

650V 41mohm Super-Junction Power MOSFET

AKS65N410WMF

Description:

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

Features:

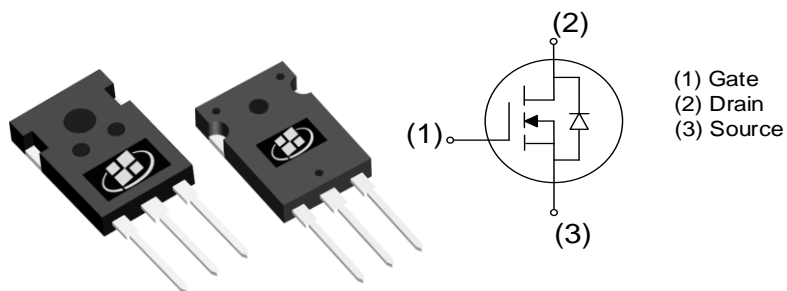
- Low FOM $R_{DS(ON)} \times Q_G$
- EMI-Friendly
- 100% UIS tested
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

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
$R_{DS(ON), max} @ V_{GS}=10V$	41	m Ω
I_D	62	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKS65N410WMF	TO-247-3L	S65N410WMF	Tube	600 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)	62	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$) (Note 1)	39	A
I_{DM}	Drain Current - Pulsed (Note 1,2)	248	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 3)	1656	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	416	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	0.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Steady State (Note 4)	35	$^\circ\text{C/W}$

