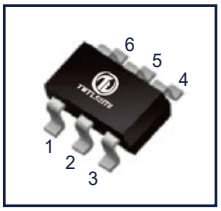
TL-MMDT4413

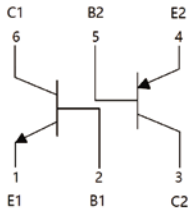
SOT-363 DUAL TRANSISTOR (NPN+PNP)

Features

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



SOT-363



Equivalent Circuit

Ordering information

Product ID	Pack	Naming rule	Marking	hFE(1)	Qty(PCS)
MMDT4413	SOT-363	MMDT4413 产品名称 product name	K13	100-300	3000

Maximum Ratings, NPN 4401 Section (T_A=25℃)

Symbol	Parameter	Value	Uniat
V_{CBO}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	6	V
I_C	Collector Current	0.6	A
P_C	Collector Power Dissipation	0.2	W
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	625	℃/W
T_J,T_{stg}	Operation Junction And Storage Temperature Range	-55～+150	℃

NPN 4401 ELECTRICAL CHARACTERISTICS (T_A=25℃)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	Collector-base breakdown voltage	I_C=100μA, I_E=0	60			V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C=1mA, I_B=0	40			V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E=100μA, I_C=0	6			V
I_{CBO}	Collector cut-off current	V_{CB}=50V, I_E=0			0.1	nA
I_{CEO}	Collector cut-off current	V_{CE}=35V, I_B=0			0.5	nA
I_{EBO}	Emitter cut-off current	V_{EB}=5V, I_C=0			0.1	nA
$h_{FE(1)}$	DC current gain	V_{CE}=1V, I_C=0.1mA	20			
$h_{FE(2)}$		V_{CE}=1V, I_C=1mA	40			
$h_{FE(3)}$		V_{CE}=1V, I_C=10mA	80			
$h_{FE(4)}$		V_{CE}=1V, I_C=150mA	100		300	
$h_{FE(5)}$		V_{CE}=2V, I_C=500mA	40			
$V_{CE(sat)1}$	Collector-emitter saturation voltage	I_C=150mA, I_B=15mA			0.4	V
$V_{CE(sat)1}$		I_C=500mA, I_B=50mA			0.75	V
$V_{BE(sat)1}$	Base-emitter saturation voltage	I_C=150mA, I_B=15mA	0.75		0.95	V
$V_{BE(sat)2}$		I_C=500mA, I_B=50mA			1.2	V
f_T	Transition frequency	V_{CE}=10V, I_C=20mA, f=100MHz	250			MHz
C_{ob}	Collector output capacitance	V_{CB}=5V,I_E=0,f=1MHz			6.5	pF
t_d	Delay time	V_{CC}=30V,V_{BE}=2.0V, I_C=150mA ,I_{B1}=15mA			15	nS
t_r	Rise time				20	nS
t_s	Storage time	V_{CC}=30V, I_C=150mA, I_{B1}=- I_{B2}=15mA			225	nS
t_f	Fall time				30	nS

Maximum Ratings, PNP 4403 Section (T_A=25℃)

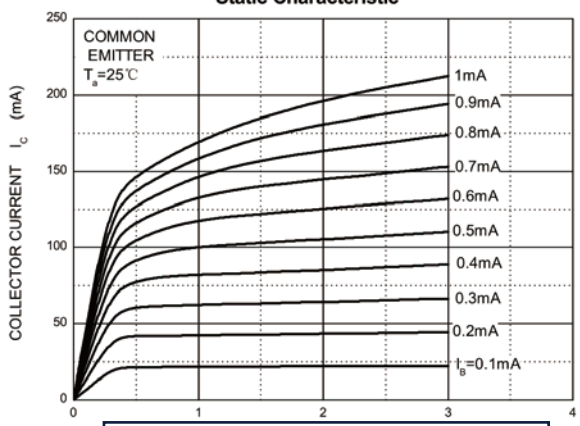
Symbol	Parameter	Value	Uniat
V_{CBO}	Collector-Base Voltage	-40	V
V_{CEO}	Collector-Emitter Voltage	-40	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_C	Collector Current	-0.6	A
P_C	Collector Power Dissipation	0.2	W
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	625	℃/W
T_J,T_{stg}	Operation Junction And Storage Temperature Range	-55～+150	℃

