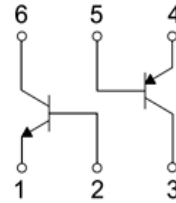


**Complementary NPN+PNP Transistor**

**Features**

- Complementary pair
- One 4401-Type NPN
- One 4403-Type PNP
- Epitaxial planar die construction
- Ideal for low power amplification and switching



Schematic Diagram



SOT-363

**NPN Absolute Maximum Ratings**

( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	60	V
Collector-Emitter Voltage	$V_{CE0}$	40	V
Emitter-Base Voltage	$V_{EB0}$	6	V
Collector Current -Continuous	$I_C$	0.6	A
Collector Power Dissipation	$P_C$	0.2	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Junction Temperature	$T_J$	-55 to +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 to +150	$^\circ\text{C}$

**PNP Absolute Maximum Ratings**

( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	-40	V
Collector-Emitter Voltage	$V_{CE0}$	-40	V
Emitter-Base Voltage	$V_{EB0}$	-5	V
Collector Current -Continuous	$I_C$	-0.6	A
Collector Power Dissipation	$P_C$	0.2	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Junction Temperature	$T_J$	-55 to +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 to +150	$^\circ\text{C}$

**Complementary NPN+PNP Transistor**

**NPN Electrical Characteristics** ( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	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	$I_{CBO}$	$V_{CB}=50\text{V}, I_E=0$	--	0.1	$\mu\text{A}$
Collector Cut-off Current	$I_{CEO}$	$V_{CE}=35\text{V}, I_B=0$	--	0.5	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{EB}=5\text{V}, I_C=0$	--	0.1	$\mu\text{A}$
DC Current Gain	$h_{FE(1)}$	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	20	--	
	$h_{FE(2)}$	$V_{CE}=1\text{V}, I_C=1\text{mA}$	40	--	
	$h_{FE(3)}$	$V_{CE}=1\text{V}, I_C=10\text{mA}$	80	--	
	$h_{FE(4)}$	$V_{CE}=1\text{V}, I_C=150\text{mA}$	100	300	
	$h_{FE(5)}$	$V_{CE}=2\text{V}, I_C=500\text{mA}$	40	--	
Collector-Emitter Saturation Voltage	$V_{CE(sat)1}$	$I_C=150\text{mA}, I_B=15\text{mA}$	--	0.4	V
	$V_{CE(sat)2}$	$I_C=500\text{mA}, I_B=50\text{mA}$	--	0.75	V
Base-Emitter Saturation Voltage	$V_{BE(sat)1}$	$I_C=150\text{mA}, I_B=15\text{mA}$	0.75	0.95	V
	$V_{BE(sat)2}$	$I_C=500\text{mA}, I_B=50\text{mA}$	--	1.2	V
Transition Frequency	$f_T$	$V_{CE}=10\text{V}, I_C=20\text{mA}, f=100\text{MHz}$	250	--	MHz
Output Capacitance	$C_{ob}$	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$	--	6.5	pF
Delay Time	$t_d$	$V_{CC}=30\text{V}, V_{BE}=2.0\text{V}, I_C=150\text{mA}, I_{B1}=15\text{mA}$	--	15	nS
Rise Time	$t_r$		--	20	nS
Storage Time	$t_s$	$V_{CC}=30\text{V}, I_C=150\text{mA}, I_{B1}=-I_{B2}=15\text{mA}$	--	225	nS
Fall Time	$t_f$		--	30	nS

