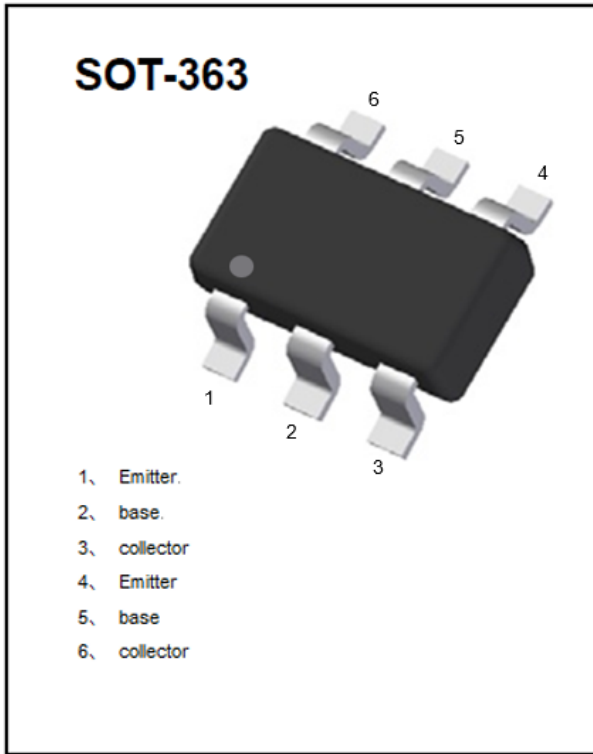


Dual NPN+PNP Small Signal Transistor



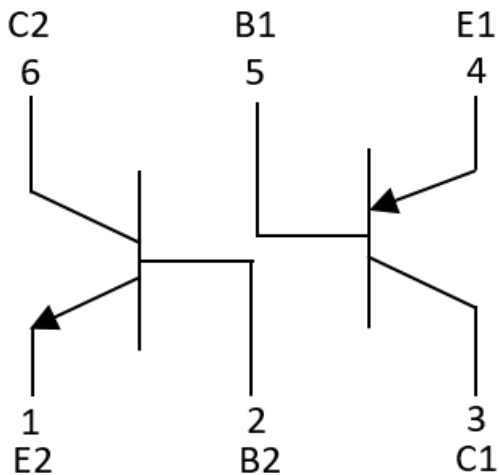
Features

- Epoxy meets UL-94 V-0 flammability rating
- Surface mount package ideally Suited for Automatic Insertion
- NPN/PNP

Mechanical Data

- **Package:** SOT-363
- **Terminals:** Tin plated leads, solderable per J-STD-002 and JESD22-B102
- **Marking:** K13

Equivalent circuit



Ordering Information (Example)

PREFERED P/N	PACKING CODE	UNIT WEIGHT(g)	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
MMDT4413	F2	Approximate 0.009g	3000	30000	120000	7" reel



MMDT4413

■TR1 PNP Pin3、4、5 Maximum Ratings (Ta=25°C Unless otherwise specified)

Item	Symbol	Unit	Conditions	Value
Collector-Base Voltage	V_{CBO}	V	$I_C=-100\mu A, I_E=0$	-40
Collector-Emitter Voltage	V_{CEO}	V	$I_C=-1mA, I_B=0$	-40
Emitter-Base Voltage	V_{EBO}	V	$I_E=-100\mu A, I_C=0$	-5
Collector Current -Continuous	I_C	mA		-200
Total Device Dissipation	P_C	mW		200
Junction Temperature	T_J	°C		150
Storage Temperature	T_{STG}	°C		-55 to +150

■TR1 PNP Pin3、4、5 Electrical Characteristics (Ta=25°C unless otherwise specified)