PNP 4403 ELECTRICAL CHARACTERISTICS (T_A=25℃)

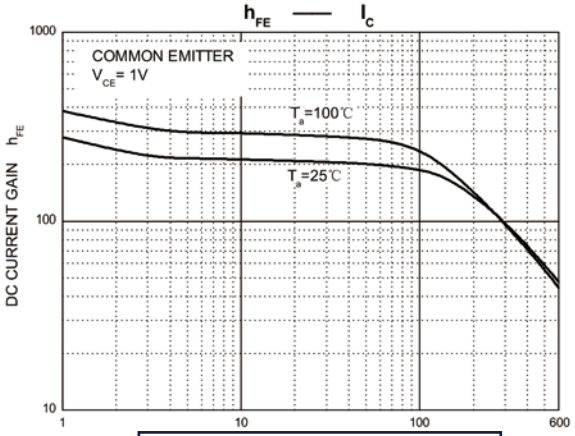
Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	Collector-base breakdown voltage	I_C=-100μA, I_E=0	-40			V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C=-1mA, I_B=0	-40			V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E=-100μA, I_C=0	-5			V
I_{CBO}	Collector cut-off current	V_{CB}=-35V, I_E=0			-0.1	nA
I_{CEO}	Collector cut-off current	V_{CE}=-35V, I_B=0			-0.5	nA
I_{EBO}	Emitter cut-off current	V_{EB}=-5V, I_C=0			-0.1	nA
$h_{FE(1)}$	DC current gain	V_{CE}=-1V, I_C=-0.1mA	30			
$h_{FE(2)}$		V_{CE}=-1V, I_C=-1mA	60			
$h_{FE(3)}$		V_{CE}=-1V, I_C=-10mA	100			
$h_{FE(4)}$		V_{CE}=-1V, I_C=-150mA	100		300	
$h_{FE(5)}$		V_{CE}=-2V, I_C=-500mA	20			
$V_{CE(sat)1}$	Collector-emitter saturation voltage	I_C=-150mA, I_B=-15mA			-0.4	V
$V_{CE(sat)1}$		I_C=-500mA, I_B=-50mA			-0.75	V
$V_{BE(sat)1}$	Base-emitter saturation voltage	I_C=-150mA, I_B=-15mA	-0.75		-0.95	V
$V_{BE(sat)2}$		I_C=-500mA, I_B=-50mA			-1.3	V
f_T	Transition frequency	V_{CE}=-10V, I_C=-20mA, f=100MHz	200			MHz
C_{ob}	Collector output capacitance	V_{CB}=-10V,I_E=0,f=1MHz			8.5	pF
t_d	Delay time	V_{CC}=-30V,V_{BE}=-2.0V, I_C=-150mA ,I_{B1}=-15mA			15	nS
t_r	Rise time				20	nS
t_S	Storage time	V_{CC}=-30V, I_C=-150mA, I_{B1}=- I_{B2}=-15mA			225	nS
t_f	Fall time				30	nS

Typical Characteristics (NPN Transistor)

