

400V N-Channel MOSFET

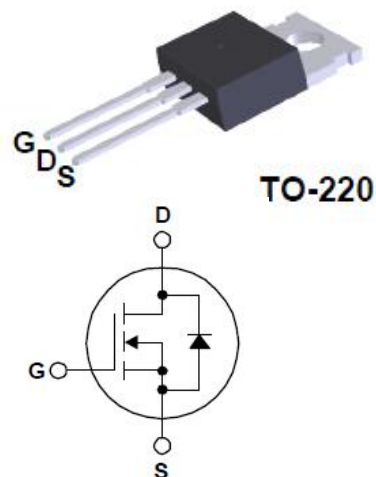
Features

- $V_{DSS}=400V / I_D=15A$
- $R_{DS(On)}=0.24\Omega(Typ.)@V_{GS}=10V$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

PIN DESCRIPTION



Part Number	Package	Marking	ROHS Status	Packing
SI15N40B	TO-220	SI15N40B	Pb-Free	Tube&Box

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

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	400	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current-Continuous	15	A
I_{DM}	Drain Current-Pulsed <small>NOTE 1</small>	60	A
E_{AS}	Single Pulse Avalanche Energy	472	mJ
I_{AS}	Avalanche Current	9.5	A
E_{AR}	Repetitive Avalanche Energy	283	mJ
P_D	Maximum Power Dissipation	$T_C=25^\circ C$ 65	W
T_J	Operating Junction Temperature	-55 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$

Thermal Resistance Ratings

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	60	K/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.89	K/W

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

Symbol	Parameter	Test Conditions	Min	TYP	Max	Unit
Static Characteristics						
BV_{DSS}	Drain-source breakdown voltage	$V_{GS}=0V, I_{DS}=250\mu A$	400	-	-	V
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	3	-	4	V
I_{DSS}	Zero gate voltage drain current	$V_{DS}=400V, V_{GS}=0V$	-	-	1	μA
I_{GSS}	Gate-source leakage current	$V_{GS}=\pm 30V$	-	-	± 100	nA
$R_{DS(on)}$	Drain-source on-state resistance	$V_{GS}=10V, I_{DS}=7.5A$	-	0.24	0.3	Ω
Dynamic Characteristic						
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V, f=1MHz$	-	1900	-	pF
C_{oss}	Output Capacitance		-	227	-	pF
C_{rss}	Reverse Transfer Capacitance		-	26	-	PF
Switching Characteristics						
Q_g	Total Gate Charge at 4.5V	$V_{GS}=10V, V_{DD}=320V, I_D=15A$	-	55	-	nC
Q_{gs}	Gate-Source charge		-	9.1	-	nC
Q_{gd}	Gate-Drain charge		-	26	-	nC
$T_{d(on)}$	Turn-on delay time	$V_{DS}=200V, R_G=25\Omega, I_D=15A$	-	46	-	ns
t_r	Rise time		-	36	-	ns
$T_{d(off)}$	Turn-off delay time		-	224	-	ns
t_f	Fall time		-	60	-	ns
Diode Characteristic						
I_S	Continuous Body Diode Current	$T_C=25^\circ\text{C}$	-	-	15	A
I_{SM}	Pulsed Diode Forward Current		-	-	60	A
V_{SD}	Body Diode Voltage	$V_{GS}=0V, I_{SD}=7.5A$	-	-	1.4	V
t_{rr}	Reverse Recovery Time	$I_S=15A, T_J=25^\circ\text{C}$ $di/dt=100A/\mu s,$	-	285	-	nS
Q_{rr}	Reverse Recovery Charge		-	2.6	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 10mH, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$



