emitter-base breakdown voltage	V <sub>(BR)EBO</sub>	I <sub>E</sub> = -100μA, I <sub>C</sub> = 0	-5			V
Collector cut-off current	I <sub>CBO</sub>	V <sub>CB</sub> = -50 V, I <sub>E</sub> = 0			-0.1	μA
Collector cut-off current	I <sub>CEO</sub>	V <sub>CE</sub> = -35 V, I <sub>B</sub> = 0			-0.5	μA
Emitter cut-off current	I <sub>EBO</sub>	V <sub>EB</sub> = -5V, I <sub>C</sub> = 0			-0.1	μA
DC current gain	h <sub>FE(1)</sub>	V <sub>CE</sub> = -1 V, I <sub>C</sub> = -0.1mA	30			
	h <sub>FE(2)</sub>	V <sub>CE</sub> = -1 V, I <sub>C</sub> = -1mA	60			
	h <sub>FE(3)</sub>	V <sub>CE</sub> = -1 V, I <sub>C</sub> = -10mA	100			
	h <sub>FE(4)</sub>	V <sub>CE</sub> = -2 V, I <sub>C</sub> = -150mA	100		300	
	h <sub>FE(5)</sub>	V <sub>CE</sub> = -2 V, I <sub>C</sub> = -500mA	20			
Collector-emitter saturation voltage	V <sub>CE(sat)1</sub>	I <sub>C</sub> = -150 mA, I <sub>B</sub> = -15mA			-0.4	V
	V <sub>CE(sat)2</sub>	I <sub>C</sub> = -500 mA, I <sub>B</sub> = -50mA			-0.75	V
Base-emitter saturation voltage	V <sub>BE(sat)1</sub>	I <sub>C</sub> = -150 mA, I <sub>B</sub> = -15mA	-0.75		-0.95	V
	V <sub>BE(sat)2</sub>	I <sub>C</sub> = -500 mA, I <sub>B</sub> = -50mA			-1.3	V
Transition frequency	f <sub>T</sub>	V <sub>CE</sub> = -10V, I <sub>C</sub> = -20mA f = 100MHz	200			MHz
Output Capacitance	C <sub>ob</sub>	V <sub>CB</sub> = -10V, I <sub>E</sub> = 0 f = 1MHz			8.5	pF
Delay time	t <sub>d</sub>	V <sub>CC</sub> = -30V, V <sub>BE</sub> = -2V			15	nS
Rise time	t <sub>r</sub>	I <sub>C</sub> = -150mA, I <sub>B1</sub> = -15mA			20	nS
Storage time	t <sub>s</sub>	V <sub>CC</sub> = -30V, I <sub>C</sub> = -150mA			225	nS
Fall time	t <sub>f</sub>	I <sub>B1</sub> = -I <sub>B2</sub> = -15mA			30	nS