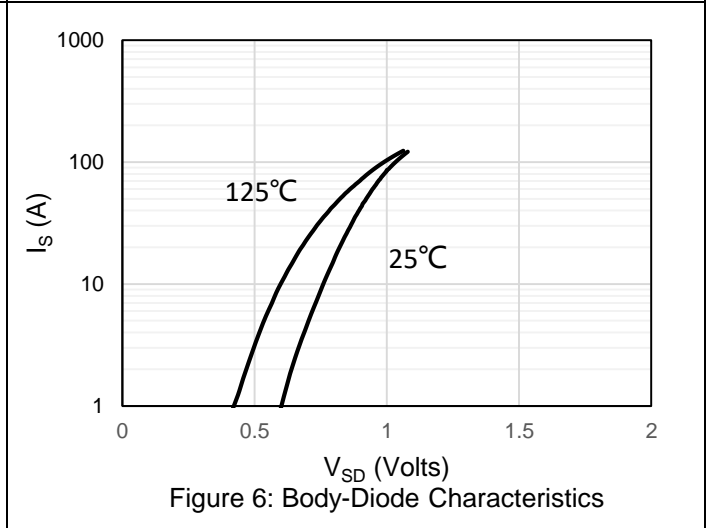
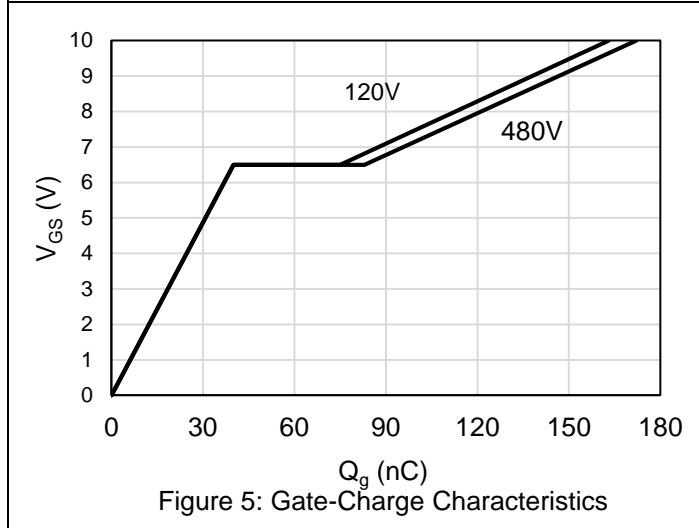
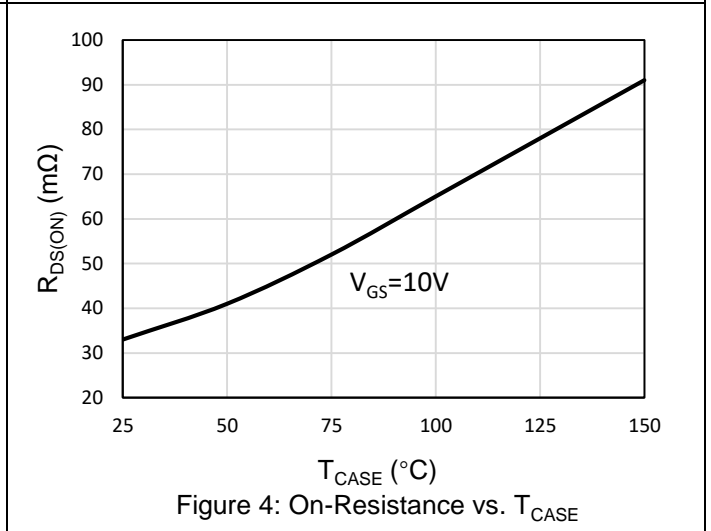
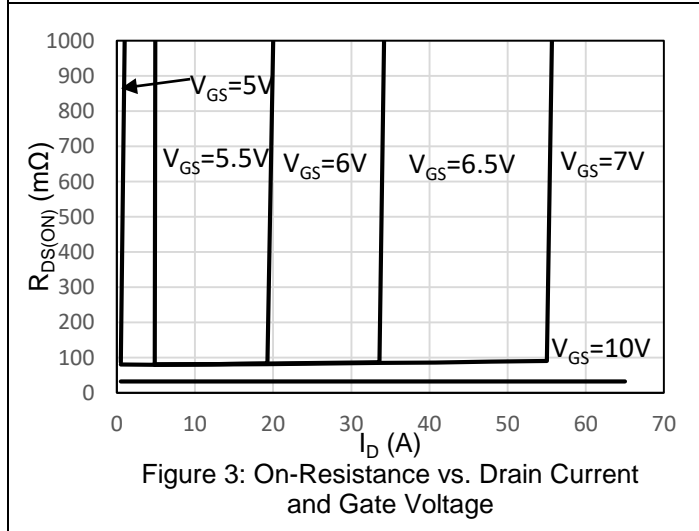
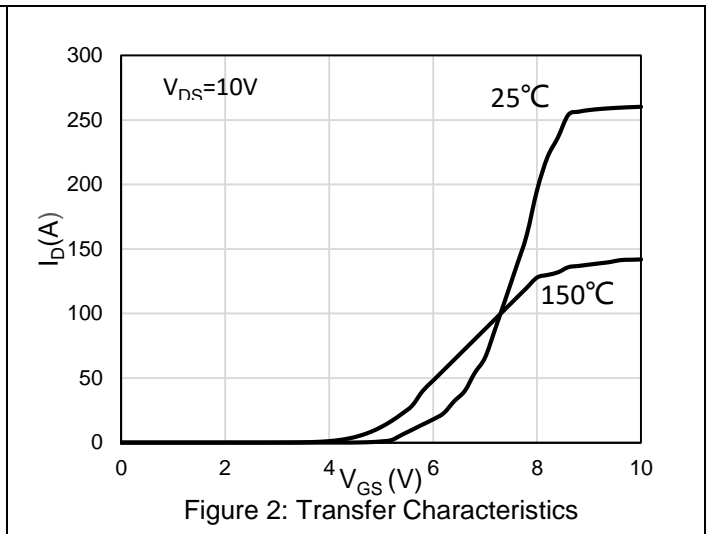
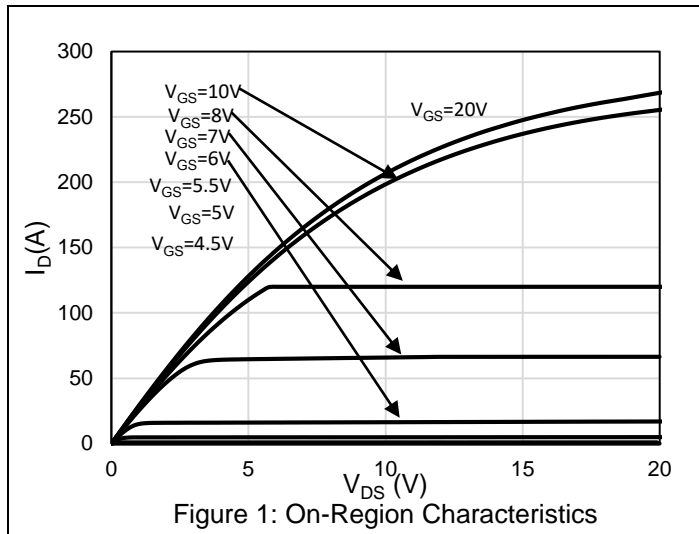
Notes:

1. The max drain current rating limited by package and maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 23 \text{ mH}$, $V_{DD} = 150 \text{ V}$, $I_{AS} = 12 \text{ A}$, $R_G = 25 \Omega$. Starting $T_J = 25^\circ\text{C}$, guarantee by design
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	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$			3.5	μA	
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 150^\circ\text{C}$		1000			
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA	
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 3.3\text{ mA}$	3	4	4.5	V	
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 33.1\text{ A}$		34	41	m Ω	
Dynamic Characteristics							
C_{ISS}	Input capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, F = 1\text{ MHz}$		6715		pF	
C_{OSS}	Output capacitance				245		pF
C_{RSS}	Reverse capacitance				1.64		pF
R_G	Gate resistance	$F = 1\text{ MHz}$		1.8		Ω	
Switching Characteristics							
$T_{D(ON)}$	Turn On Delay Time	$V_{DS} = 400\text{ V}, I_D = 40\text{ A}, V_{GS} = 13\text{ V}, R_{GEN} = 2.2\ \Omega$		28		ns	
T_R	Rise Time				44		ns
$T_{D(OFF)}$	Turn Off Delay Time				106		ns
T_F	Fall Time				42		ns
Q_G	Total Gate Charge	$V_{DS} = 480\text{ V}, I_D = 49.6\text{ A}, V_{GS} = 10\text{ V}$		172		nC	
Q_{GS}	Gate-Source Charge				40		nC
Q_{GD}	Gate-Drain Charge				83		nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Body-Diode Forward Current				62	A	
I_{SM}	Maximum Pulsed Body-Diode Forward Current (NOTE 1)				248	A	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 49.6\text{ A}$		0.92		V	
Q_{RR}	Reverse recovery charge	$V_{DS} = 400\text{ V}, I_D = 49.6\text{ A}, di/dt = 100\text{ A}/\mu\text{S}$		1291		nC	
T_{RR}	Reverse recovery time				177		ns
I_{RRM}	Peak Reverse Recovery Current				13.7		A