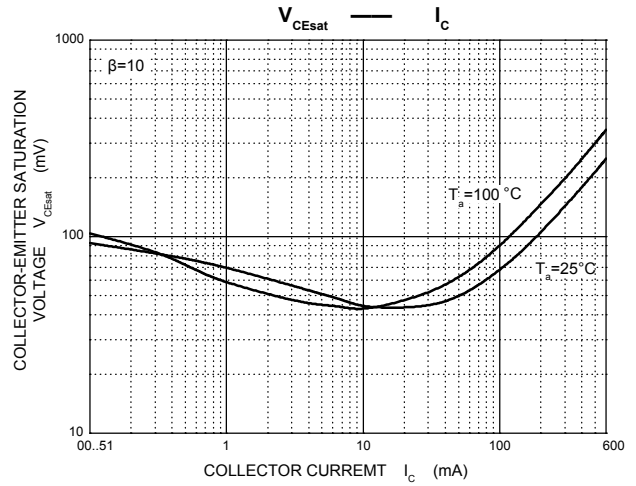
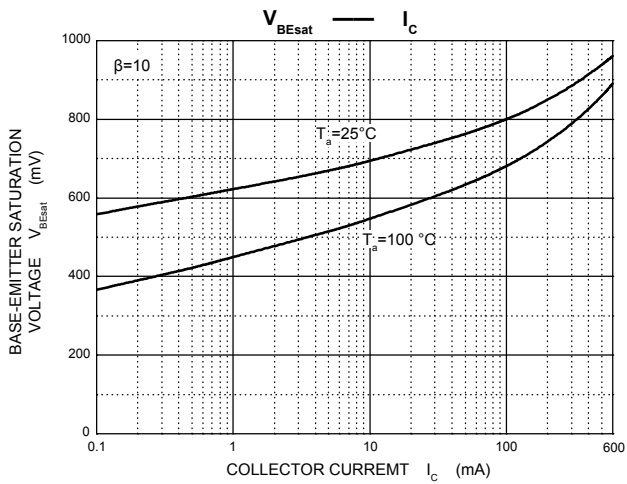
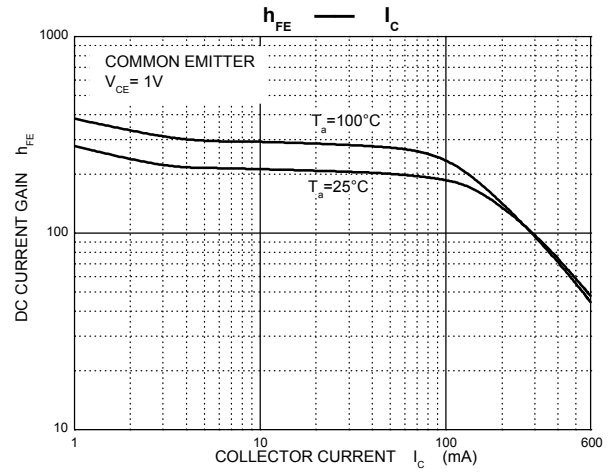
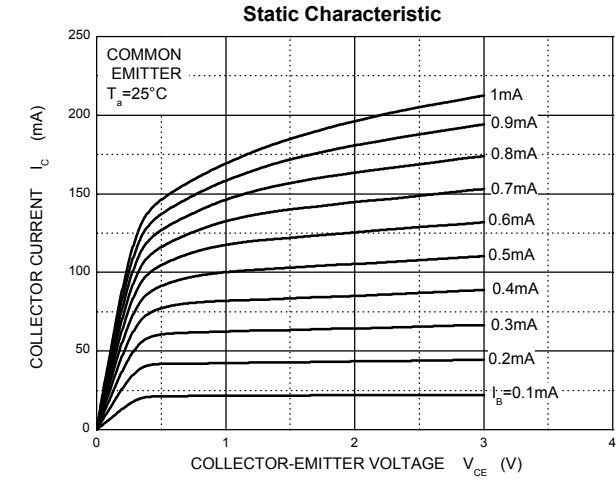
**Complementary NPN+PNP Transistor**

