

650V 95mohm Super-Junction Power MOSFET
AKS65N950WMF

Description:

This SJ device integrated with fast-recovery diode provides good FOM factor, EMI-Friendly for customer application.

Features:

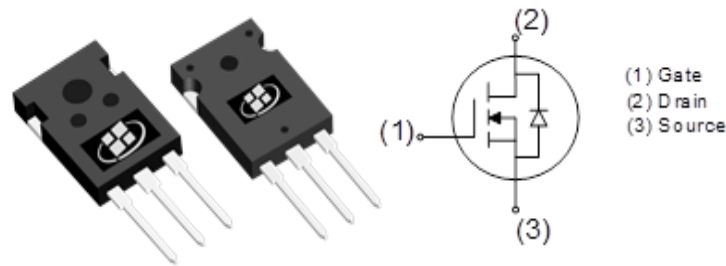
- EMI-Friendly
- 100% UIS tested
- RoHS compliant ^(Note 1)
- Halogen-free ^(Note 1)

Applications:

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

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	650	V
$R_{DS(on), max} @V_{GS} = 10V$	95	mΩ
I_D	35	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKS65N950WMF	TO-247	S65N950WMF	Tube	300 per box

Notes:

1. Contact ALKAIDSEMI sales for detail information

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) ^(Note 1)	35	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	22	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	105	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy ^(Note 3)	540	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	312	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State ^(Note 4)	35	$^\circ\text{C}/\text{W}$

Notes:

1. The max drain current rating is package limited
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 10.8 \text{ mH}$, $V_{DD} = 100\text{V}$, $I_{AS} = 10 \text{ A}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
4. Mount on minimum PCB layout

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Static Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	650			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V},$			1	μA
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 0.25\text{ mA}$	3	4	5	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		84	95	m Ω

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		3375		pF
C_{OSS}	Output Capacitance			76		pF
C_{RSS}	Reverse Transfer Capacitance			8		pF
R_G	Gate Resistance	$F = 1\text{ MHz}$		1.2		Ω

Switching Characteristics

$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 400\text{ V}, I_D = 20\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 10\text{ }\Omega$		41		nS
T_R	Rise Time			62		nS
$T_{D(OFF)}$	Turn Off Delay Time			110		nS
T_F	Fall Time			36		nS
Q_G	Total Gate Charge	$V_{DD} = 400\text{ V}, I_D = 20\text{ A},$ $V_{GS} = 10\text{ V}$		90		nC
Q_{GS}	Gate-Source Charge			20		nC
Q_{GD}	Gate-Drain Charge			45		nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Body-Diode Forward Current				35	A
I _{SM}	Maximum Pulsed Body-Diode Forward Current				105	A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 20 A		0.95	1.2	V
T _{RR}	Reverse recovery time	V _{DD} = 50 V, I _D = 20 A, di/dt = 100 A/μS		125		nS
Q _{RR}	Reverse recovery charge			800		nC
I _{RRM}	Peak Reverse Recovery Current			12.5		A