Typical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

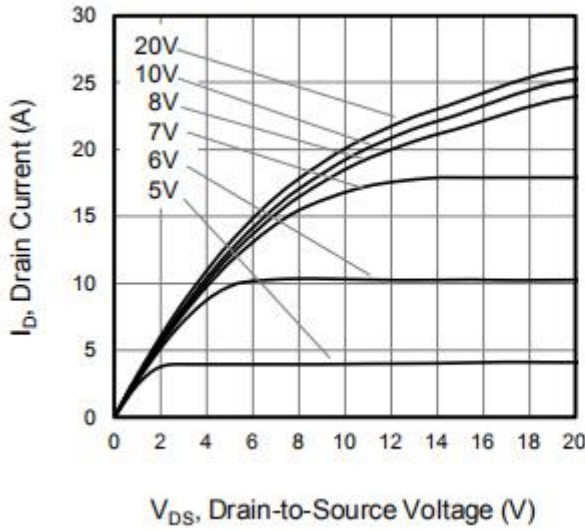


Figure 2. Body Diode Forward Voltage

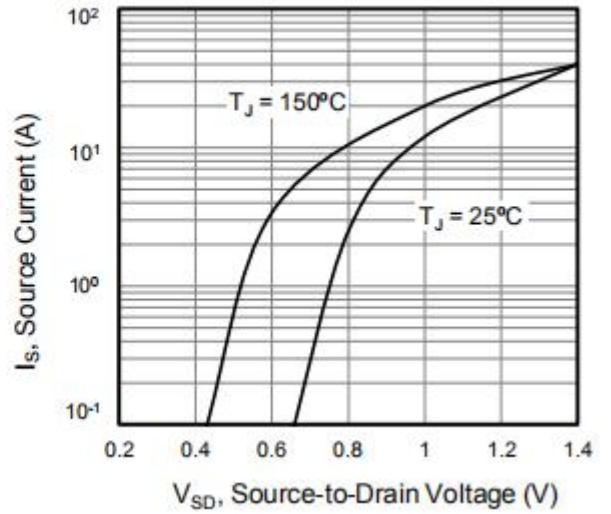