**PNP Electrical Characteristics** ( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	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	$I_{CBO}$	$V_{CB} = -50\text{V}, I_E = 0$	--	-0.1	$\mu\text{A}$
Collector Cut-off Current	$I_{CEO}$	$V_{CE} = -35\text{V}, I_B = 0$	--	-0.5	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = -5\text{V}, I_C = 0$	--	-0.1	$\mu\text{A}$
DC Current Gain	$h_{FE(1)}$	$V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$	30	--	
	$h_{FE(2)}$	$V_{CE} = -1\text{V}, I_C = -1\text{mA}$	60	--	
	$h_{FE(3)}$	$V_{CE} = -1\text{V}, I_C = -10\text{mA}$	100	--	
	$h_{FE(4)}$	$V_{CE} = -2\text{V}, I_C = -150\text{mA}$	100	300	
	$h_{FE(5)}$	$V_{CE} = -2\text{V}, I_C = -500\text{mA}$	20	--	
Collector-Emitter Saturation Voltage	$V_{CE(sat)1}$	$I_C = -150\text{mA}, I_B = -15\text{mA}$	--	-0.4	V
	$V_{CE(sat)2}$	$I_C = -500\text{mA}, I_B = -50\text{mA}$	--	-0.75	V
Base-Emitter Saturation Voltage	$V_{BE(sat)1}$	$I_C = -150\text{mA}, I_B = -15\text{mA}$	-0.75	-0.95	V
	$V_{BE(sat)2}$	$I_C = -500\text{mA}, I_B = -50\text{mA}$	--	-1.3	V
Transition Frequency	$f_T$	$V_{CE} = -10\text{V}, I_C = -20\text{mA}, f = 100\text{MHz}$	200	--	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = -10\text{V}, I_E = 0, f = 1\text{MHz}$	--	8.5	pF
Delay Time	$t_d$	$V_{CC} = -30\text{V}, V_{BE} = -2\text{V}, I_C = -150\text{mA}, I_{B1} = -15\text{mA}$	--	15	nS
Rise Time	$t_r$		--	20	nS
Storage Time	$t_s$	$V_{CC} = -30\text{V}, I_C = -150\text{mA}, I_{B1} = -I_{B2} = -15\text{mA}$	--	225	nS
Fall Time	$t_f$		--	30	nS

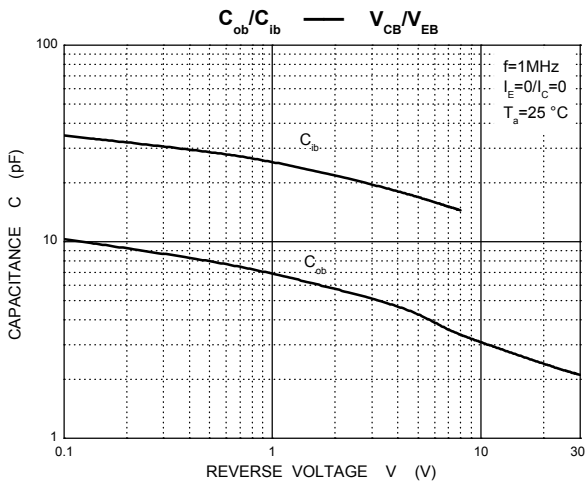
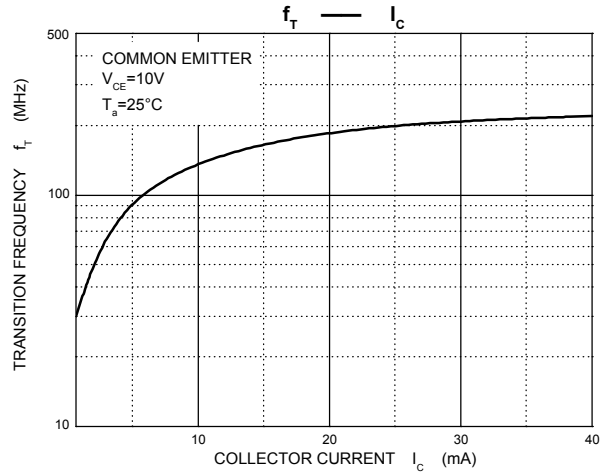
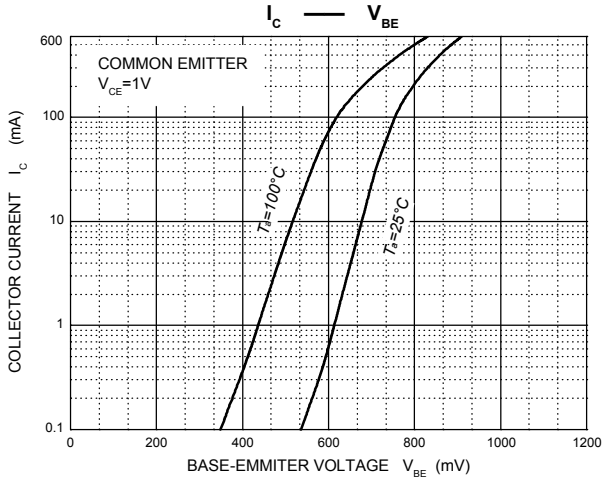
**Complementary NPN+PNP Transistor**