Electrical Characteristics Diagrams



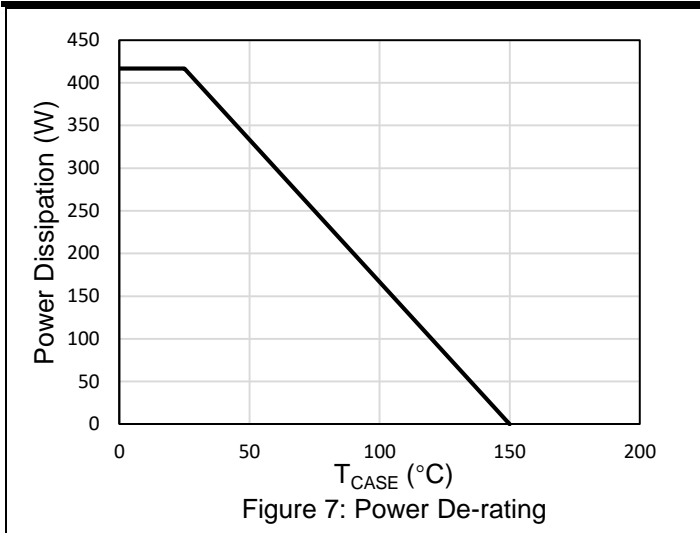


Figure 7: Power De-rating

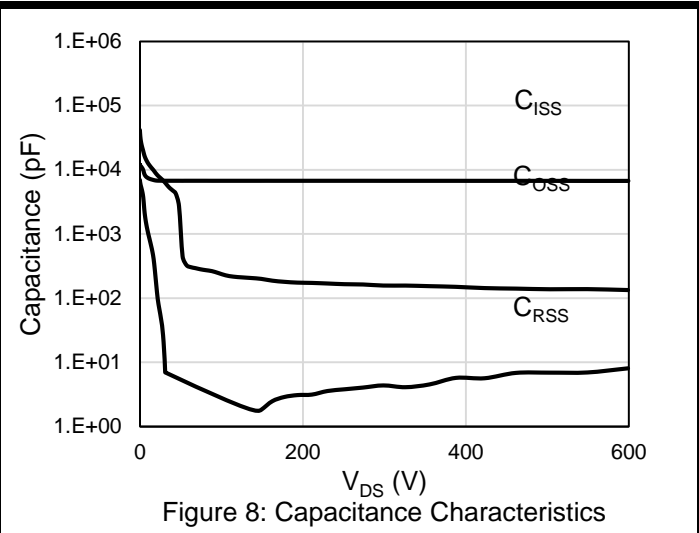


Figure 8: Capacitance Characteristics

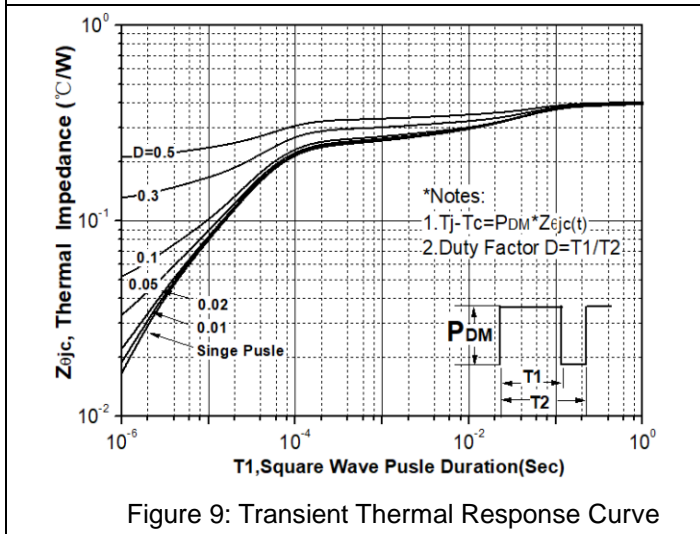


