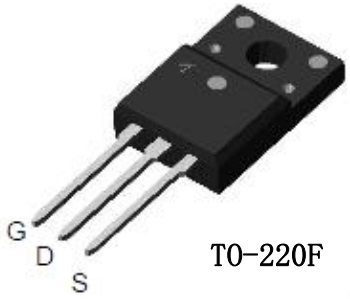
500V N-Channel MOSFET

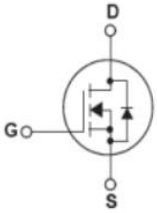
Features

- V_{DSS}=500V I_D=13A
  $R_{DS(ON)}$=0.5Ω(Max.)@V_{GS}=10V
- High Reliability Capability with Passivation
- 100% avalanche tested
- RoHS compliant
- Smart design in high voltage technology.

PIN DESCRIPTION



TO-220F



Applications

- LED power supplies
- Cell Phone Charger
- Standby Power

Part Number	Package	Marking	ROHS Status	Packing
SI13N50F	TO-220F	SI13N50F	Pb-Free	Box (Tube)

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Symbol	Parameter		Typical	Unit
V_{DSS}	Drain-Source Voltage		500	V
V_{GSS}	Gate-Source Voltage		±30	V
I_D	Drain Current	TC=25℃	13	A
		TC=100℃	6.5	A
I_{DM}	Pulsed Drain Current		50	A
P_D	Power Dissipation (TC = 25ºC)		42	W
I_{AR}	Avalanche Current		5.5	A
E_{AS}	Single Pulse Avalanche Energy		904	mJ
E_{AR}	Repetitive Avalanche Energy		454	mJ
T_J , T_{stg}	Operating Junction and Storage Temperature Range		-55 to 150	℃

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case.	RθJC	2.5	℃/W
Thermal resistance, junction – ambient.	RθJA	62	

Electrical Characteristics (T_A=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	TYP	Max	Unit
Static Characteristics						
BV_{DSS}	Drain-source breakdown voltage	V_{GS}=0V, I_D=250uA	500	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=500V,V_{GS}=0V	-	-	1	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±30V,V_{DS}=0V	-	-	±100	nA
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	2	-	4	V
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS}=10V, I_D=6.5A	-	-	0.5	Ω
g_{fs}	Forward Transconductance	V_{DS}=40V, I_D=6.5A	-	13	-	S
Dynamic Characteristic						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	1361	-	pF
C_{oss}	Output Capacitance		-	167	-	
C_{rss}	Reverse Transfer Capacitance		-	12.6	-	
Q_G	Gate Total Charge	V_{DS}=400V, I_D=13A, V_{GS}=10V,	-	30.7	-	nC
Q_{gs}	Gate-Source charge		-	7.6	-	
Q_{gd}	Gate-Drain charge		-	13	-	
$t_{d(on)}$	Turn-on delay time	V_{DD}=250V,I_D=13A, R_G=25Ω,V_{GS}=10V	-	29	-	nS
t_r	Rise time		-	69	-	
$t_{d(off)}$	Turn-off delay time		-	82	-	
t_f	Fall time		-	55	-	
Drain-Source Body Diode Characteristics						
V_{SD}	Body Diode Forward Voltage	V_{GS}=0V,I_F=1A	-	-	1.4	V
t_{rr}	Body Diode Reverse Recovery Time	V_R =100V, I_F =13A , dI_F /d_t =100A/μs	-	-	550	nS
Q_{rr}	Body Diode Reverse Recovery Charge		-	4.5	-	nC
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	13	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	48	A