**NPN Typical Electrical and Thermal Characteristic Curves**



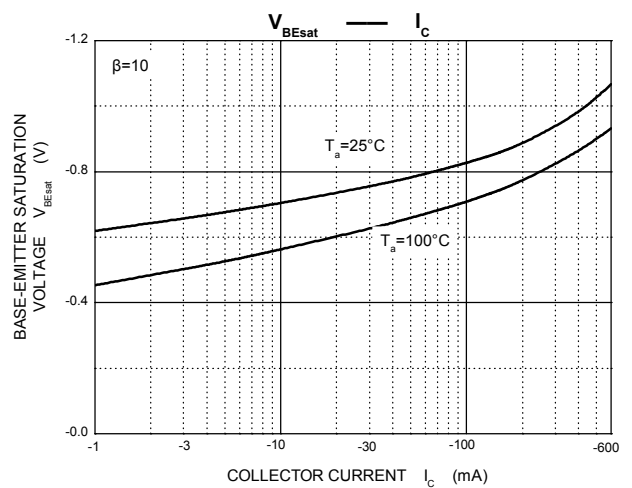
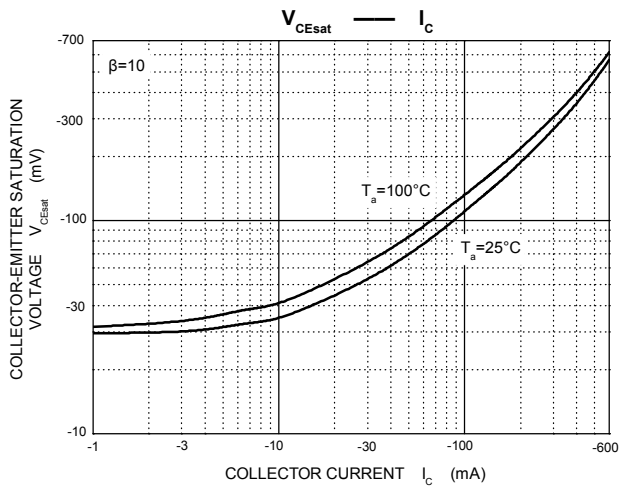
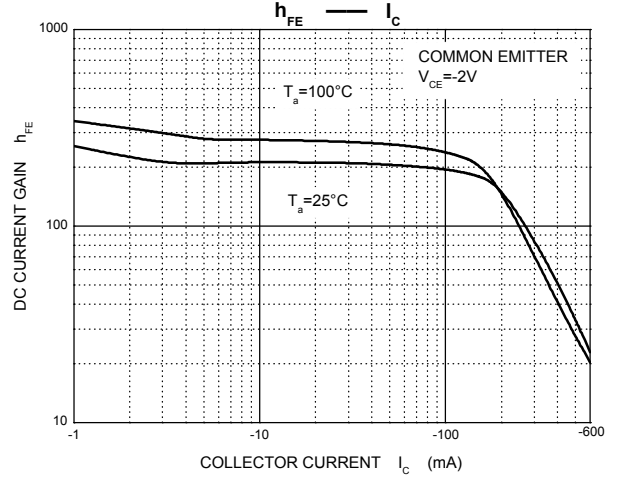
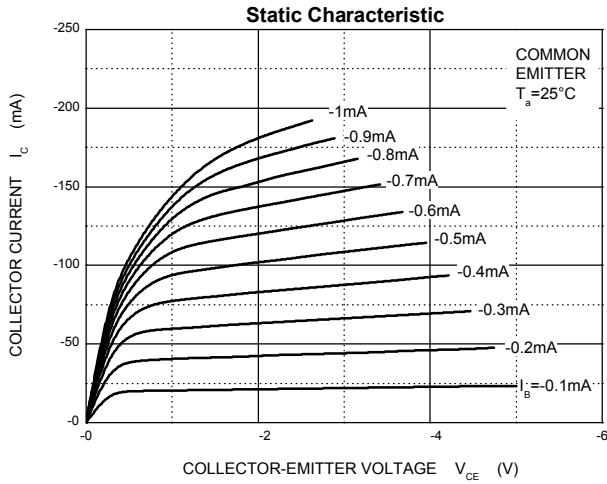
**Complementary NPN+PNP Transistor**