Electrical Characteristics Diagrams

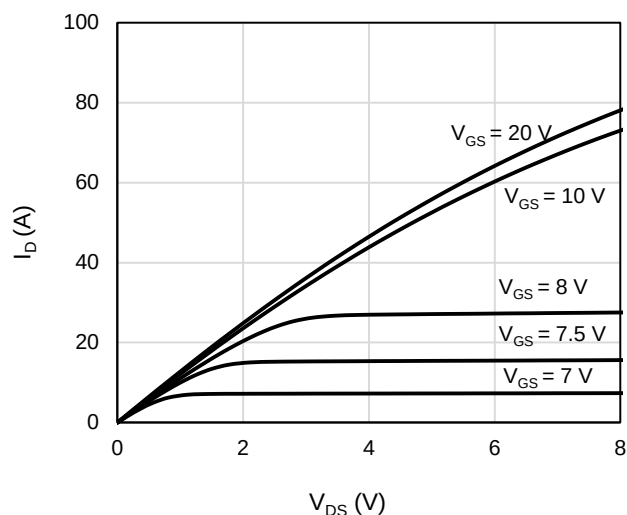


Figure 1: On-Region Characteristics

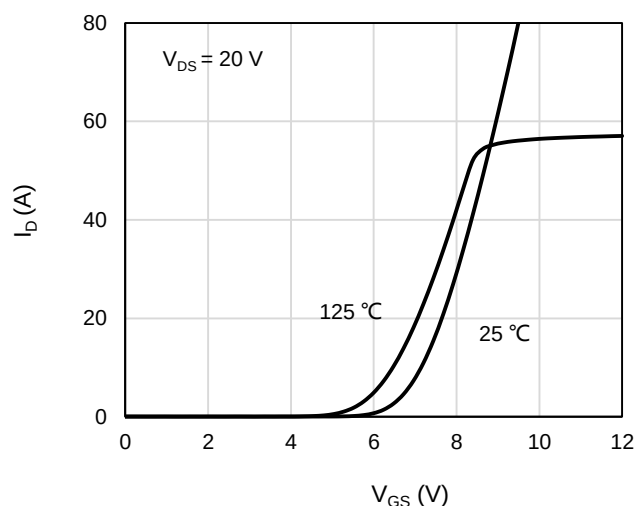


Figure 2: Transfer Characteristics

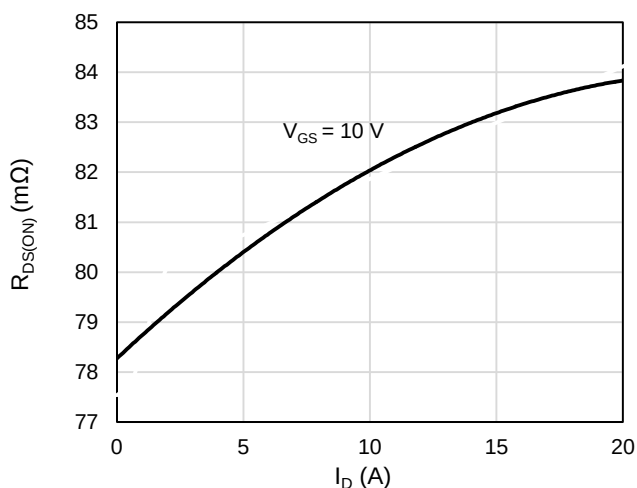


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

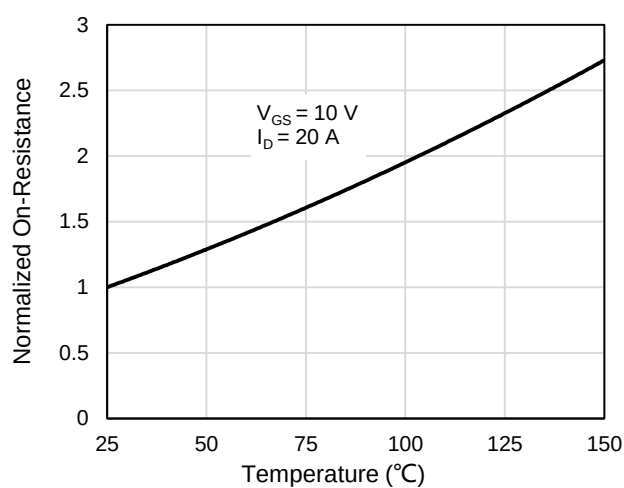