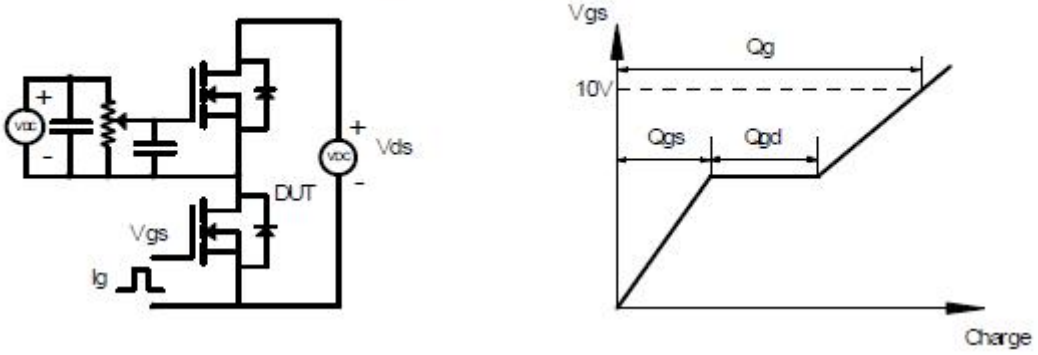
Note:

1.The value of R θJA is measured with the device in a still air environment with T A =25°C.

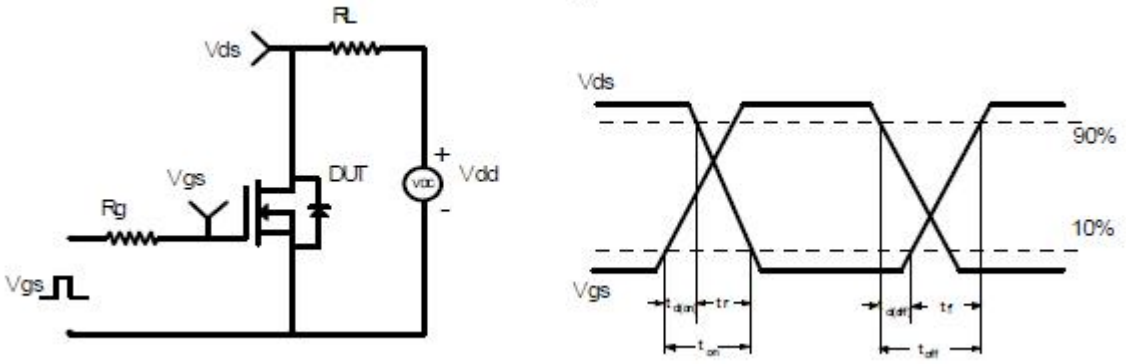
2.The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 2% max

Switching Time Test Circuit and Wave forms

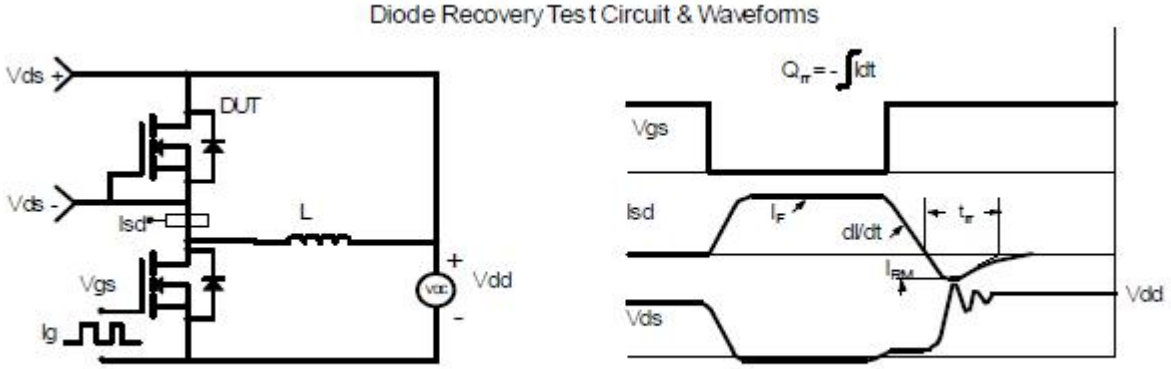
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