Figure 3. Drain Current vs. Temperature

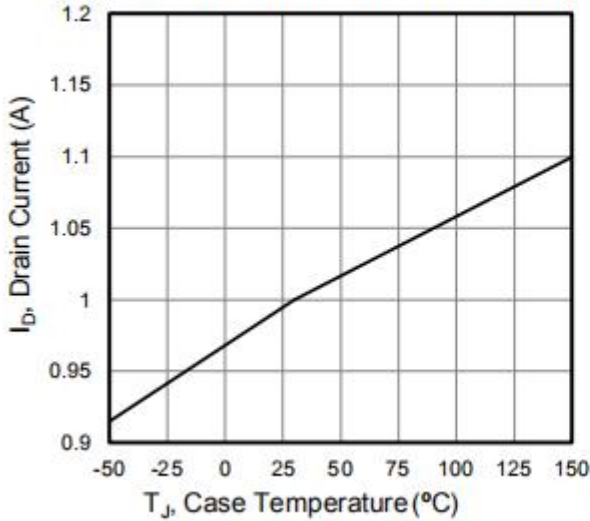


Figure 4. BV_{DSS} Variation vs. Temperature

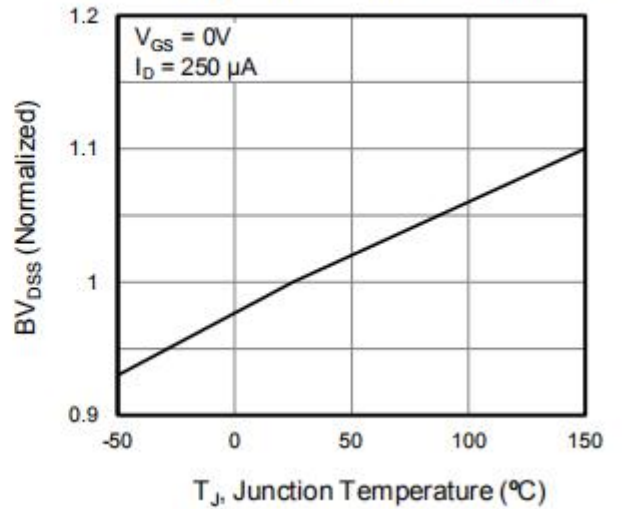


Figure 5. Transfer Characteristics