Item	Symbol	Unit	Conditions	Min	TYP	Max
Collector-base breakdown voltage	V_{CBO}	V	$I_C=-100\mu A, I_E=0$	-40		
Collector-emitter breakdown voltage	V_{CEO}	V	$I_C=-1mA, I_B=0$	-40		
Emitter-base breakdown voltage	V_{EBO}	V	$I_E=-100\mu A, I_C=0$	-5		
Collector cut-off current	I_{CBO}	nA	$V_{CB}=-50V, I_E=0$			-100
Emmitter cut-off current	I_{EBO}	nA	$V_{EB}=-5V, I_C=0$			-100
DC current gain	h_{FE}		$V_{CE}=-1V, I_C=-0.1mA$	30		
	h_{FE}		$V_{CE}=-1V, I_C=-1mA$	60		
	h_{FE}		$V_{CE}=-1V, I_C=-10mA$	100		
	h_{FE}		$V_{CE}=-2V, I_C=-150mA$	100		300
	h_{FE}		$V_{CE}=-2V, I_C=-500mA$	20		
Collector-emitter saturation voltage	$V_{CE(sat)}$	V	$I_C=-150mA, I_B=-15mA$			-0.4
Collector-emitter saturation voltage	$V_{CE(sat)}$	V	$I_C=-500mA, I_B=-50mA$			-0.75
Base-emitter saturation voltage	$V_{BE(sat)}$	V	$I_C=-150mA, I_B=-15mA$			-0.95
Base-emitter saturation voltage	$V_{BE(sat)}$	V	$I_C=-500mA, I_B=-50mA$			-1.3
Transition frequency	f_T	MHz	$V_{CE}=-10V, I_C=-20mA, f=100MHz$	200		
Delay time	t_d	ns	$V_{CC}=-30V, I_C=-150mA, V_{BE}=-2V, I_{B1}=-15mA$			15
Rise time	t_r	ns				20
Storage time	t_s	ns	$V_{CC}=-30V, I_C=-150mA, I_{B1}=-I_{B2}=-15mA$			225
Fall time	t_f	ns				30



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■TR2 NPN Pin1、2、6 Maximum Ratings (Ta=25°C Unless otherwise specified)

Item	Symbol	Unit	Conditions	Value
Collector-Base Voltage	V_{CBO}	V	$I_C=100\mu A, I_E=0$	60
Collector-Emitter Voltage	V_{CEO}	V	$I_C=1mA, I_B=0$	40
Emitter-Base Voltage	V_{EBO}	V	$I_E=100\mu A, I_C=0$	6
Collector Current -Continuous	I_C	mA		200
Total Device Dissipation	P_C	mW		200
Junction Temperature	T_j	°C		150
Storage Temperature	T_{STG}	°C		-55 to +150

■TR2 NPN Pin1、2、6 Electrical Characteristics (Ta=25°C unless otherwise specified)

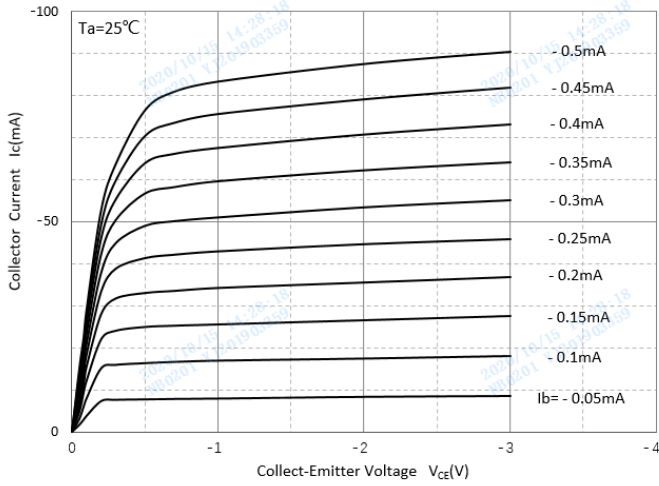
Item	Symbol	Unit	Conditions	Min	TYP	Max
Collector-base breakdown voltage	V_{CBO}	V	$I_C=100\mu A, I_E=0$	60		
Collector-emitter breakdown voltage	V_{CEO}	V	$I_C=1mA, I_B=0$	40		
Emitter-base breakdown voltage	V_{EBO}	V	$I_E=100\mu A, I_C=0$	6		
Collector cut-off current	I_{CBO}	nA	$V_{CB}=50V, I_E=0$			100
Emmitter cut-off current	I_{EBO}	nA	$V_{EB}=5V, I_C=0$			100
DC current gain	h_{FE}		$V_{CE}=1V, I_C=0.1mA$	20		
	h_{FE}		$V_{CE}=1V, I_C=1mA$	40		
	h_{FE}		$V_{CE}=1V, I_C=10mA$	80		
	h_{FE}		$V_{CE}=1V, I_C=150mA$	100		300
	h_{FE}		$V_{CE}=2V, I_C=500mA$	40		
Collector-emitter saturation voltage	$V_{CE(sat)}$	V	$I_C=150mA, I_B=15mA$			0.4
Collector-emitter saturation voltage	$V_{CE(sat)}$	V	$I_C=500mA, I_B=50mA$			0.75
Base-emitter saturation voltage	$V_{BE(sat)}$	V	$I_C=150mA, I_B=15mA$			0.95
Base-emitter saturation voltage	$V_{BE(sat)}$	V	$I_C=500mA, I_B=50mA$			1.2
Transition frequency	f_T	MHz	$V_{CE}=10V, I_C=20mA, f=100MHz$	250		
Delay time	t_d	ns	$V_{CC}=30V, I_C=150mA,$ $V_{BE}=2V, I_{B1}=15mA$			15
Rise time	t_r	ns				20
Storage time	t_s	ns				225
Fall time	t_f	ns				30