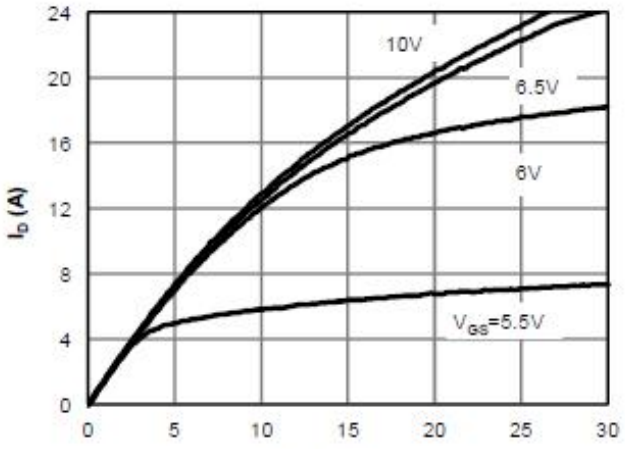


Fig 1: On-Region Characteristics

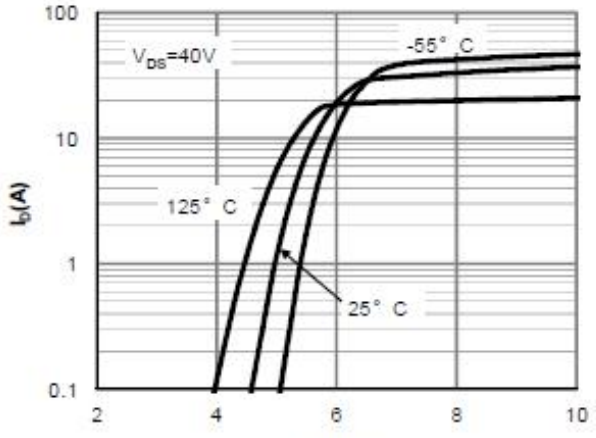


Figure 2: Transfer Characteristics

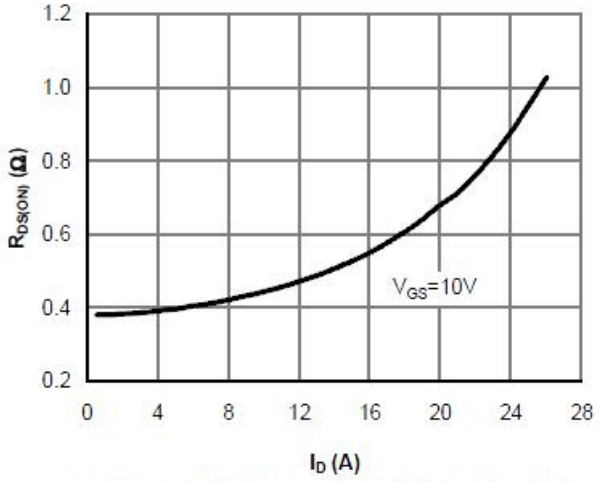


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

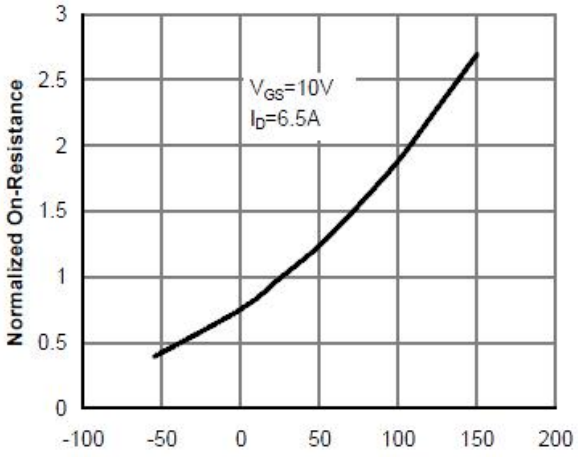


