

650V N-Channel POWER MOSFET

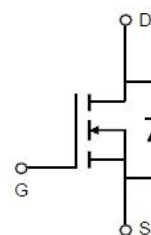
Features

- $V_{DSS}=650V$ $I_D=4A$
 $R_{DS(ON)}=2.8\Omega(\text{Max.})@V_{GS}=10V$
- High Reliability Capability with Passivation
- 100% avalanche tested
- RoHS compliant
- Low ON Resistance

Applications

- LED power supplies
- Cell Phone Charger
- Standby Power

PIN DESCRIPTION



Part Number	Package	Marking	ROHS Status	Packing
SI4N65A	TO-251	SI4N65A	Pb-Free	Box (Tube)

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

Symbol	Parameter	Typical	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current	4	A
	$T_C=25^\circ\text{C}$		
I_{DM}	Pulsed Drain Current	16	A
P_D	Power Dissipation (TC = 25°C)	30	W
I_{AR}	Avalanche Current	2.5	A
E_{AS}	Single Pulse Avalanche Energy	200	mJ
E_{AR}	Repetitive Avalanche Energy	116	mJ
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – Case.	$R_{\theta JC}$	4.17	$^\circ\text{C}/\text{W}$
Thermal resistance, junction – Ambient.	$R_{\theta JA}$	62	

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

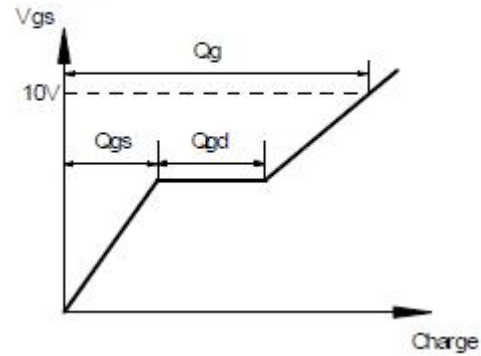
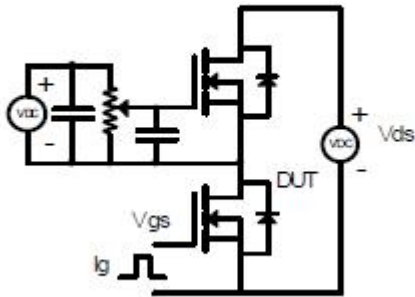
Symbol	Parameter	Test Conditions	Min	TYP	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-source breakdown voltage	V _{GS} =0V, I _D =250uA	650	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V	-	-	1	uA
I _{GSS}	Gate-Source Leakage	V _{GS} =±30V, V _{DS} =0V	-	-	± 100	nA
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 =2A	-	-	2.8	Ω
g _{fs}	Forward Transconductance	V _{DS} =15V, I _D =2A	-	3.5	-	S
Dynamic Characteristic						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	610	-	pF
C _{oss}	Output Capacitance		-	53	-	
C _{rss}	Reverse Transfer Capacitance		-	4	-	
Q _G	Gate Total Charge	V _{DS} =520V, I _D =4A, V _{GS} =10V,	-	15	-	nC
Q _{gs}	Gate-Source charge		-	3	-	
Q _{gd}	Gate-Drain charge		-	7	-	
t _{d(on)}	Turn-on delay time	V _{DD} =325V, I _D =4A, R _G =10Ω, V _{GS} =10V	-	14	-	nS
t _r	Rise time		-	16	-	
t _{d(off)}	Turn-off delay time		-	32	-	
t _f	Fall time		-	11	-	
Drain-Source Body Diode Characteristics						
V _{SD}	Body Diode Forward Voltage	V _{GS} =0V, I _F =1A	-	-	14	V
t _{rr}	Body Diode Reverse Recovery Time	V _{GS} =0V, I _F =4A, dI _F /d _t =100A/μs	-	250	-	nS
Q _{rr}	Body Diode Reverse Recovery Charge		-	12.	-	uC
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	4	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	16	A

Note:

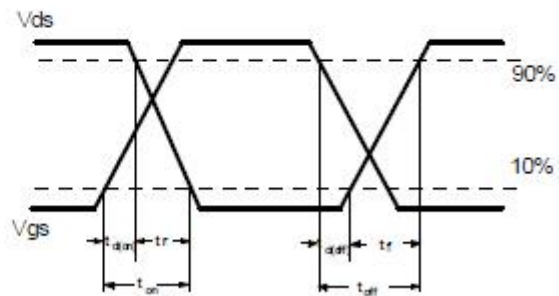
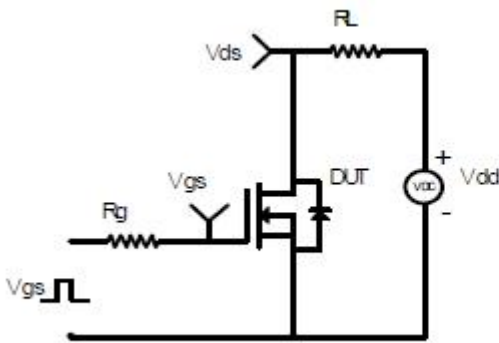
1. The value of R_{θJA} is measured with the device in a still air environment with T_A =25°C.
2. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 2% max

Switching Time Test Circuit and Wave forms

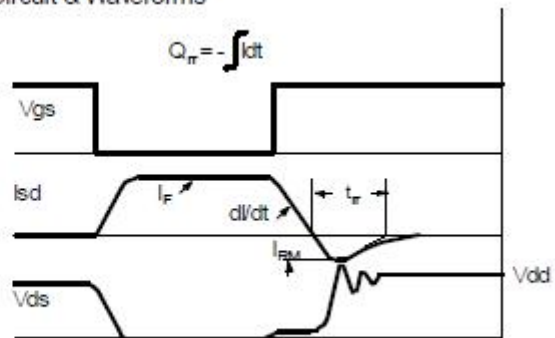
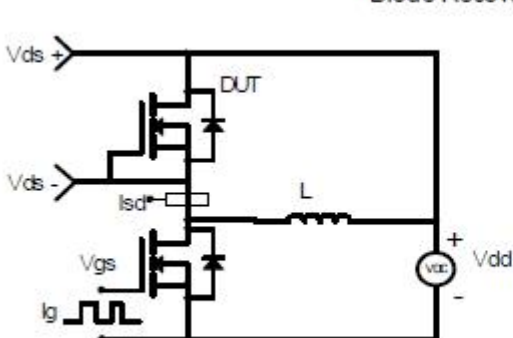
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

