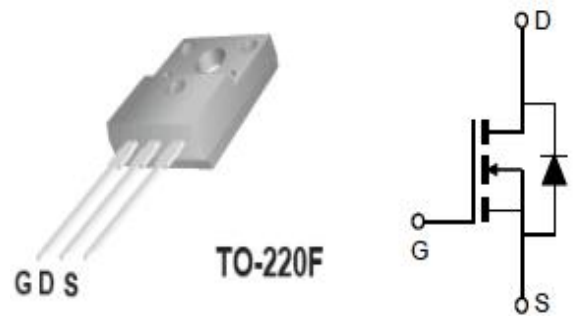


500V N-Channel MOSFET

Features

- $V_{DS}=500V$ $I_D=23A$
- $R_{DS(ON)}=0.21\Omega$ (Typ.)@ $V_{GS}=10V, I_D=11.5V$
- Low On-Resistance
- Improved dv/dt capability
- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Fast switching speed

PIN DESCRIPTION



Applications

- High frequency switching mode power supply
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Part Number	Package	Marking	ROHS Status	Packing
SI23N50F	TO-220F	SI23N50F	Lead free	Box(Tube)

Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Value	Unit	
V_{DS}	Drain-Source Voltage	500	V	
V_{GS}	Gate-Source Voltage	± 30	V	
I_D	Continuous Drain Current	$T_c=25^\circ C$	23	A
		$T_c=100^\circ C$	15	A
I_{DM}	Pulsed Drain Current	88	A	
E_{AS}	Single Pulse Avalanche Energy	1400	mJ	
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ C$	
P_D	Total Power Dissipation	$T_c=25^\circ C$	50	W

THERMAL RESISTANCE RATINGS

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient	-	65	$^\circ C/W$
$R_{\theta JC}$	Maximum Junction-to-Case	-	3.2	

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	TYP.	Max.	Unit
Static Characteristics						
$V_{(BRV)DSS}$	Drain-source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	500	-	-	V
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3	-	4	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=500V, V_{GS}=0V$	-	-	1	μA
		$V_{DS}=400V, V_{GS}=0V,$	-	-	10	μA
I_{GSS}	Gate-source leakage current	$V_{DS}=0V, V_{GS}=\pm 30V$	-	-	± 100	nA
$R_{DS(on)}$	Drain-source on-state resistance	$V_{GS}=10V, I_D=11.5A$	-	0.21	0.26	Ω
g_{FS}	Forward Transconductance	$V_{DS}=30V, I_D=5.5A$	-	25	-	S
Dynamic Characteristic						
Qg	Total Gate Charge	$V_{GS}=10V, V_{DD}=400V$ $I_D=23A$	-	69	-	nC
Qgs	Gate-Source Charge		-	22	-	nC
Qgd	Gate-Drain Charge		-	24	-	nC
$T_{d(on)}$	Turn-on delay time	$I_D=23A, V_{DD}=250V,$ $R_G=25\Omega, V_{GS}=10V$	-	60	-	nS
T_r	Rise time		-	122	-	nS
$T_{d(off)}$	Turn-off delay time		-	124	-	nS
T_f	Fall time		-	77	-	nS
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V$ $f=1.0MHz$	-	3086	-	pF
C_{oss}	Output Capacitance		-	290	-	pF
C_{rss}	Reverse Transfer Capacitance		-	24	-	pF
Source-Drain Diode						
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=1A$	-	-	1	V
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	88	A
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	23	A
T_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_F=23A,$ $diF/dt=100A/\mu s$	-	524	-	ns
Q_{rr}	Reverse Recovery Charge		-	9.6	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $L=60mH, I_{AS}=7A, V_{DD}=150V, R_G=25\Omega,$ Starting $T_J=25^\circ\text{C}$.
3. Pulse Test: Pulse width $\leq 300\mu s,$ Duty Cycle $\leq 2\%$.
4. $I_{SD} \leq 11A, di/dt \leq 200A/\mu s, V_{DD} \leq B_{VDSS},$ Starting $T_J = 25^\circ\text{C}$.