Figure 4: On-Resistance vs. Junction Temperature

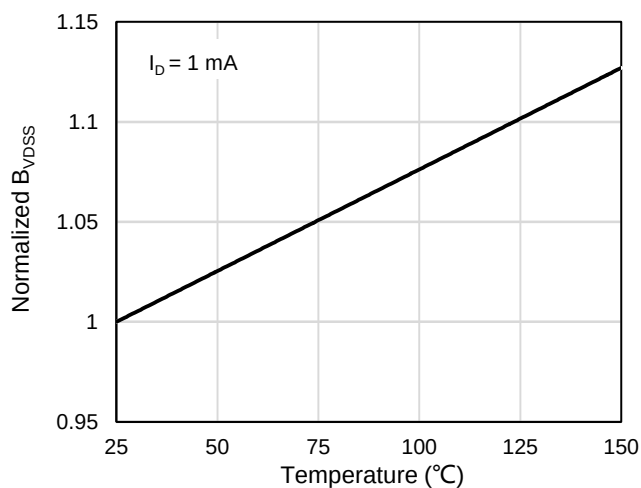


Figure 5: Breakdown Voltage vs. Junction Temperature

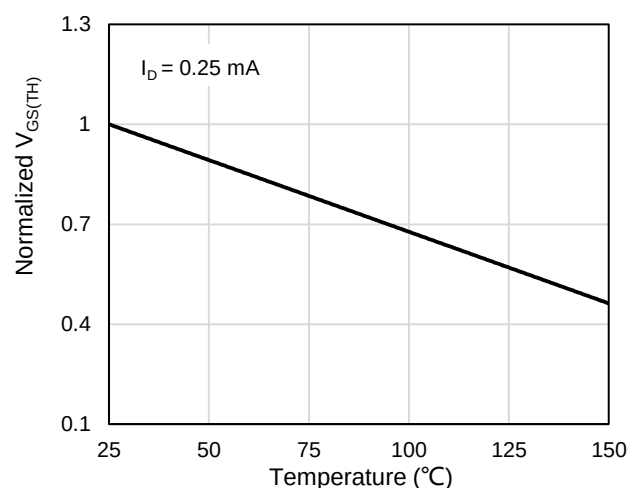


Figure 6: Threshold Voltage vs. Junction Temperature

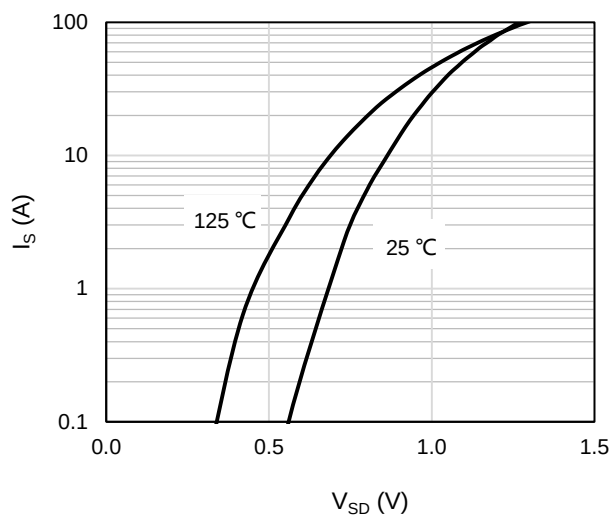


Figure 7: Body-Diode Characteristics