Figure 9: Transient Thermal Response Curve

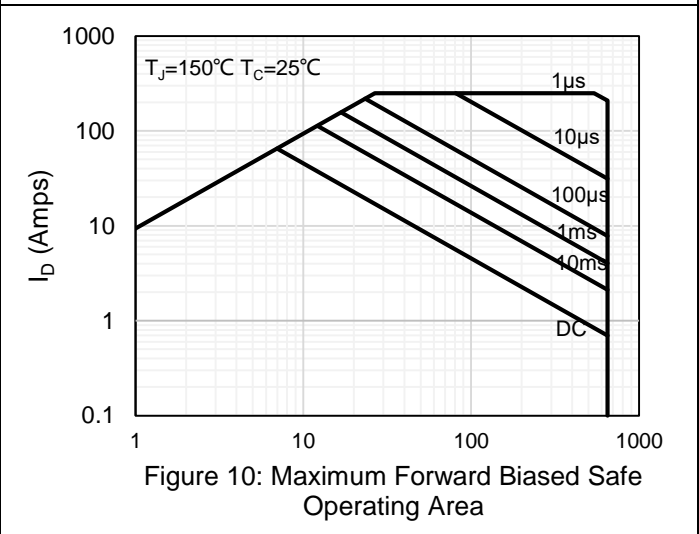
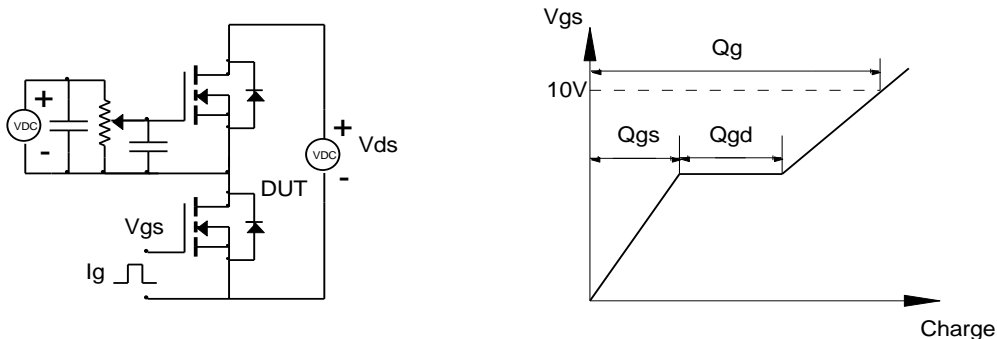


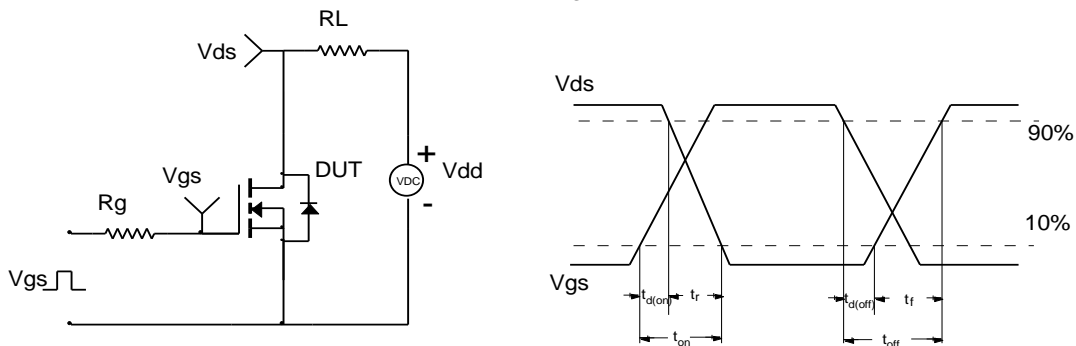
Figure 10: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