Typical Performance Characteristics

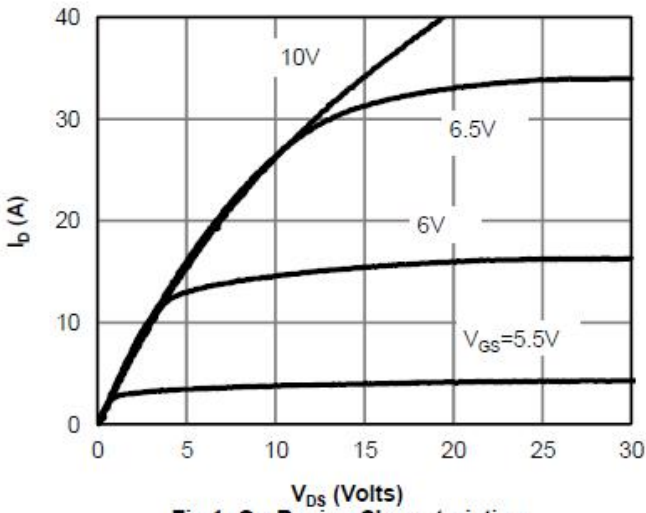


Fig 1: On-Region Characteristics

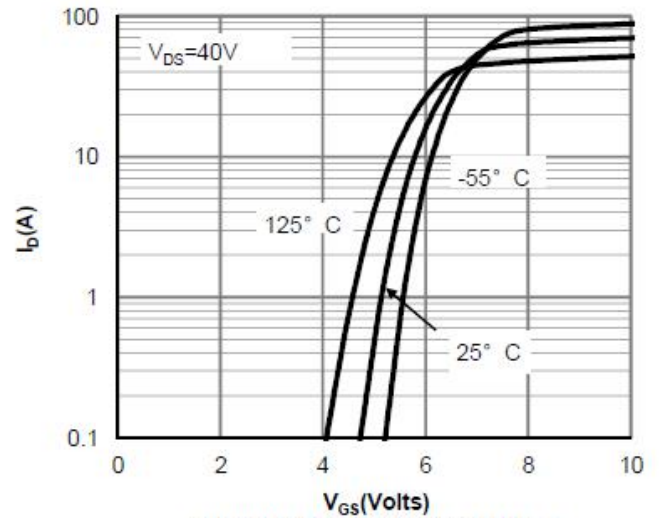


Figure 2: Transfer Characteristics

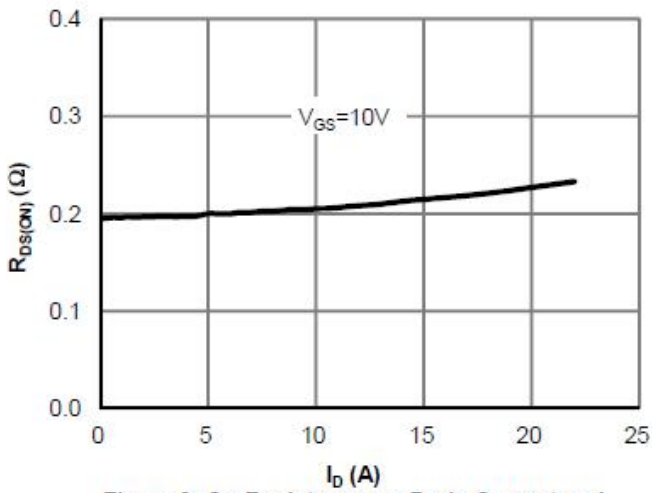


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