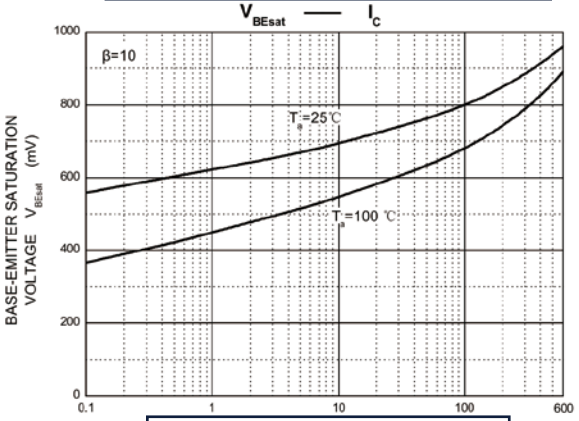
Static Characteristic



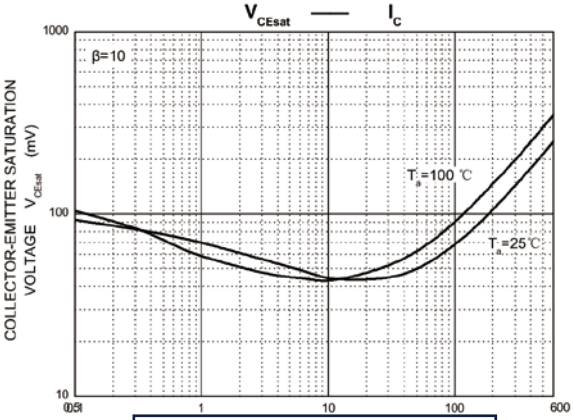
h_{FE} — I_C



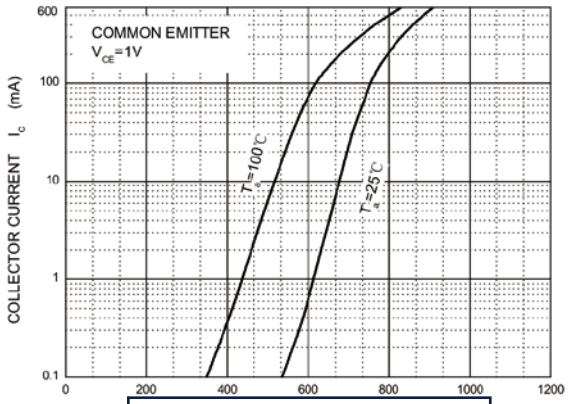
V_{BEsat} — I_C



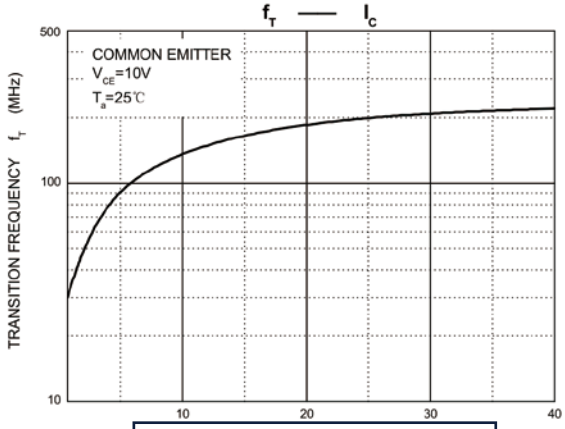
V_{CEsat} — I_C



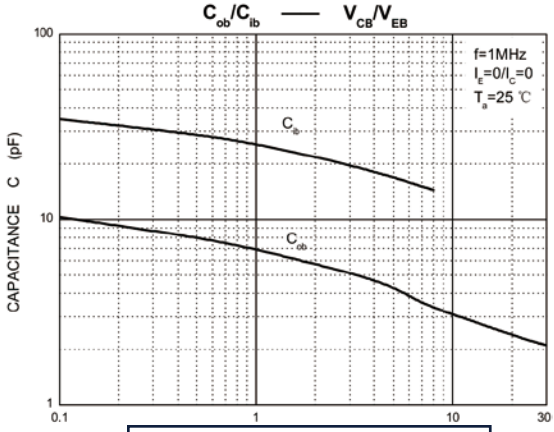
I_C — V_{BE}



f_T — I_C

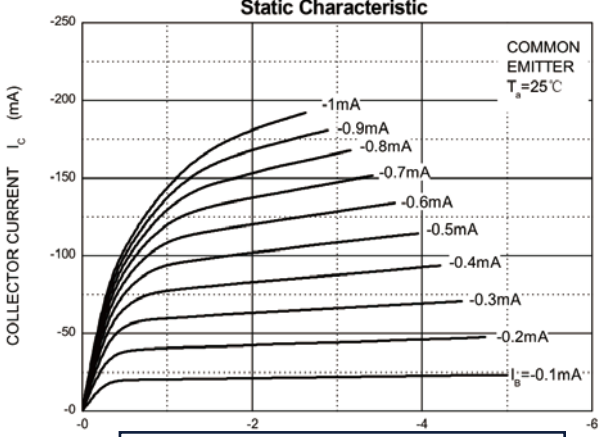


C_{ob}/C_{ib} — V_{CB}/V_{EB}