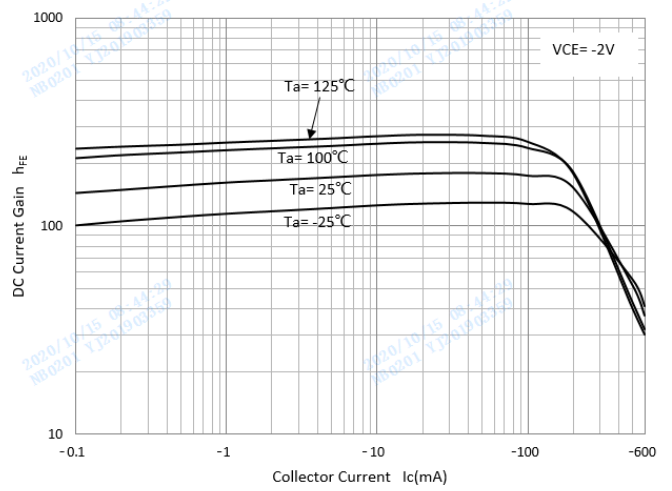
MMDT4413

■ TR1 PNP Pin3、4、5 Characteristics (Typical)

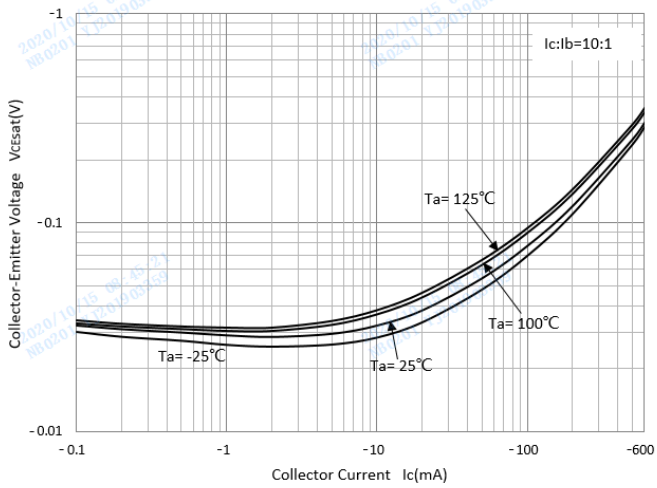
Static Characteristic



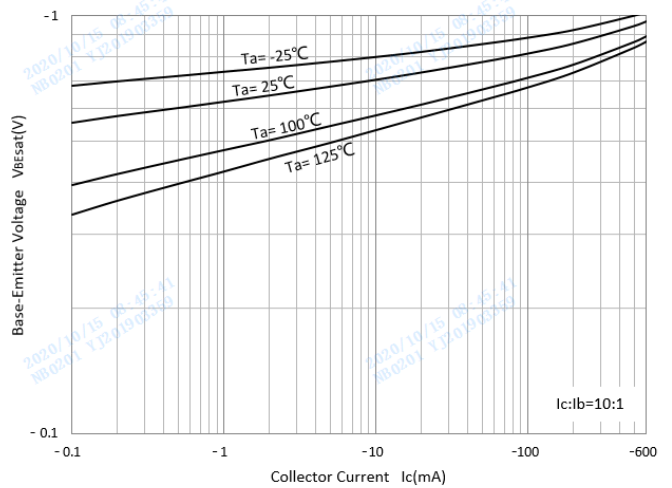
DC Current Gain



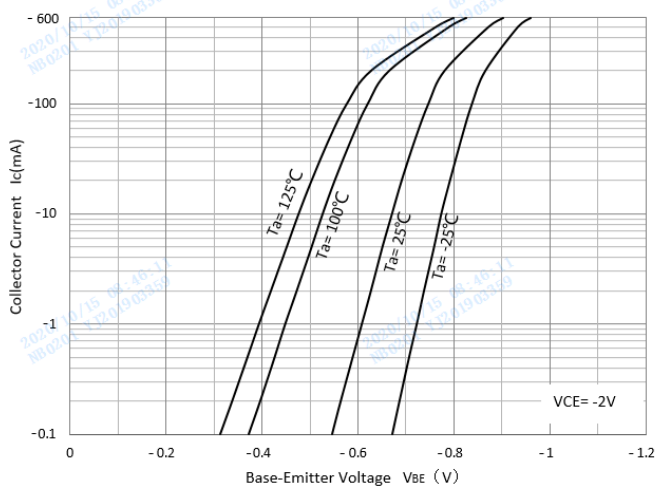
Collector-Emitter Saturation Voltage