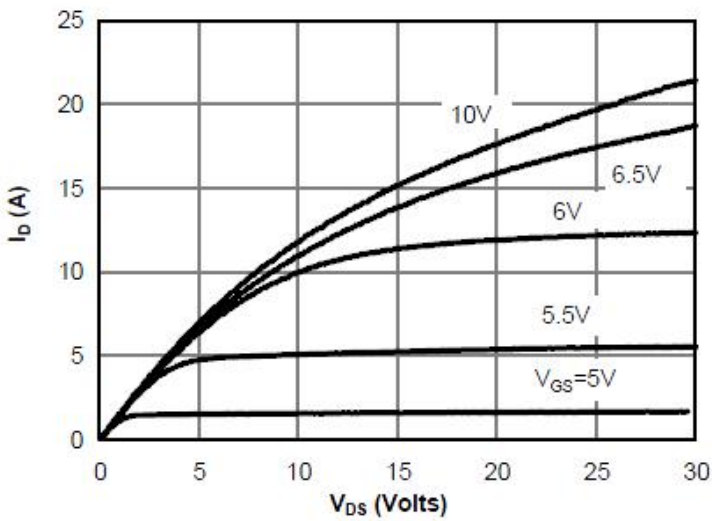


Fig 1: On-Region Characteristics

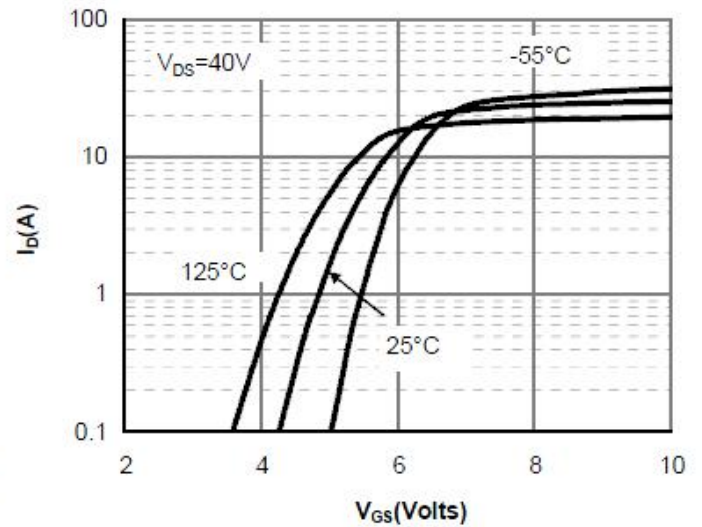


Figure 2: Transfer Characteristics

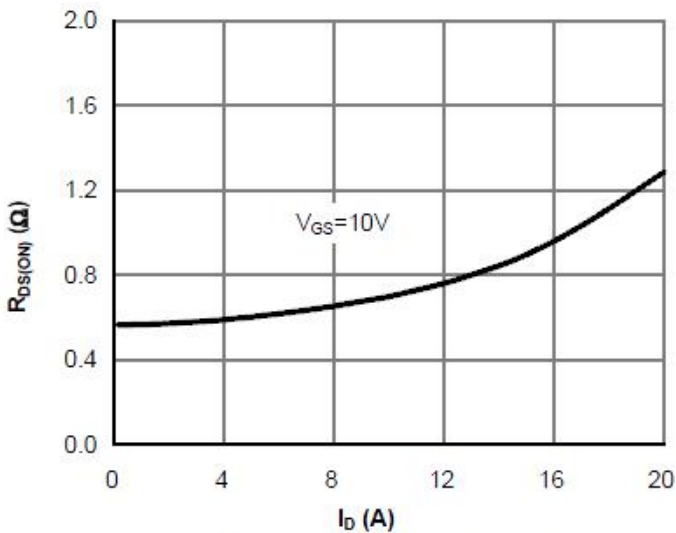


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