Figure 4: On-Resistance vs. Junction Temperature

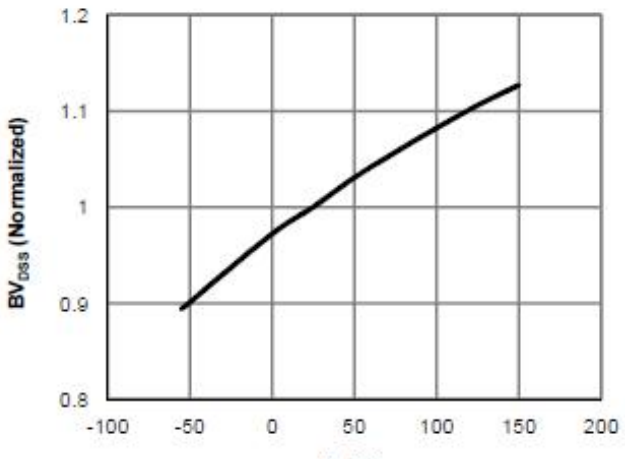


Figure 5: Break Down vs. Junction Temperature

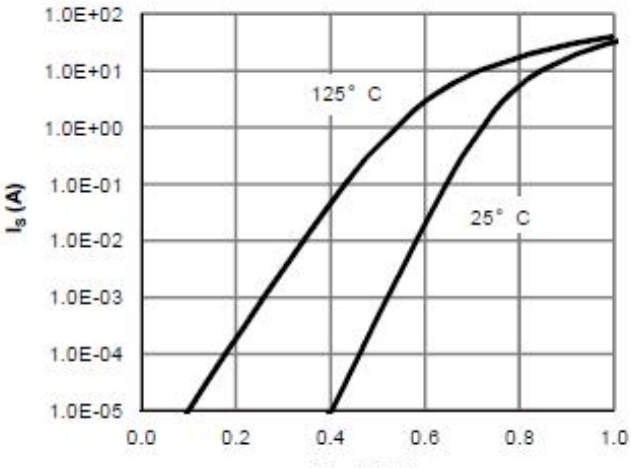
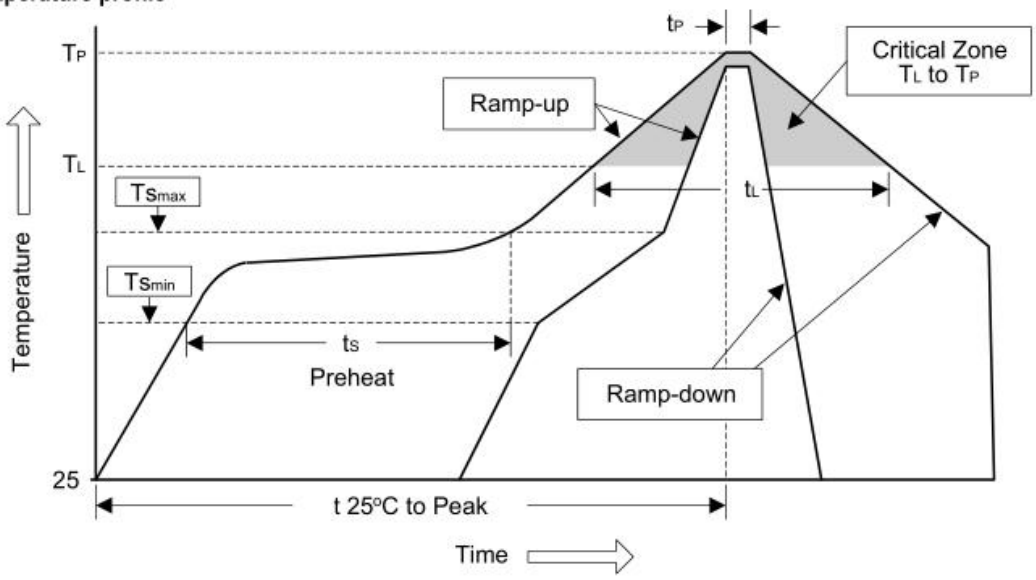


Figure 6: Body-Diode Characteristics (Note E)