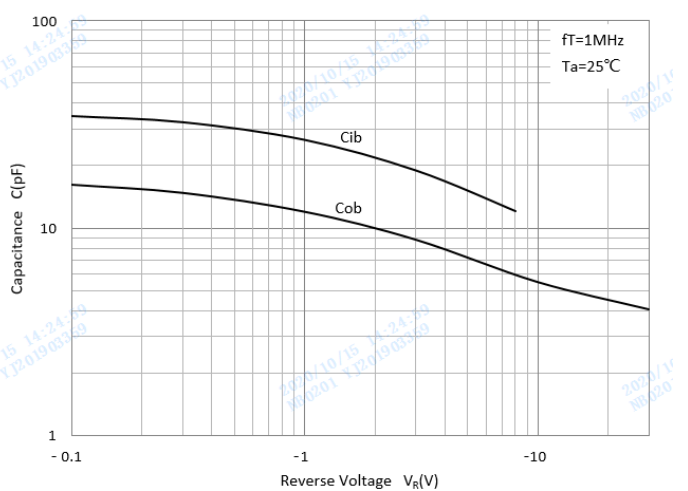
Base-Emitter Saturation Voltage



Base-Emitter On Voltage



$C_{ob}/C_{ib}-V_{CB}/V_{EB}$

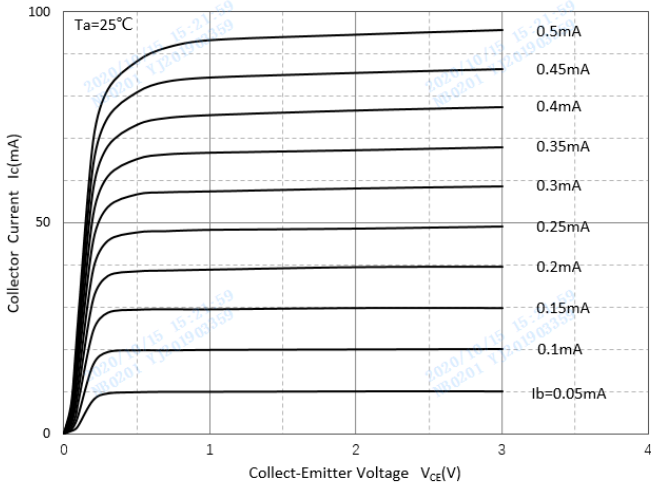




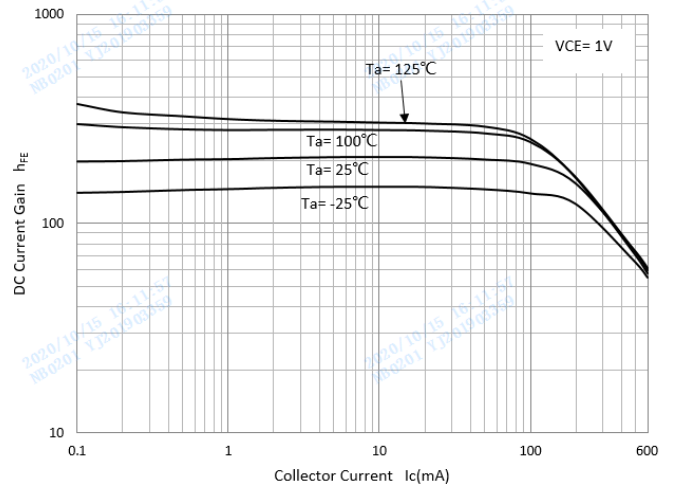
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■ TR2 NPN Pin1、2、6 Characteristics (Typical)