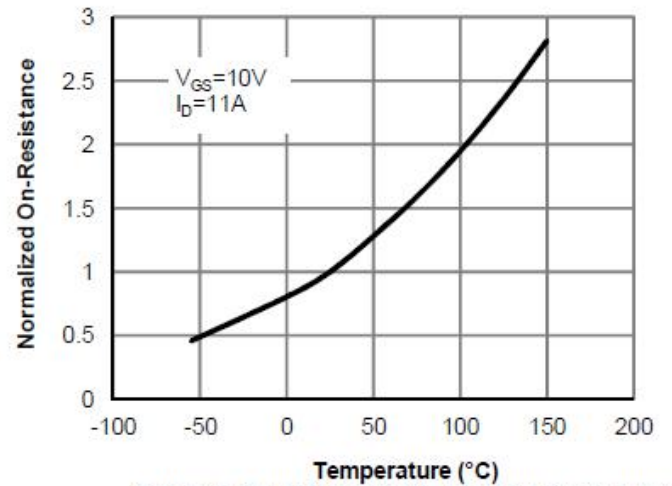


Figure 4: On-Resistance vs. Junction Temperature

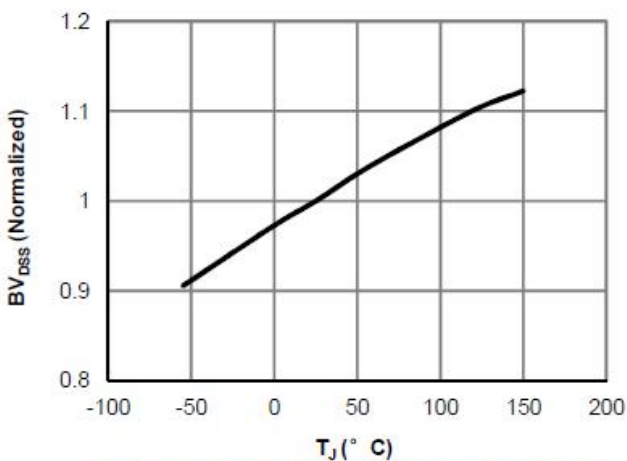


Figure 5: Break Down vs. Junction Temperature

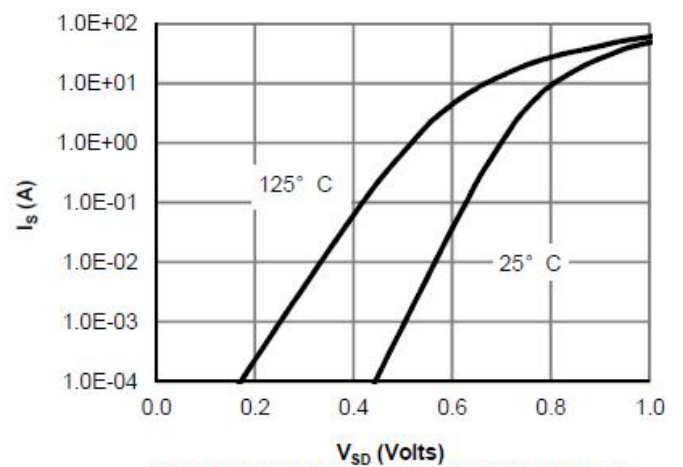


Figure 6: Body-Diode Characteristics (Note E)

Typical Performance Characteristics (Cont.)