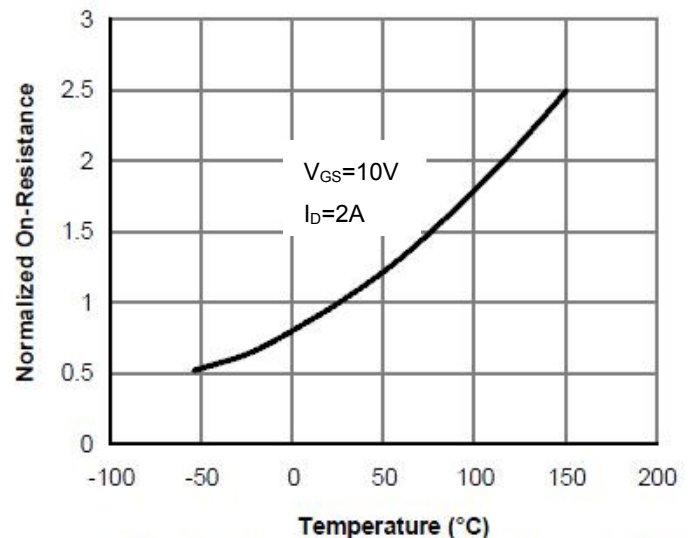


Figure 4: On-Resistance vs. Junction Temperature

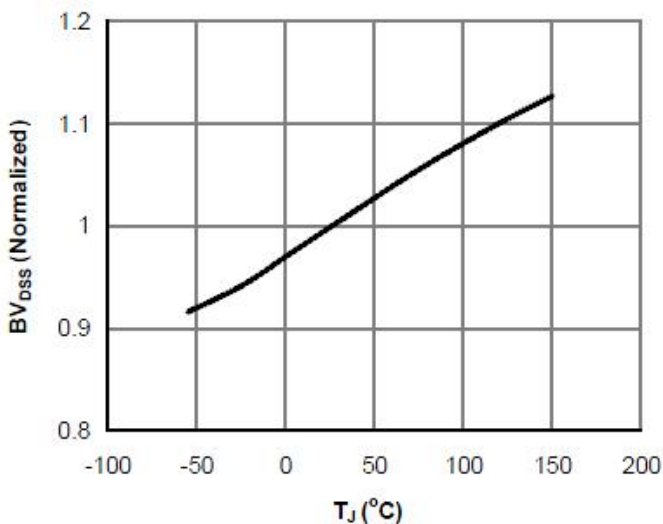


Figure 5: Break Down vs. Junction Temperature

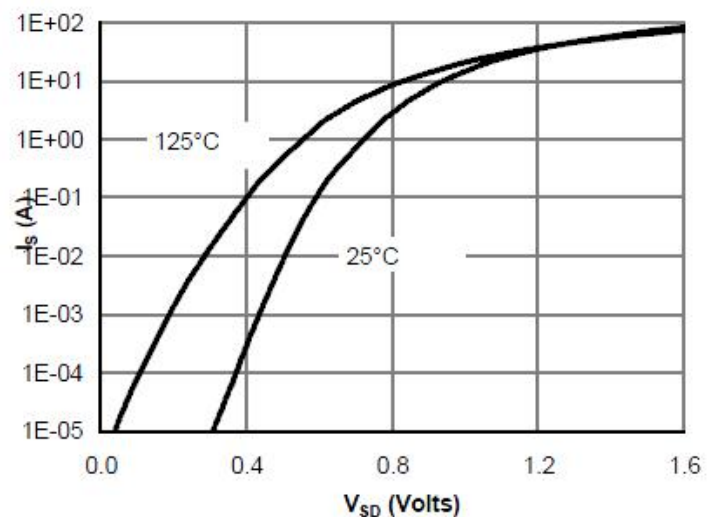
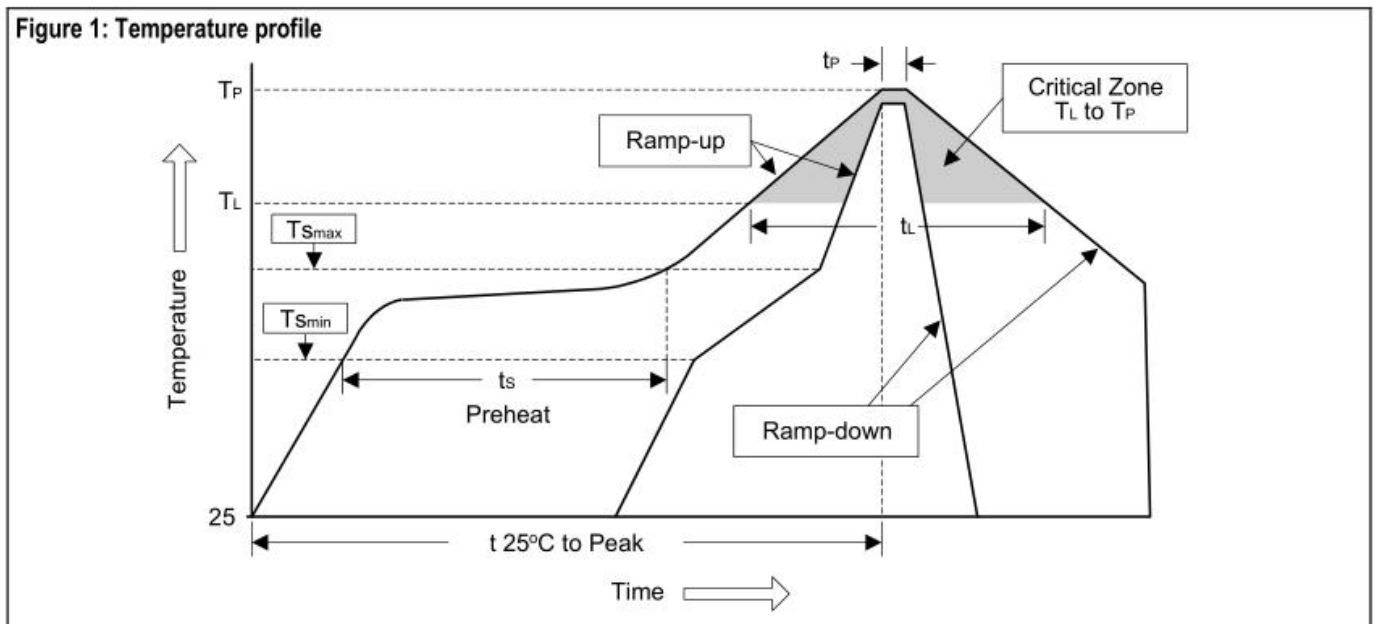