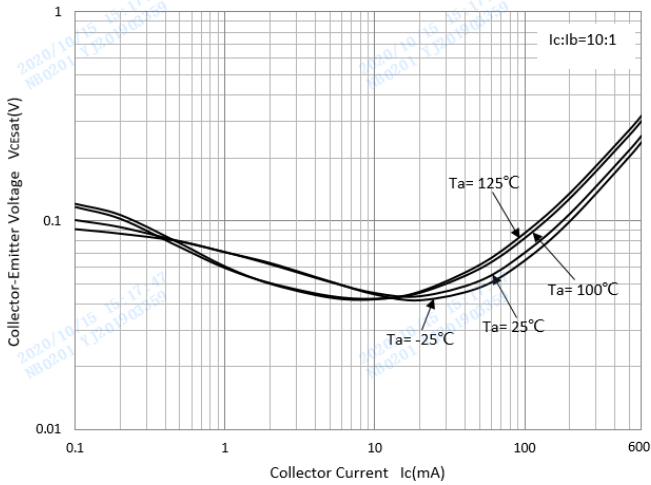
Static Characteristic



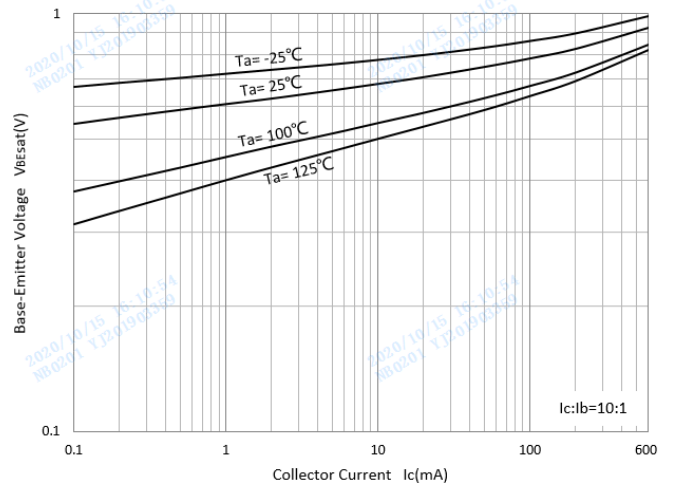
DC Current Gain



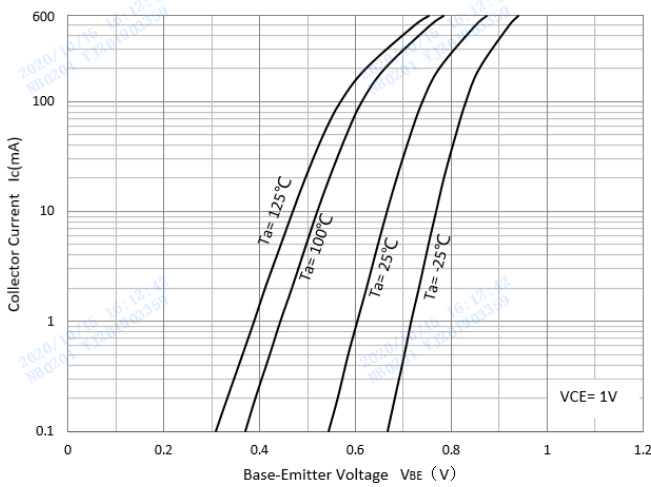
Collector-Emitter Saturation Voltage



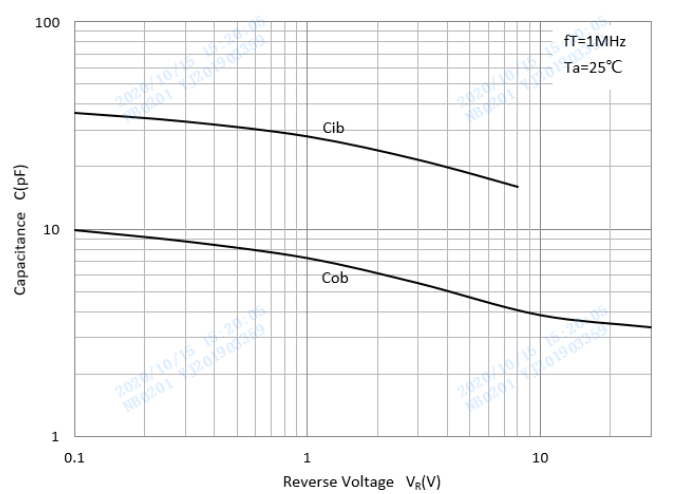
Base-Emitter Saturation Voltage



Base-Emitter On Voltage



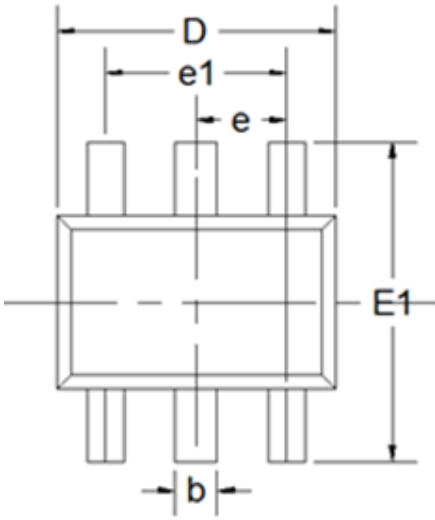
$C_{ob}/C_{ib}-V_{CB}/V_{EB}$



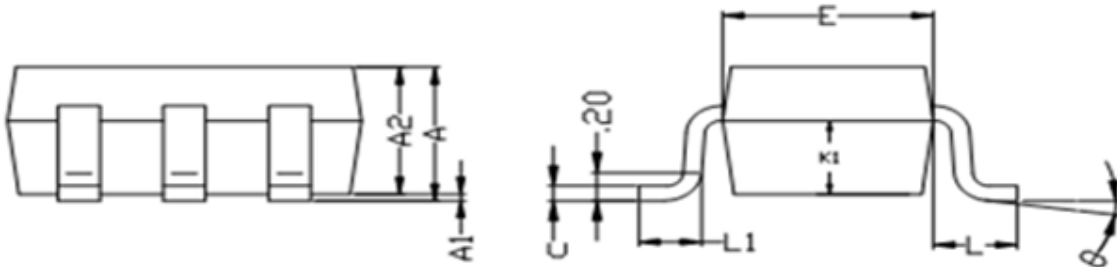


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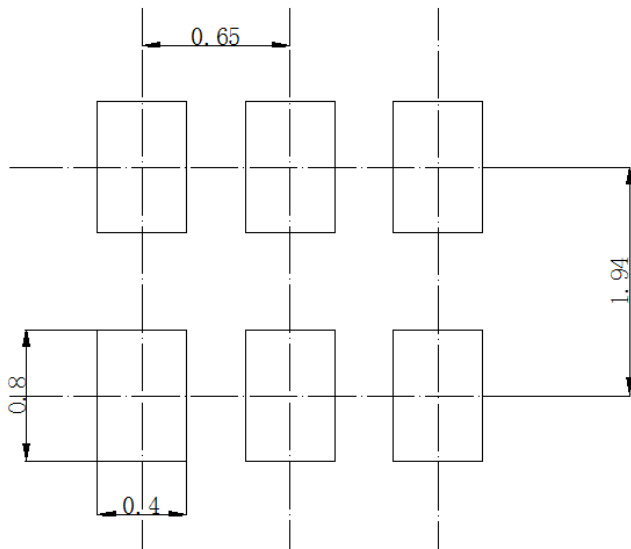
■SOT-363 Package Outline Dimensions



DIM	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.035	0.043	0.9	1.1
A1	0	0.004	0	0.1
A2	0.035	0.039	0.9	1
b	0.006	0.014	0.15	0.35
c	0.002	0.01	0.05	0.25
D	0.071	0.087	1.8	2.2
E	0.045	0.053	1.15	1.35
E1	0.085	0.096	2.15	2.45
e	0.026Typ		0.65Typ	
e1	0.047	0.055	1.2	1.4
L	0.021Typ		0.525Typ	
L1	0.01	0.018	0.26	0.46
φ	0°	8°	0°	8°



■SOT-363 Soldering Footprint



Unit: mm



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