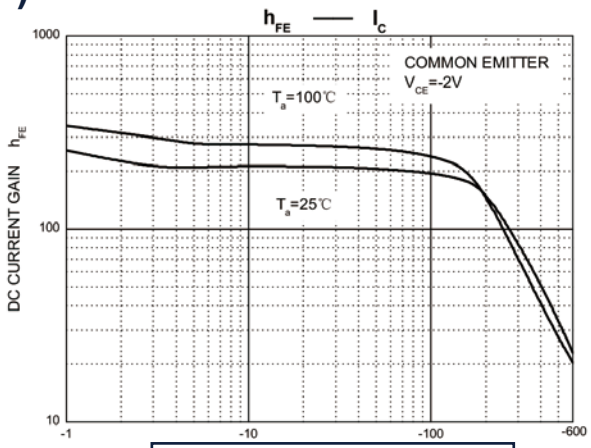
Typical Characteristics (PNP Transistor)

Static Characteristic



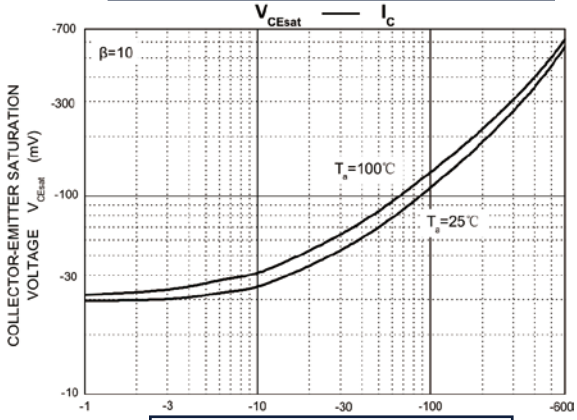
COLLECTOR-EMITTER VOLTAGE V_{CE}(V)

h_{FE} — I_C



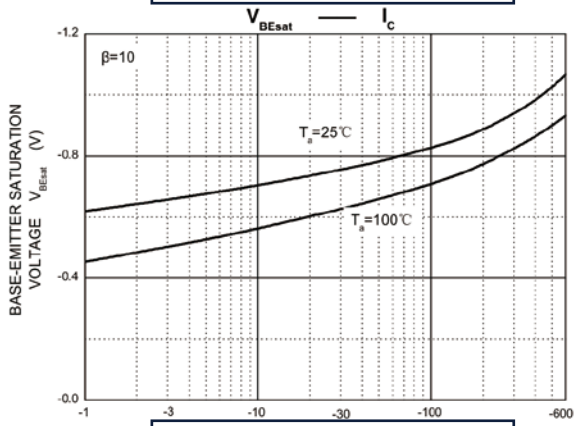
COLLECTOR CURRENT I_C(mA)

V_{CEsat} — I_C



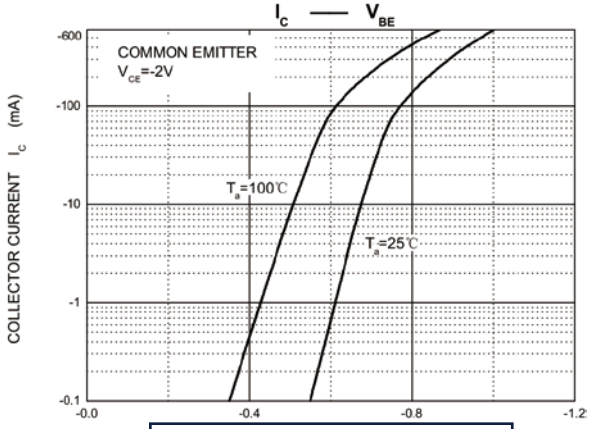
COLLECTOR CURRENT I_C(mA)