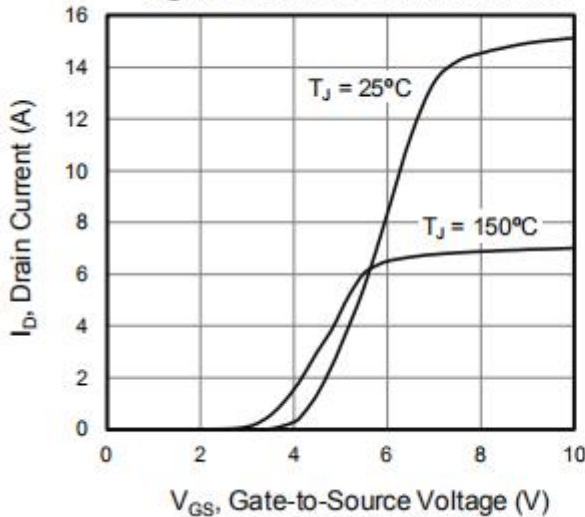
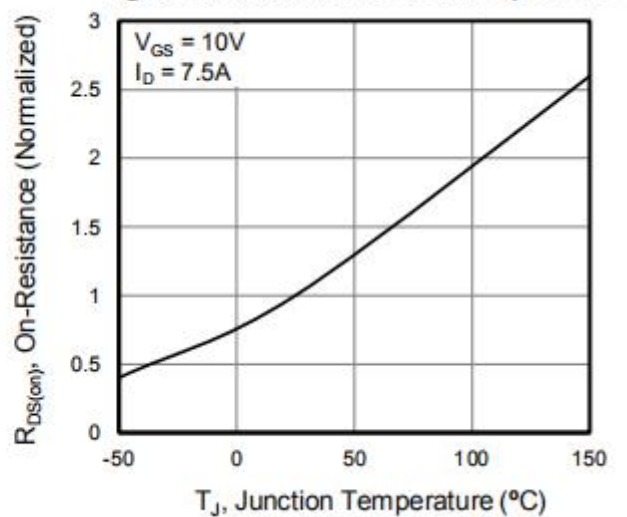
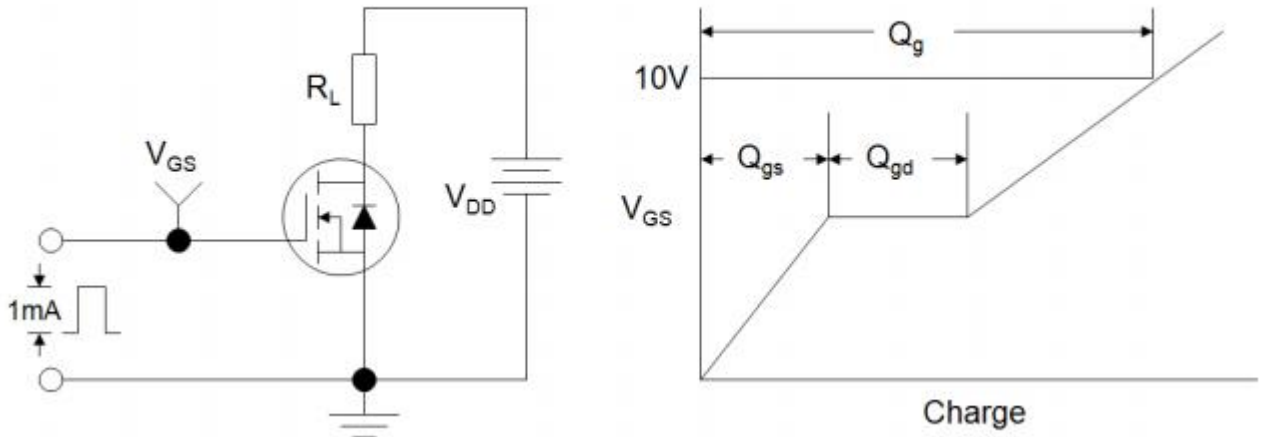
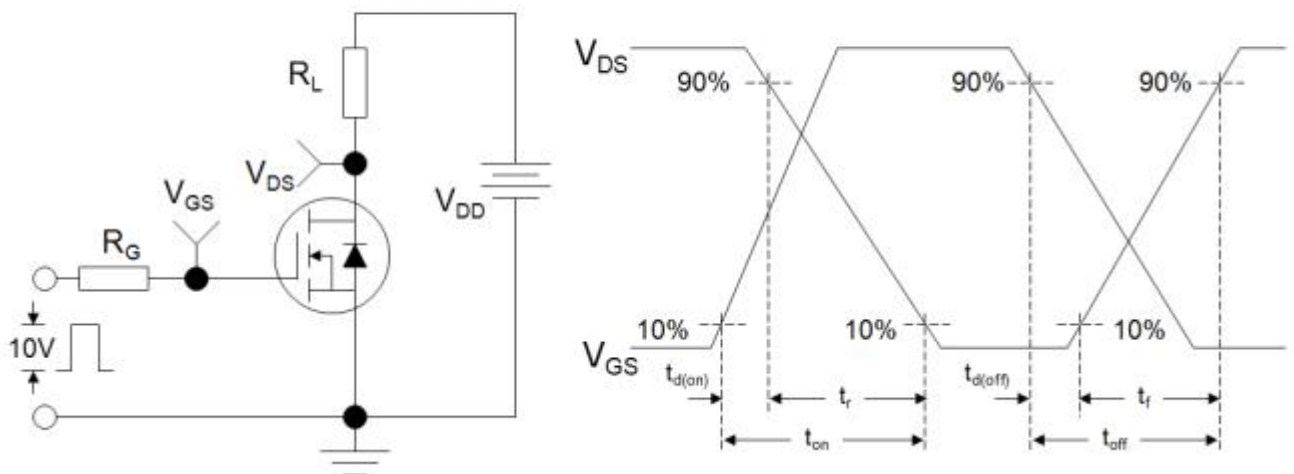
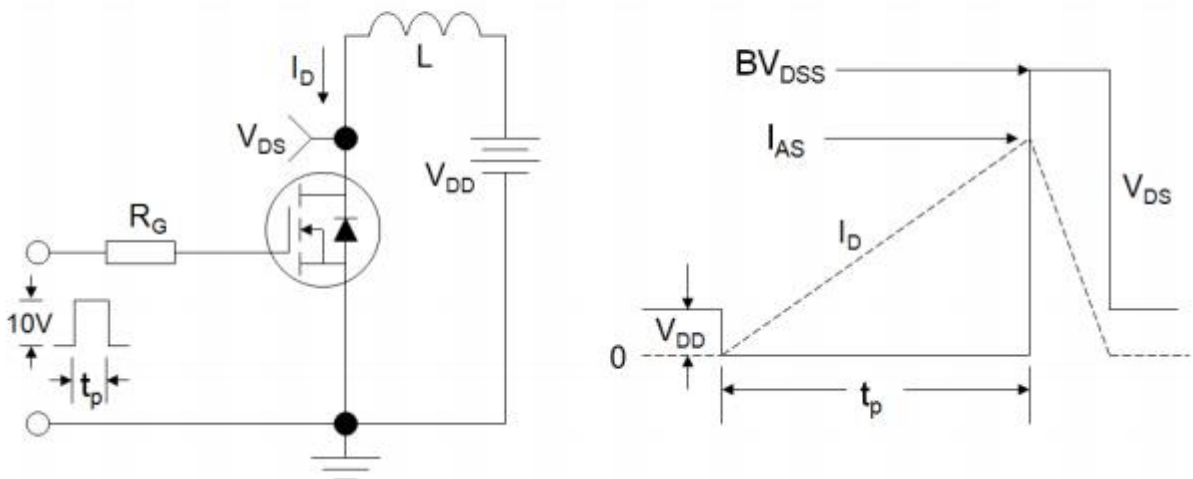