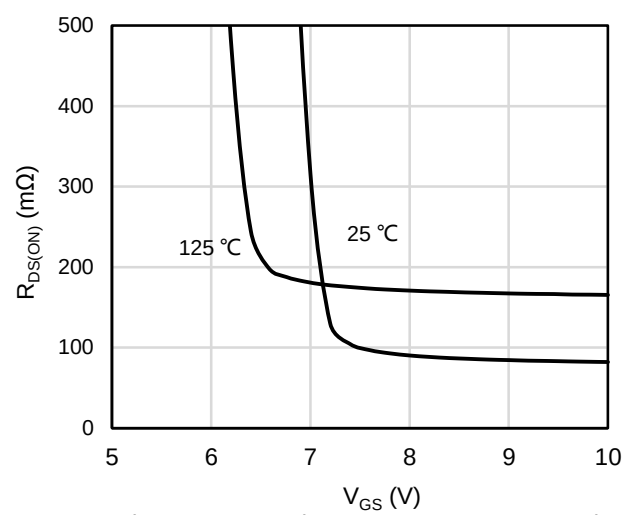


Figure 8: On-Resistance vs. Gate-Source Voltage

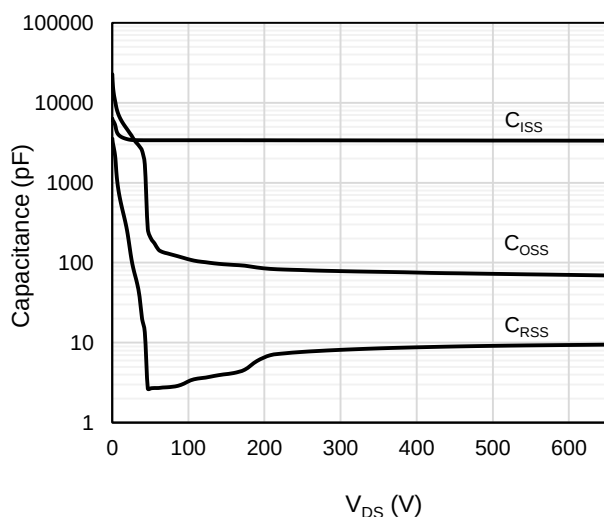


Figure 9: Capacitance Characteristics

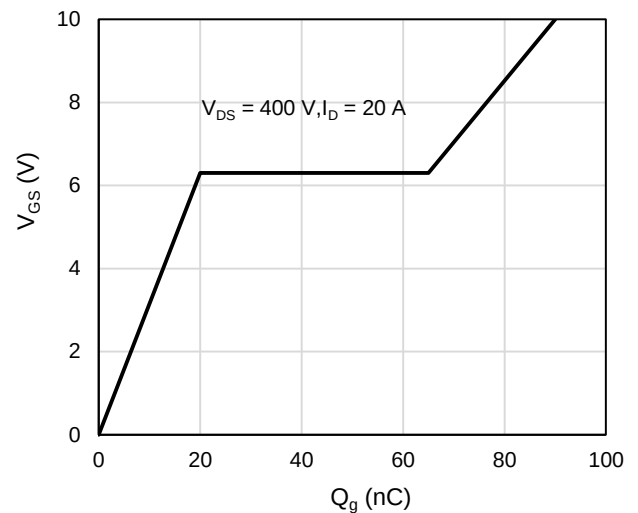


Figure 10: Gate-Charge Characteristics

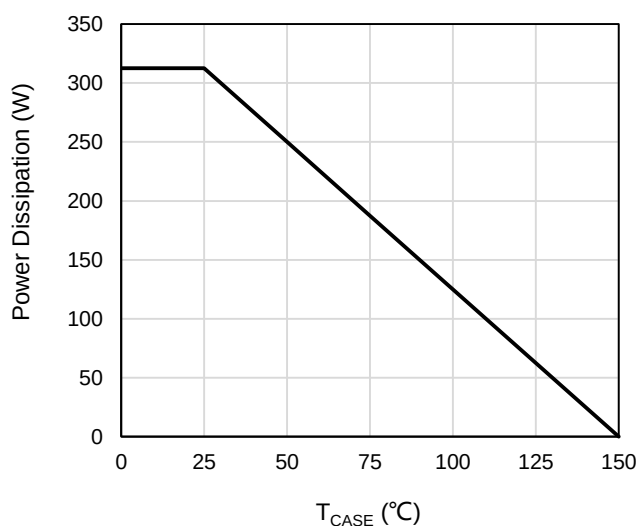


Figure 11: Power De-rating

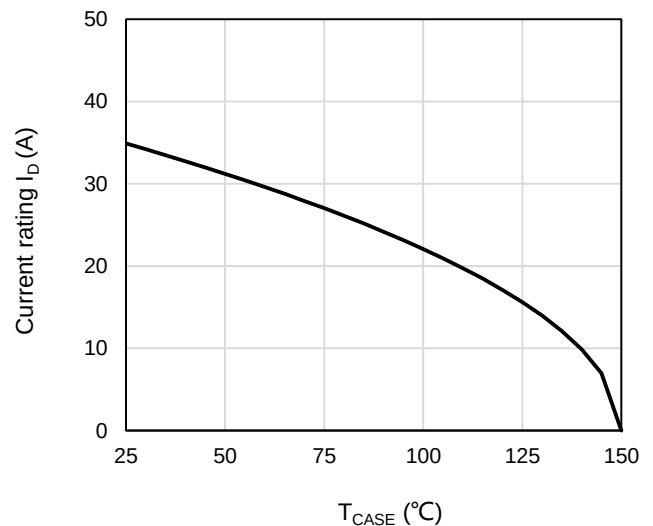