Figure 6: Body-Diode Characteristics (Note E)

Soldering Methods for Products

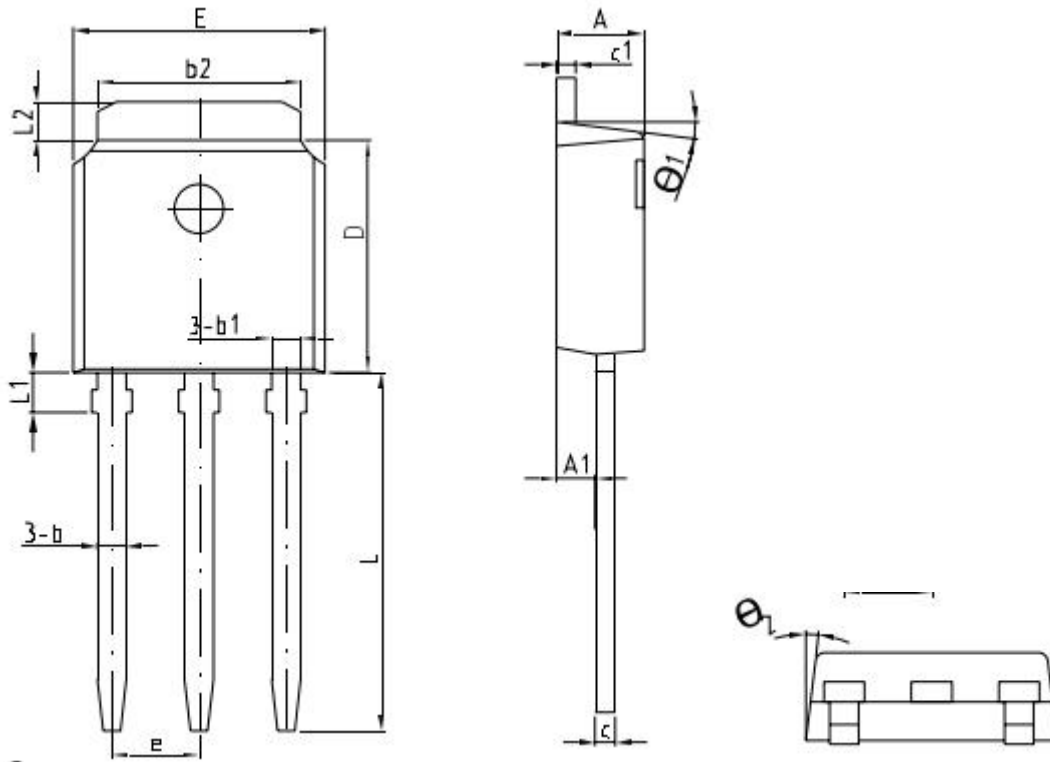
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat		
-Temperature Min(Ts min)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(min to max)(ts)	60 to 120 sec	60 to 180 sec
Tsmax to TL		
- ramp-up rate	<3°C/sec	<3°C/sec
Time maintained above:		
-Temperature(TL)	183°C	217°C
-Time(tL)	60 to 150 sec	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


unit: mm					
Symbol	Min	Max	Symbol	Min	Max
A	2.2	2.38	E	6.50	6.70
A1	0.90	1.10	e	2.286BSC	
b	0.71	0.86	L	9.10	9.70
b1	0.76NOM		L1	1.05NOM	
b2	5.13	5.46	L2	0.90	1.25
c	0.46	0.60	θ 1	7°	
C1	0.46	0.60	θ 2	7°	
D	6.0	6.20	---	----	

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■ Modify record

Date	Version	Description	Pagination
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