Figure 6. On-Resistance vs. Temperature

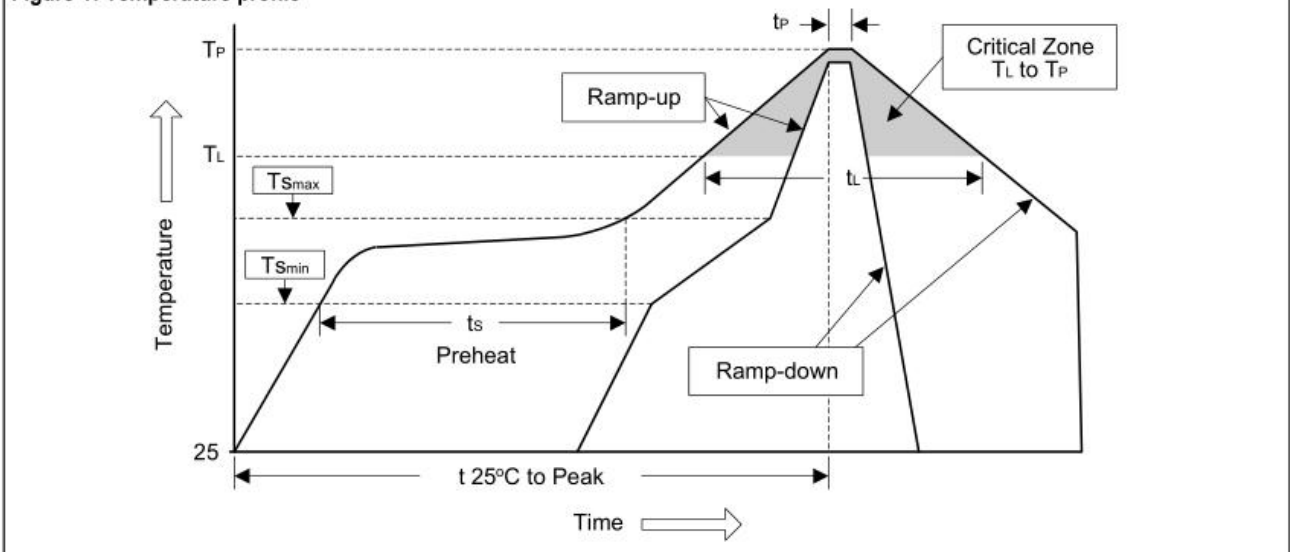


Typical Characteristics (Cont.)
Figure A: Gate Charge Test Circuit and Waveform

Figure B: Resistive Switching Test Circuit and Waveform

Figure C: Unclamped Inductive Switching Test Circuit and Waveform


Soldering Methods for Products

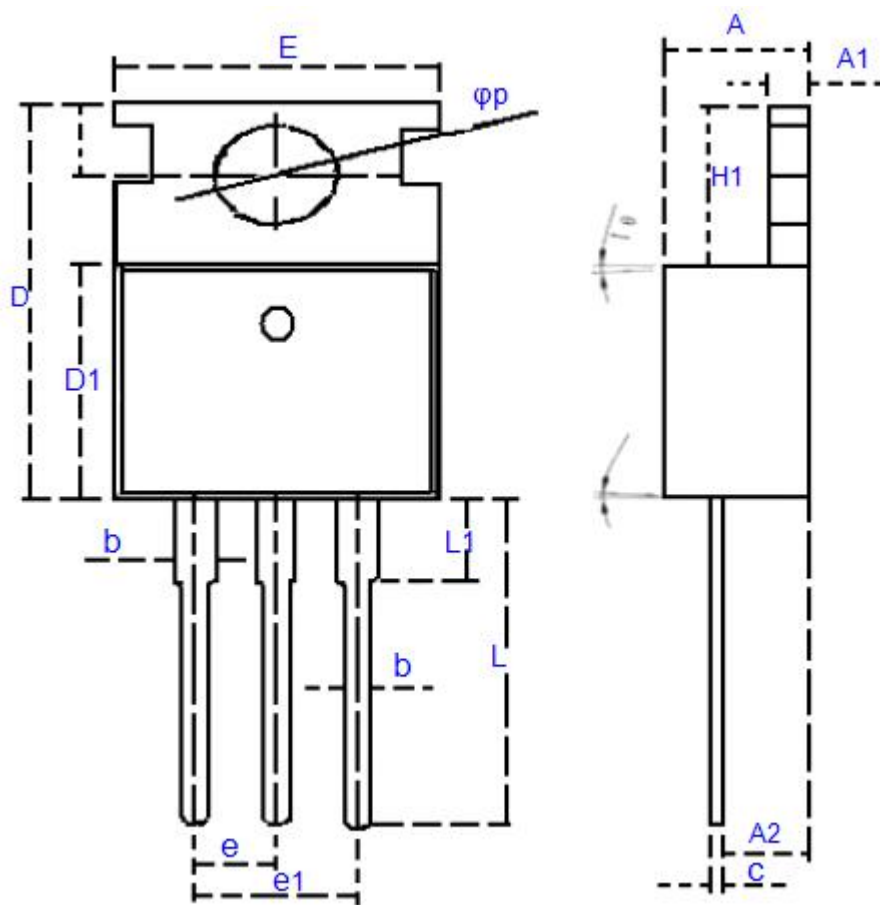
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp -up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(min to max)(ts)	- 100°C 150°C 60 to 120 sec	- 150°C 200°C 60 to 180 sec
Ts max to TL - ramp-up rate	<3°C/sec	<3°C/sec
Time maintained 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	260°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

Figure 1: Temperature profile



- 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	260°C+0/-5°C	5sec±1sec

Package Outline


Millimeters					
Symbol	Min	Max	Symbol	Min	Max
A	4.2	4.8	E	9.6	10.5
A1	1.28	1.34	e	2.54 Typ.	
A2	2.2	2.6	e1	5.08	5.18
b	0.69	0.91	H1	6.1	7.0
b1	1.17	1.37	L	12.9	13.5
c	0.42	0.51	L1	2.9	3.7
D	15.1	16.3	ΦP	3.4	3.8
D1	9.0	9.5	$\theta 1$ (°)	1	5

■ Important Notice

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■ Modify record

Date	Version	Description	Pagination
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