Figure 12: Current De-rating

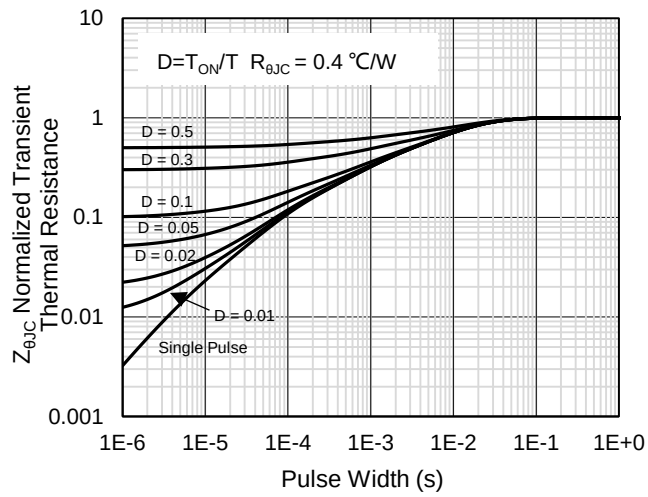


Figure 13: Normalized Maximum Transient Thermal Impedance

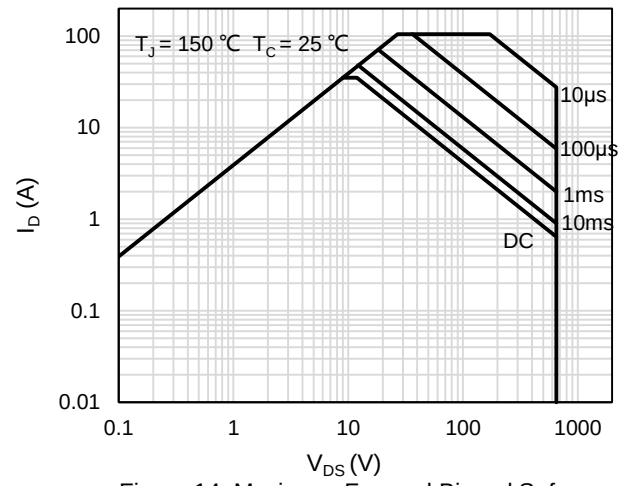
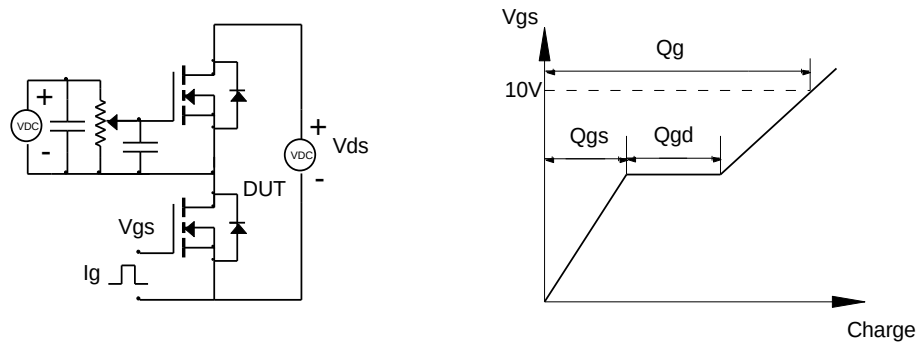


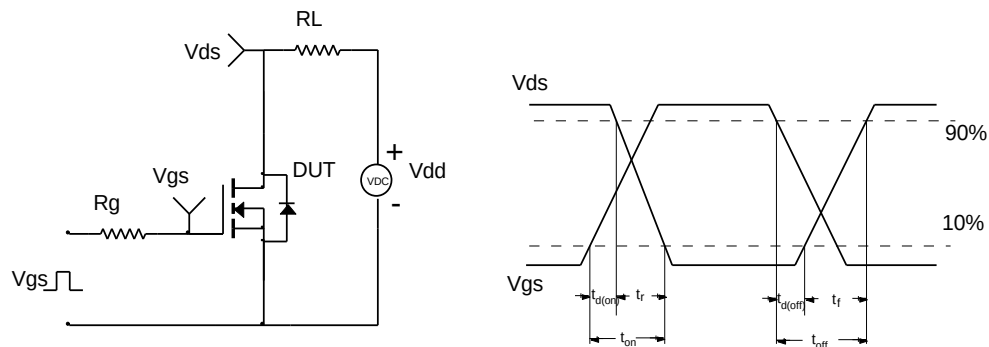
Figure 14: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