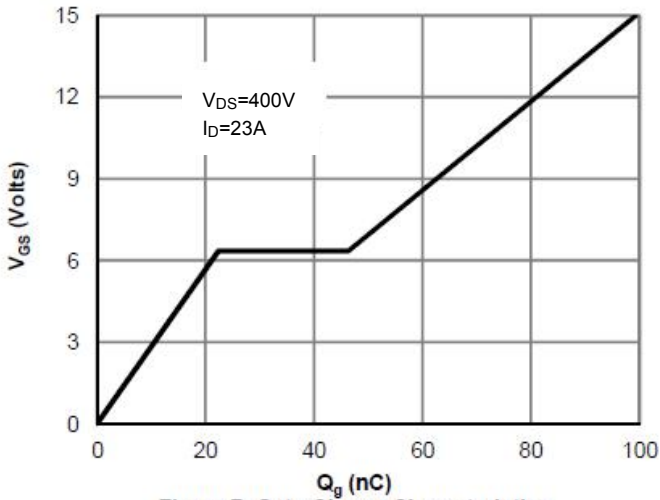


Figure 7: Gate-Charge Characteristics

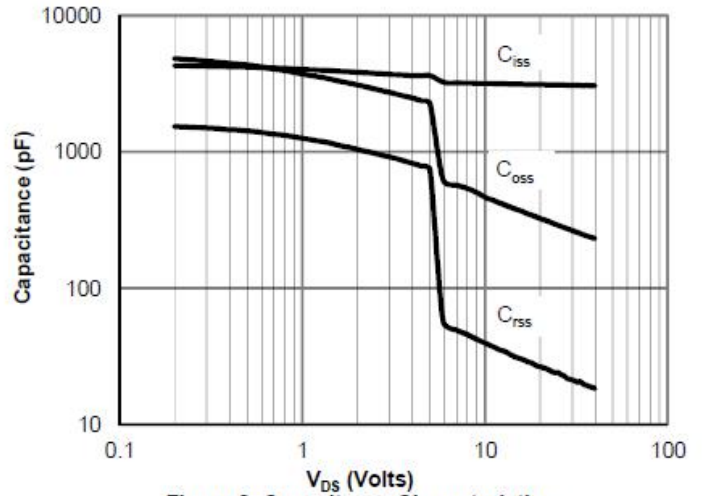


Figure 8: Capacitance Characteristics

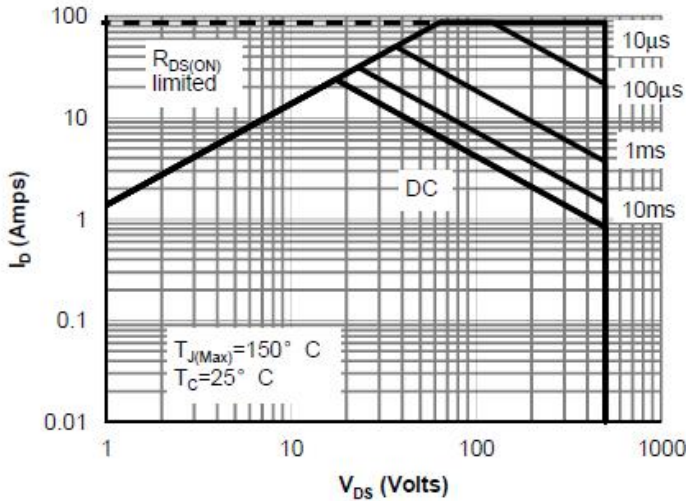


Figure 9: Maximum Forward Biased Safe Operating Area for AOT22N50 (Note F)

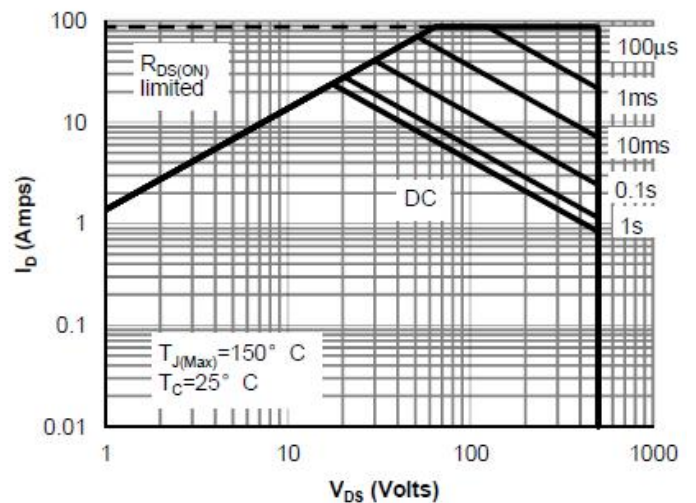


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF22N50 (Note F)