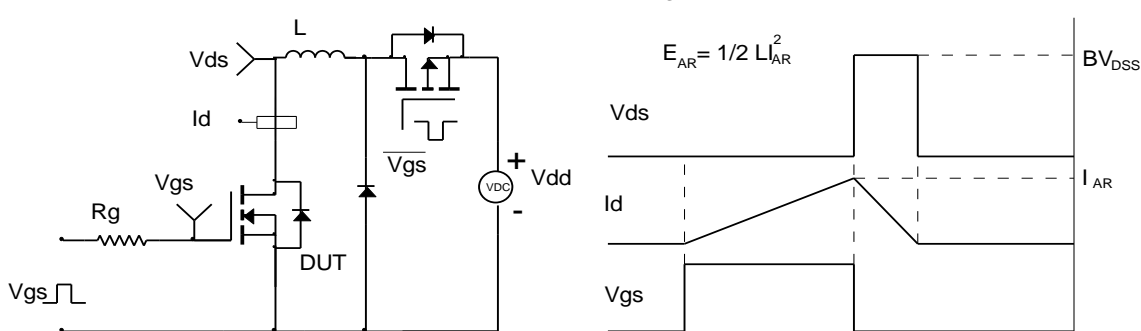
Gate Charge Test Circuit & Waveform



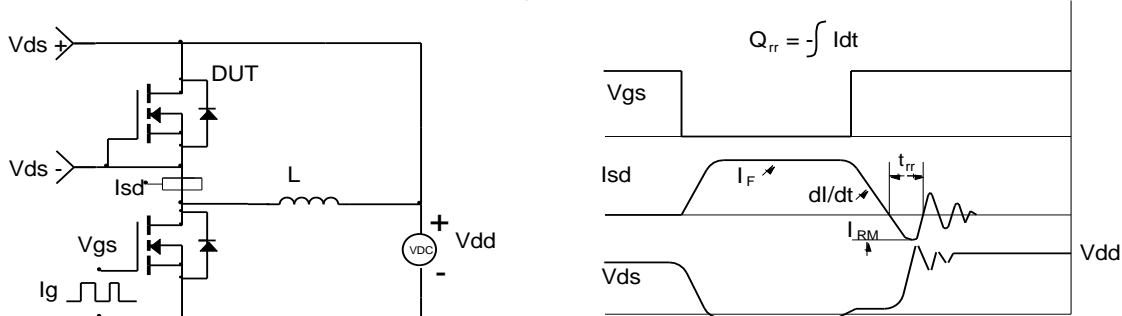
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

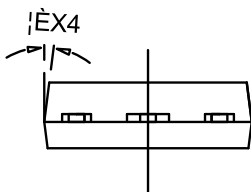
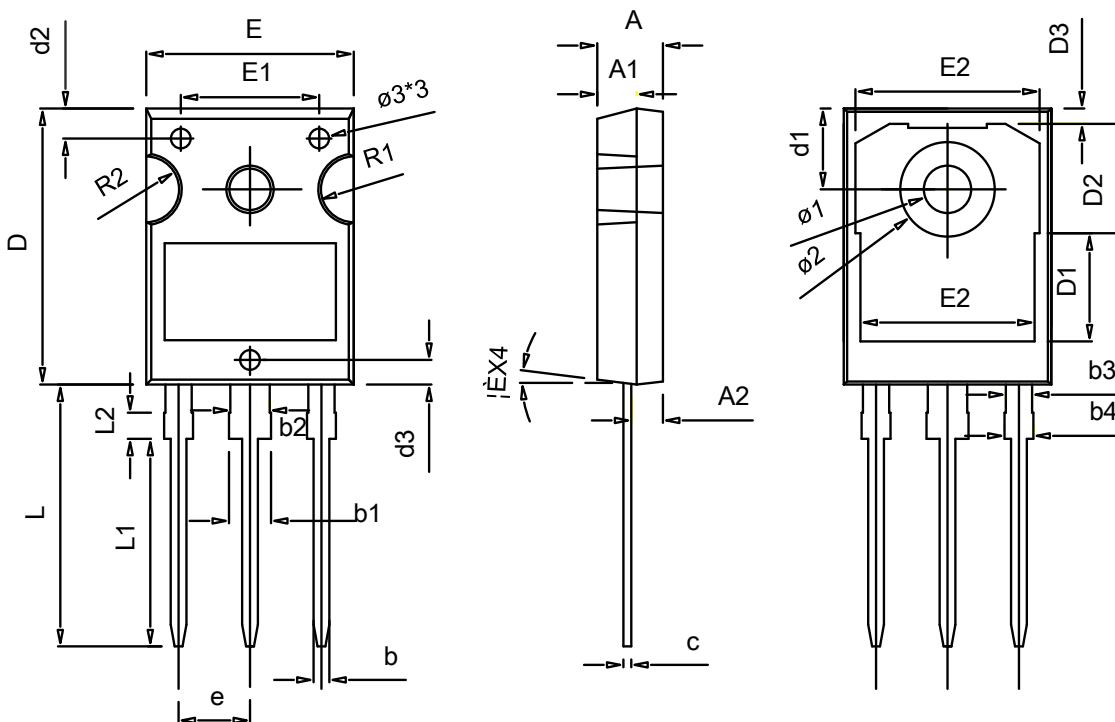