Soldering Methods for Products

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

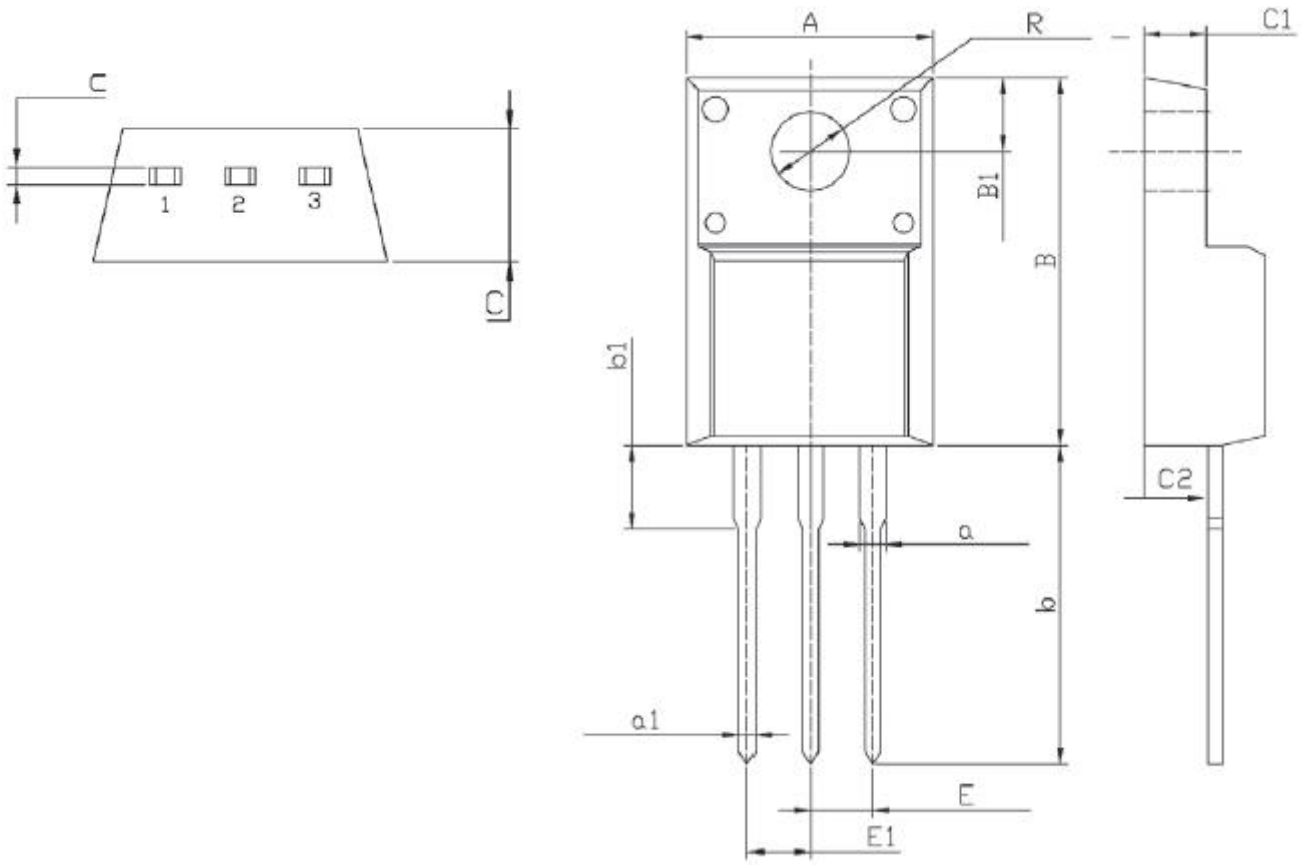
Figure 1: Temperature profile



Note :1.Storage environment: Temperature=10℃ 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℃±5℃	5sec±1sec
Pb-free devices	250℃+0/-5℃	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

Si-Trend reserves the right to change all product、product specifications and data without prior notice； Our customer Please confirm to place an order confirmation before make the integrity of information complete and up-to-date。

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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