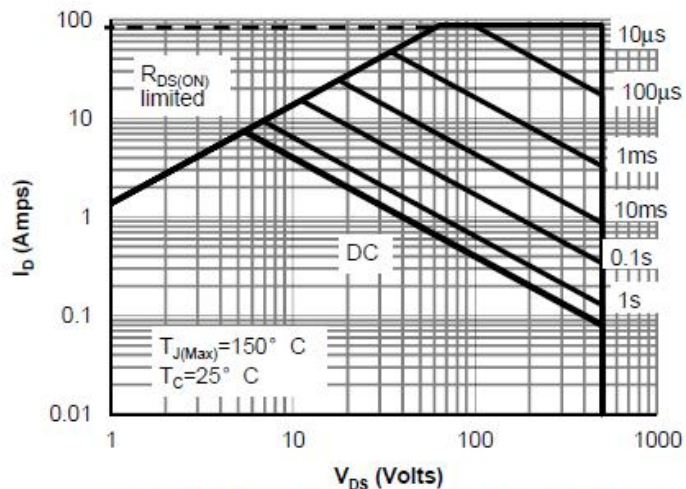


Figure 12: Maximum Forward Biased Safe Operating Area for AOTF22N50L (Note F)

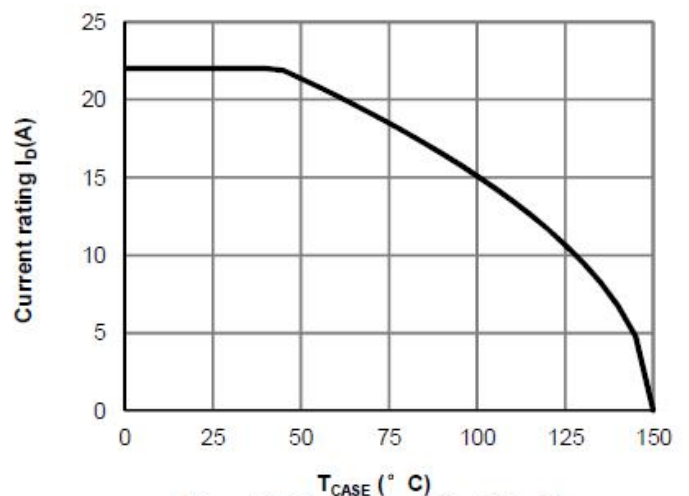
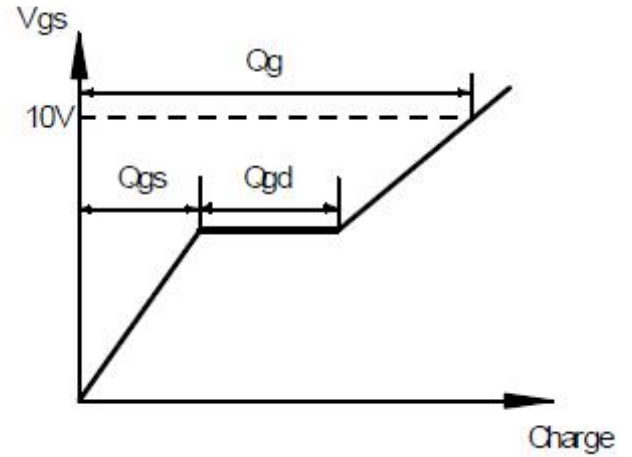
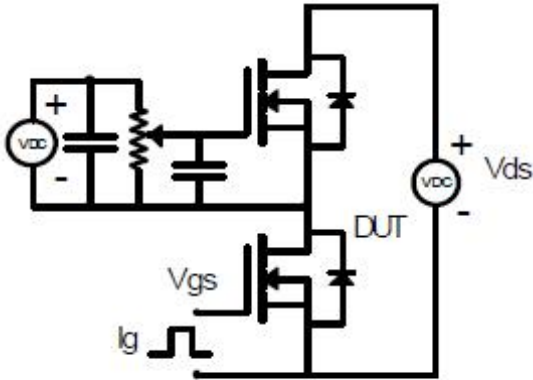