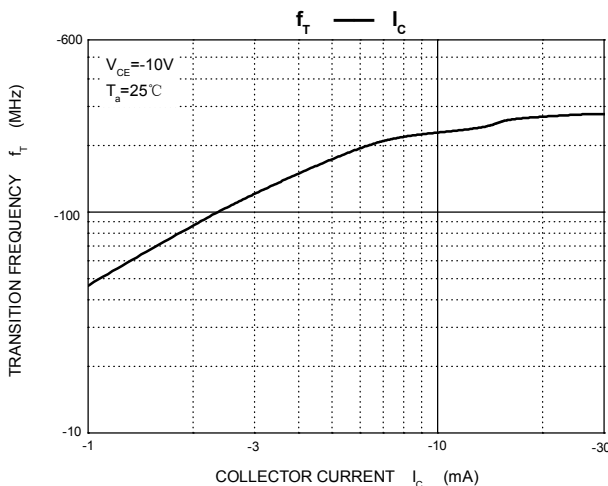
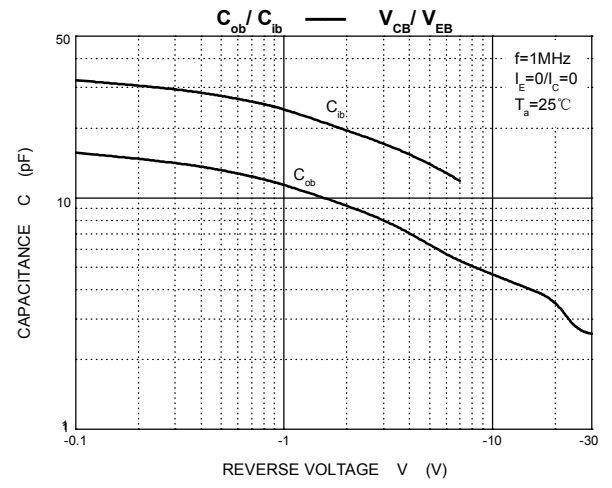
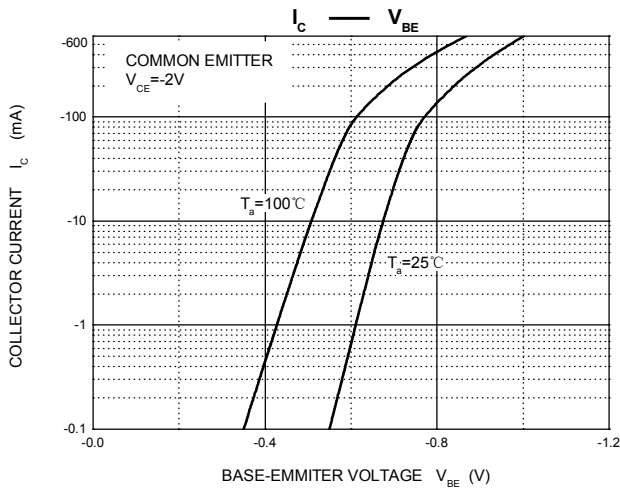
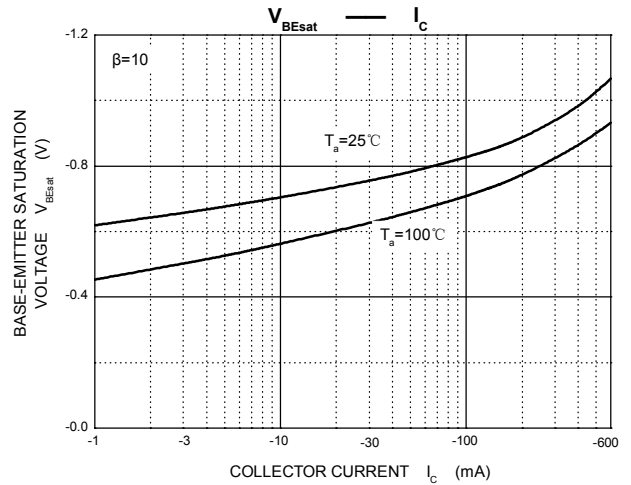
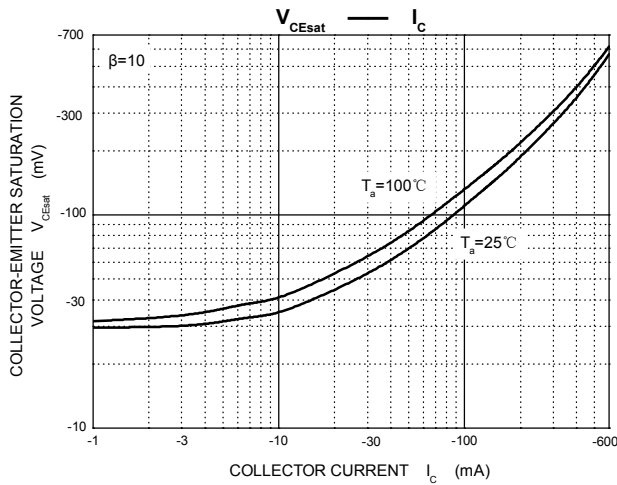
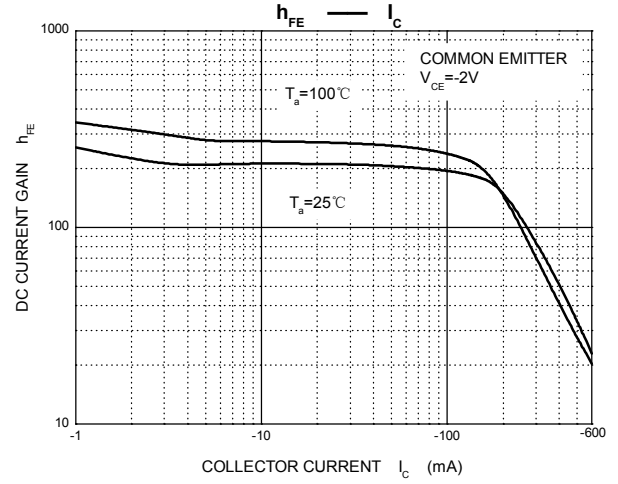
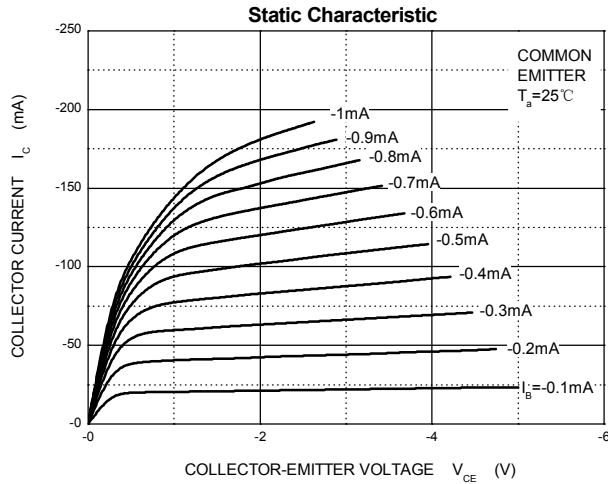
# Typical Characteristics

## NPN Transistor

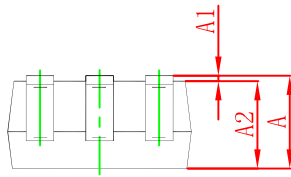
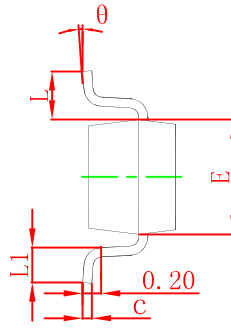
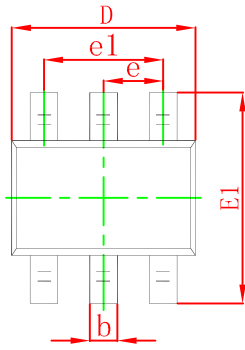


# Typical Characteristics

## PNP Transistor

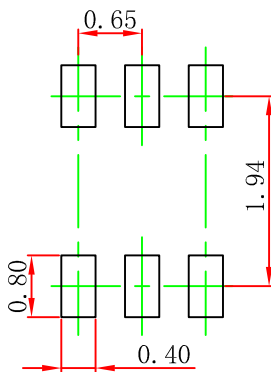


## SOT-363 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.100	0.150	0.004	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.400	0.085	0.094
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°

## SOT-363 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

### NOTICE

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