**NPN Typical Electrical and Thermal Characteristic Curves**



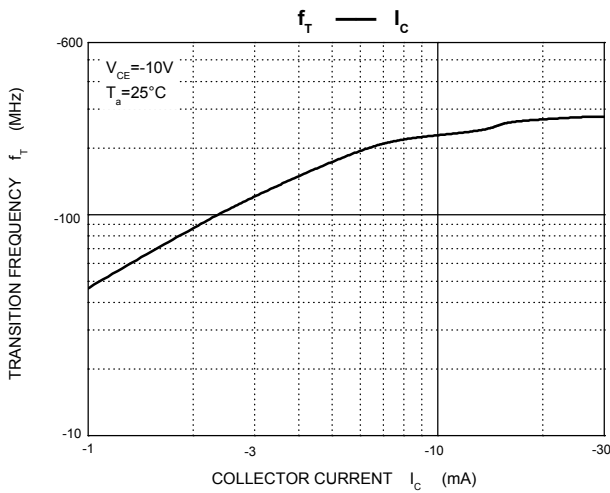
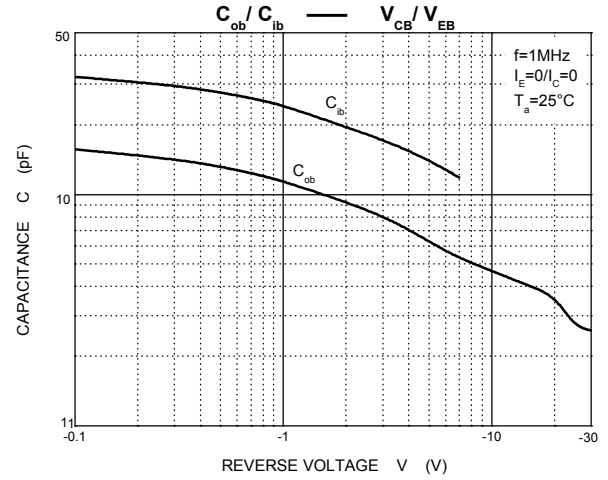
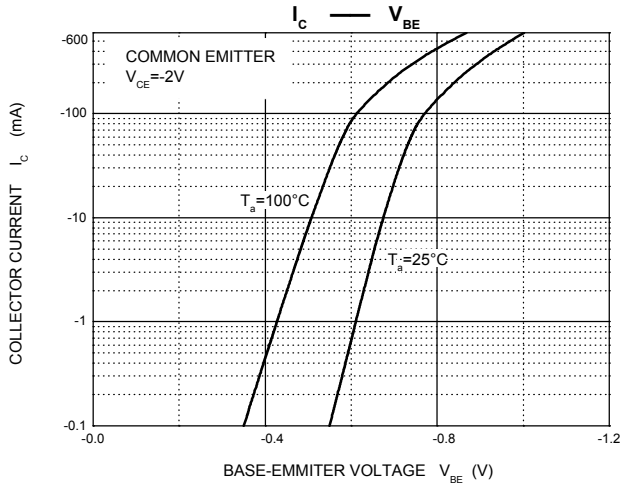
**Complementary NPN+PNP Transistor**