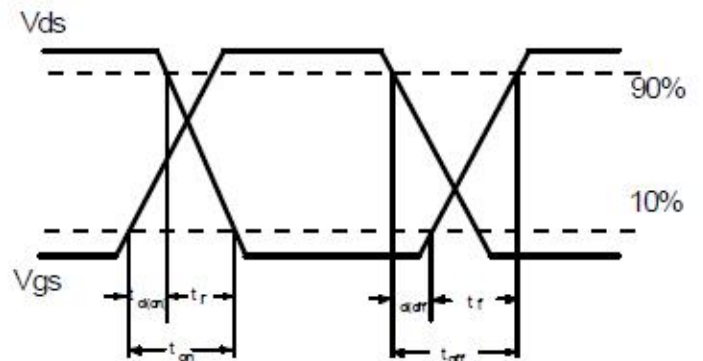
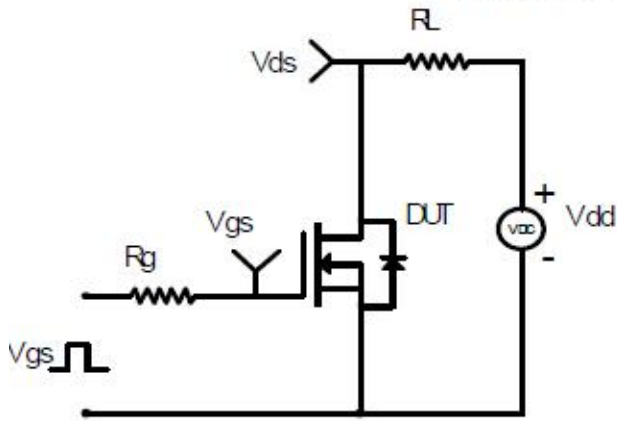
Figure 11: Current De-rating (Note B)

Switching Time Test Circuit and Wave forms

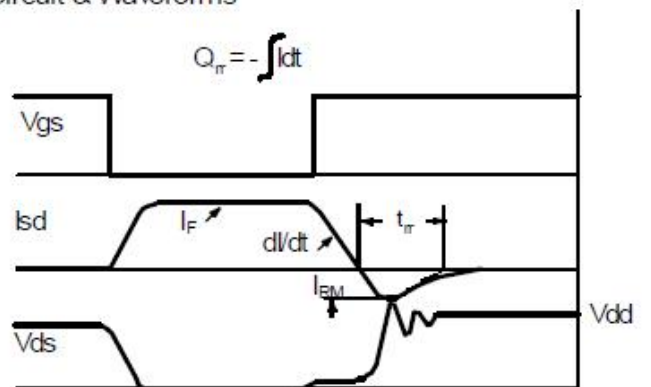
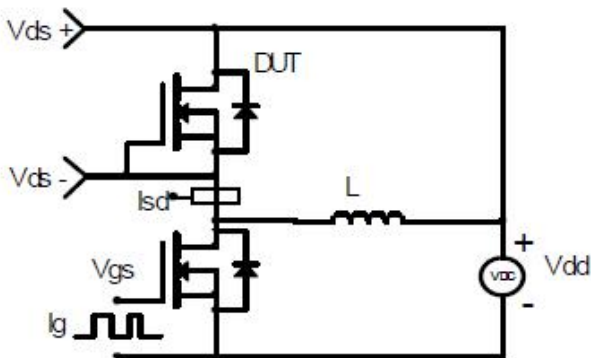
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