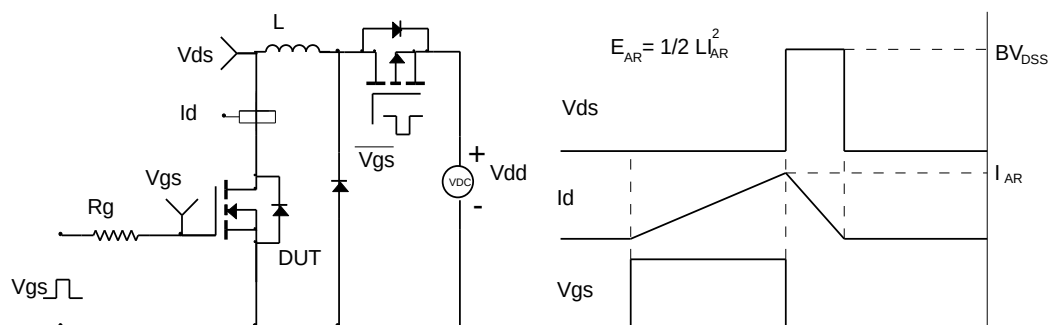
Gate Charge Test Circuit & Waveform



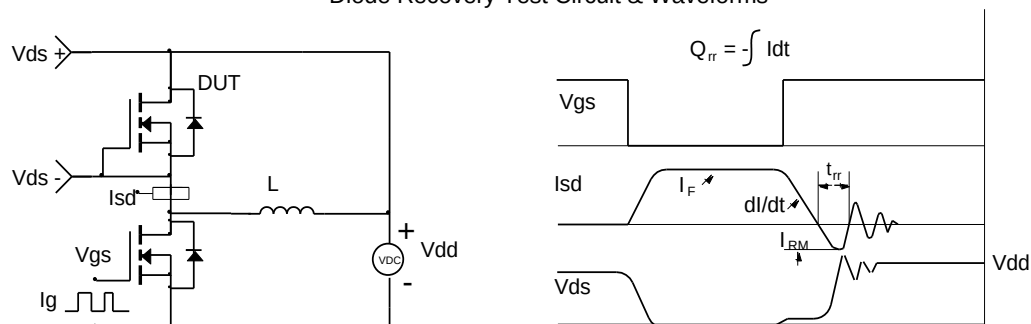
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