**PNP Typical Electrical and Thermal Characteristic Curves**



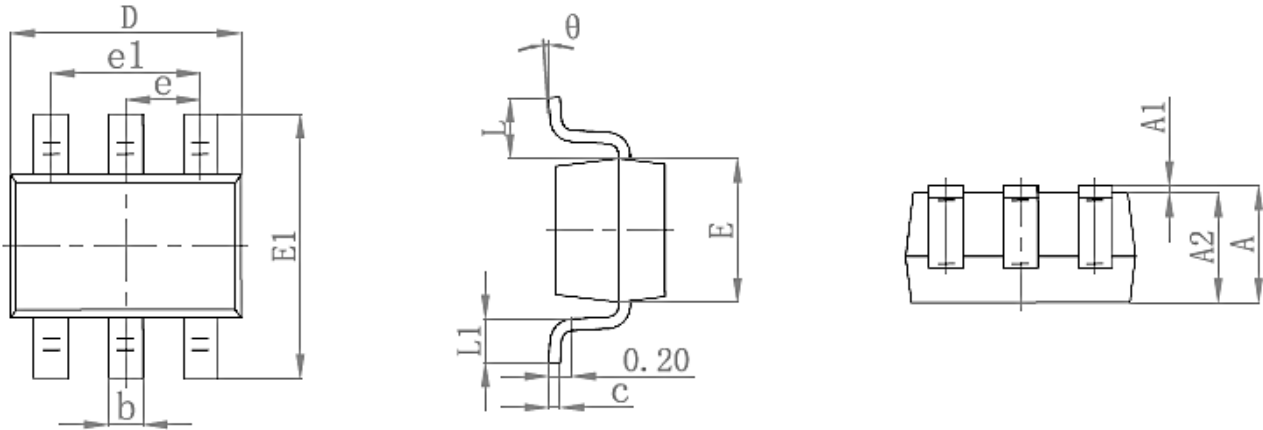
**Complementary NPN+PNP Transistor**

**PNP Typical Electrical and Thermal Characteristic Curves**



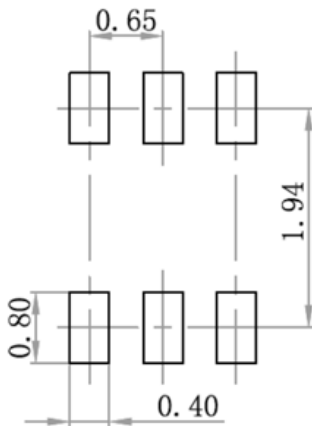
**Complementary NPN+PNP Transistor**

**Package Outline Dimensions SOT-363**



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
θ	0°	8°	0°	8°

**Suggested Pad Layout**



Note:

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

**Marking and Ordering Information**

Device	Package	Marking	Quantity	HSF Status
MMDT4413	SOT-363	K13	3000pcs / Reel	RoHS Compliant

For more information, please contact us at: [inquiry@goodarksemi.com](mailto:inquiry@goodarksemi.com)