V_{BEsat} — I_C



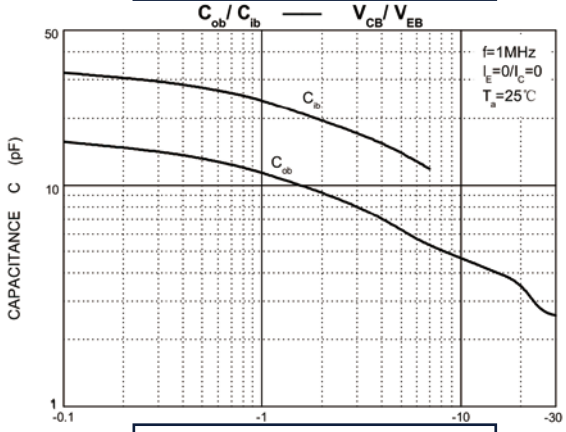
COLLECTOR CURRENT I_C(mA)

I_C — V_{BE}



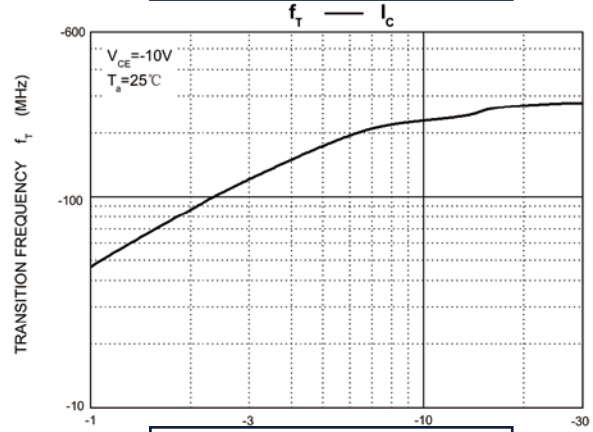
BASE-EMMITER VOLTAGE V_{BE}(V)

C_{ob} / C_{ib} — V_{CB} / V_{EB}



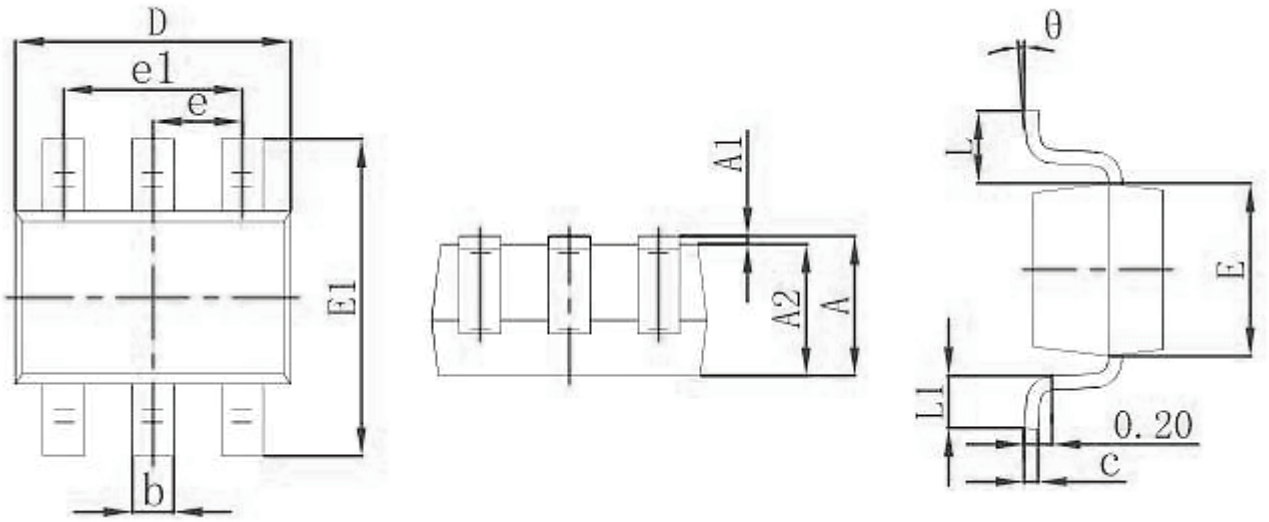
REVERSE VOLTAGE V(V)

f_T — I_C



COLLECTOR CURRENT I_C(mA)

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	2.450	0.085	0.096
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
θ	0°	8°	0°	8°