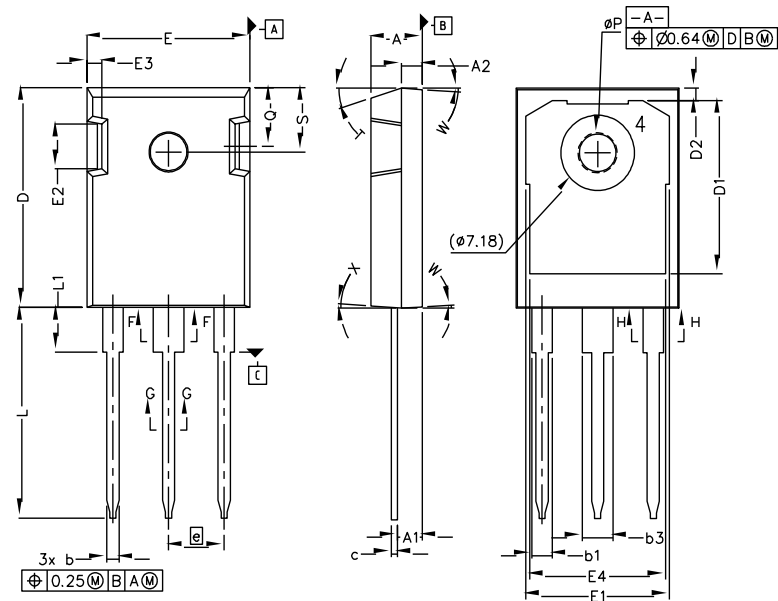


Diode Recovery Test Circuit & Waveforms

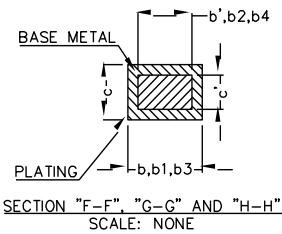


Package Outlines

POD 1

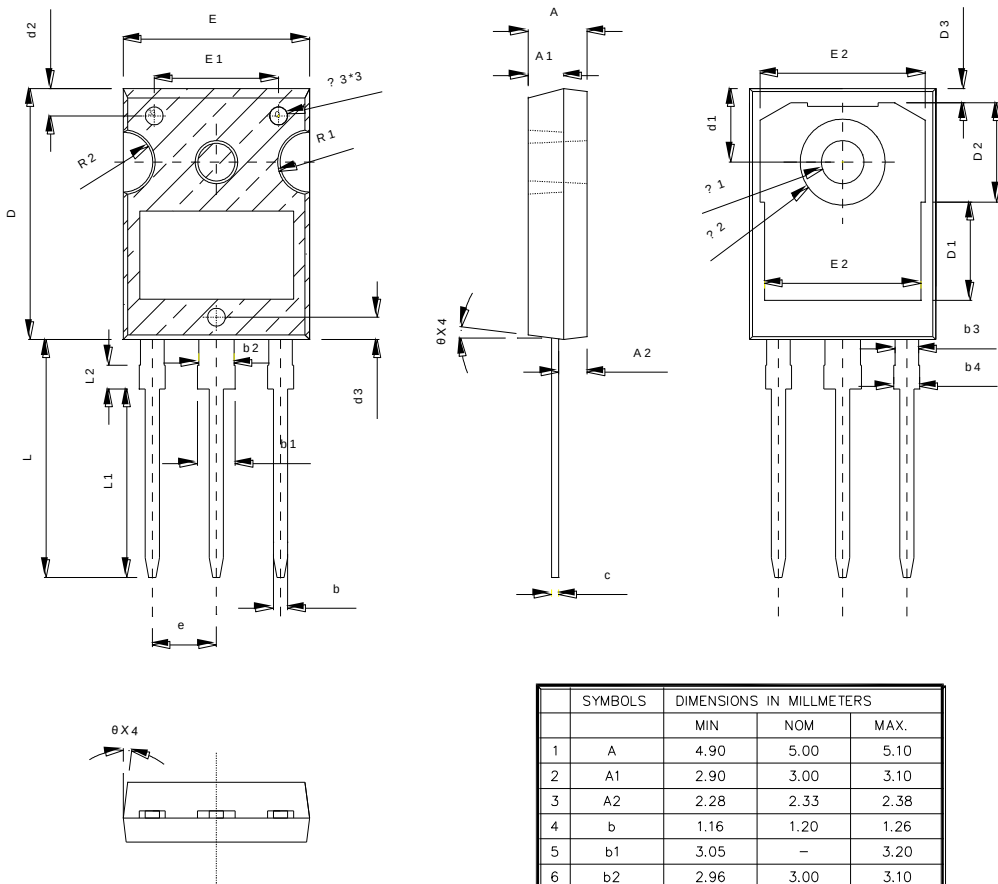


SYMBOL	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
P	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5 ° REF	
W	3.5 ° REF	
X	4 ° REF	



Package Outlines

POD 2



SYMBOLS		DIMENSIONS IN MILLIMETERS		
		MIN	NOM	MAX.
1	A	4.90	5.00	5.10
2	A1	2.90	3.00	3.10
3	A2	2.28	2.33	2.38
4	b	1.16	1.20	1.26
5	b1	3.05	—	3.20
6	b2	2.96	3.00	3.10
7	b3	1.96	2.00	2.10
8	b4	2.05	—	2.20
9	c	0.58	0.60	0.66
10	D	20.9	21.00	21.10
11	D1	—	8.23	—
12	D2	—	8.32	—
13	D3	—	1.17	—
14	d1	6.05	6.15	6.25
15	d2	2.20	2.30	2.40
16	d3	1.70	1.80	1.90
17	E	15.70	15.80	15.90
18	E1	—	10.50	—
19	E2	—	14.02	—
20	e	5.41	5.44	5.47
21	L	19.82	19.92	20.02
22	L1	—	15.79	—
23	L2	—	1.98	—
24	ϕ	4*	7*	8*
25	R1	—	2.70	—
26	R2	—	2.50	—
27	$\phi 1$	7.10	7.19	7.30
28	$\phi 2$	3.50	3.60	3.70
29	$\phi 3$	—	1.50	—

Marking Information



Note:

S65N950WMF = Product Name Code

XXXXXXX = Date code

Contact ALKAIDSEMI sales for detail information

Revision History

Revision	Release Date	Remark
Rev.1.2	2023/9/22	

Disclaimer

The information given in this document describes the independent performance of the product, but similar performance is not guaranteed under other working conditions, and cannot be guaranteed when installed with other products or equipment. To achieve the required performance of the product in actual scenarios, the customer should conduct a complete application test to assess the functionality of the product.

Alkaidsemi assumes no responsibility for equipment failures result from using products at values that exceed the ratings, operating conditions, or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which requires high reliability. Customers using or selling these products for use in medical, life-saving, or life-sustaining applications do so at their own risk and agree to fully indemnify.

Due to product or technical improvements, the information described or contained herein may be changed without prior notice.