Diode Recovery Test Circuit & Waveforms



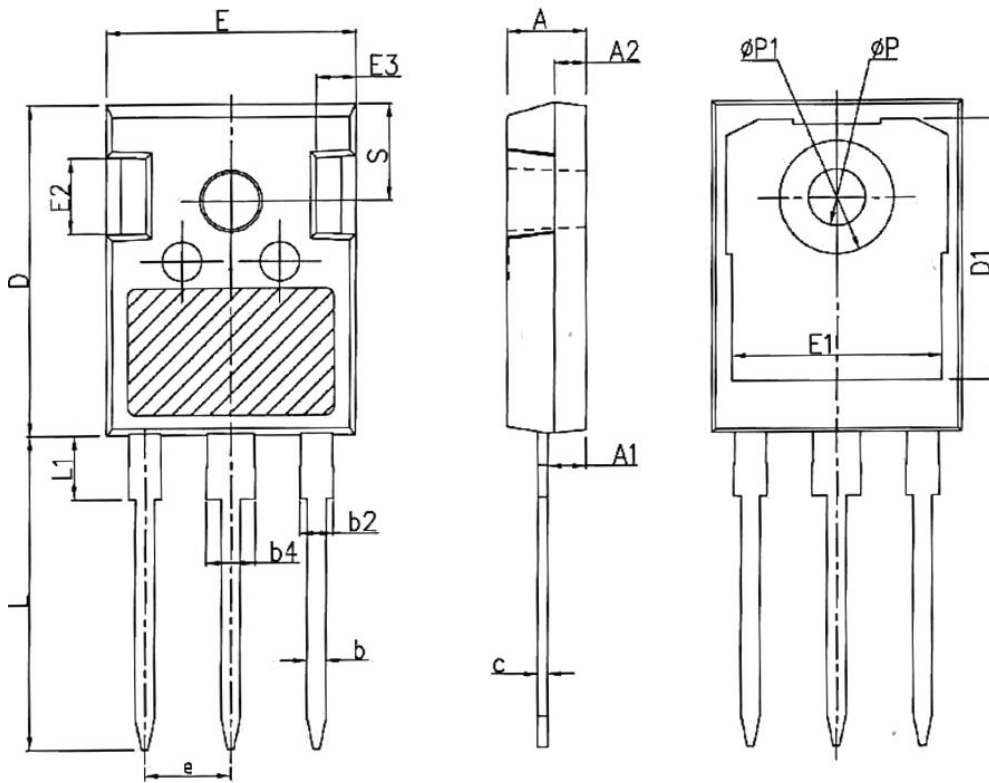
Package Outlines

POD1



	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	EX	4 \bar{a}	7 \bar{a}	8 \bar{a}
25	R1	-	2.70	-
26	R2	-	2.50	-
27	O1	7.10	7.19	7.30
28	O2	3.50	3.60	3.70
29	O3	-	1.50	-

POD2



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	-	-	7.30
S	6.15BSC		

Marking Information



S65N410WMF
XXXXXXXX

Note:

S65N410WMF=Product Name Code

XXXXXXXX=Date code

Contact ALKAIDSEMI sales for detail information

Revision History

Revision	Release Date	Remark
Rev.2.3	2022-03-17	

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.

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