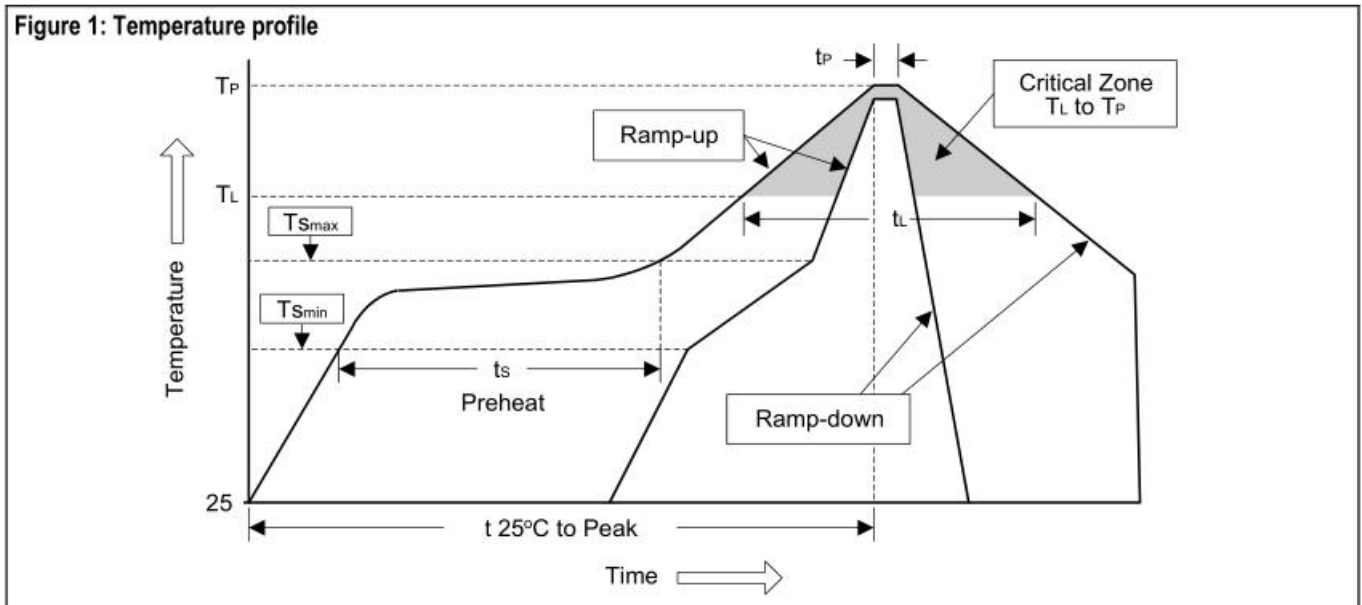


Diode Recovery Test Circuit & Waveforms



Soldering Methods for Products

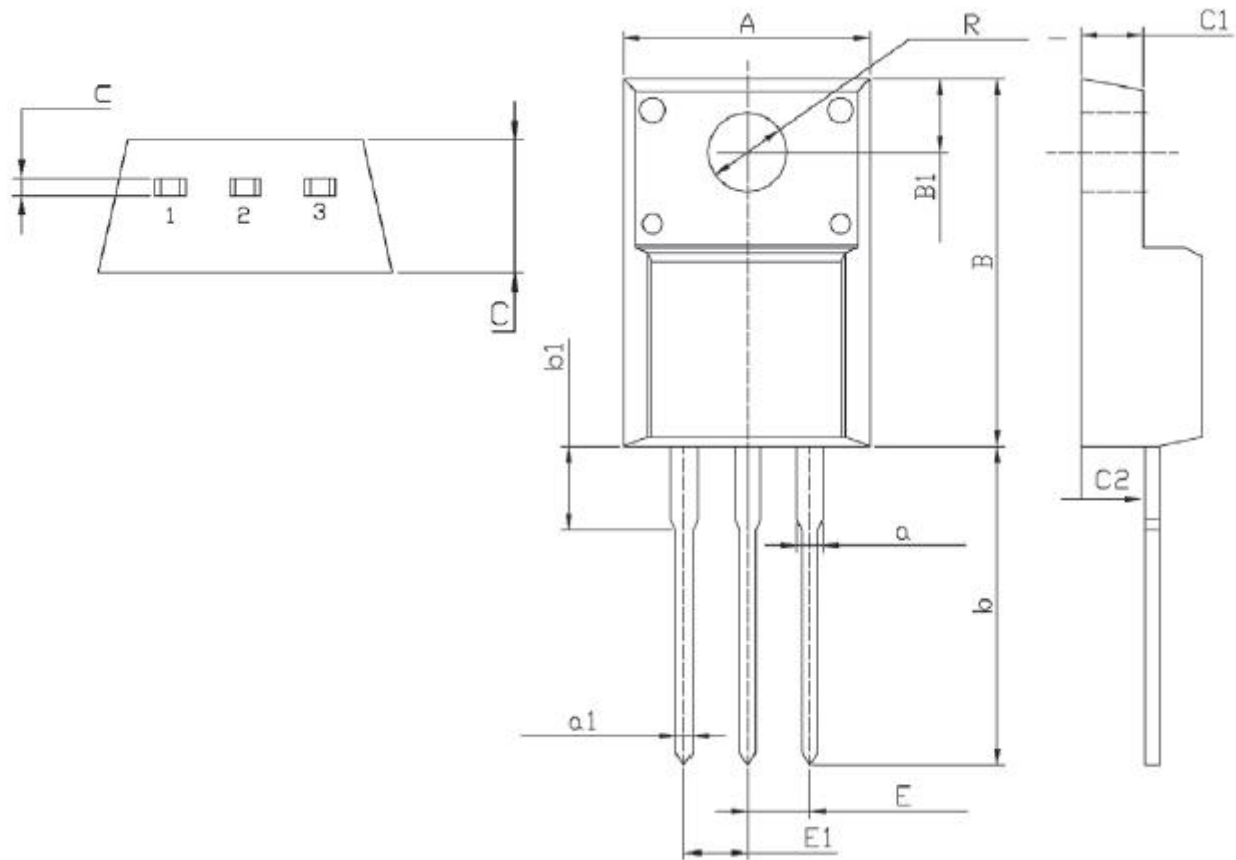
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(min to max)(ts)	- 100°C 150°C 60 to 120 sec	- 150°C 200°C 60 to 180 sec
Ts max to TL - ramp-up rate	<3°C/sec	<3°C/sec
Time maintained above: -Temperature(TL) -Time(TL)	183°C 60 to 150 sec	217°C 60 to 150 sec
Peak Temperature(TP)	240°C+0/-5°C	250°C+0/-5°C
Time within 5°C of actual Peak Temperature	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25 °C to Peak Temperature	<6 minutes	<8 minutes



- Note :**
- 1.Storage environment: Temperature=10°C to 35@Humidity=45%±15%
 - 2.Reflow soldering of surface-mount devices
 - 3.Flow(wave) soldering(solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices	245°C±5°C	5sec±1sec
Pb-free devices	250°C+0/-5°C	5sec±1sec

Package Outline



Millimeter					
Symbol	Min	Max	Symbol	Min	Max
C	4.5	4.9	b1	2.90	3.90
c	0.4	0.6	a	1.08	1.48
A	9.96	10.36	a1	0.70	0.90
B	15.67	16.07	E	2.34	2.74
B1	3.30	3.50	E1	2.34	2.74
R	3.08	3.28	C1	2.34	2.74
b	12.48	13.48	C2	2.56	2.96

■ Important Notice

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Any semiconductor under specific conditions are possible to certain failure or malfunction rate ; Customers are responsible in the use of Si-Trend products to system design and manufacturing in compliance with safety standards and adopting safety measures , To avoid the potential risk of failure may cause the personal safety and property loss ◦

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■ Modify record

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20170215	A.0	original	8