

600V 30mohm Super-Junction Power MOSFET

AKS60N300WMF

Description:

This SJ device provides good FOM performance, better EMI for customer application.

Features:

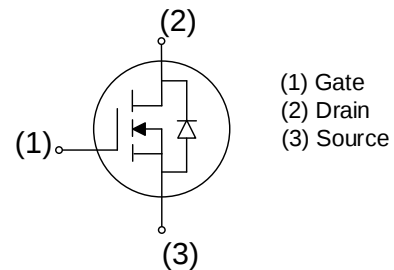
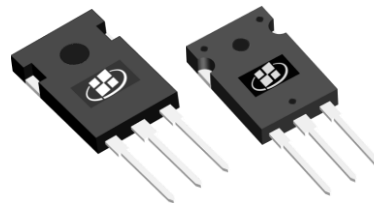
- Low FOM $R_{DS(ON)} \times Q_G$
- Better EMI
- 100% UIS tested
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

Applications:

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

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	600	V
$R_{DS(ON), max} @ V_{GS} = 10V$	30	m Ω
I_D	80	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKS60N300WMF	TO-247-3L	S60N300WMF	Tube	600 per box

Notes:

1. Contact ALKAIDSEMI sales for detail information

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	600	V
I_D	Drain Current - Continuous ($T_C = 25^{\circ}\text{C}$) (Note 1)	80	A
	Drain Current -Continuous ($T_C = 100^{\circ}\text{C}$)	50	A
I_{DM}	Drain Current - Pulsed (Note 2)	240	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 3)	2500	mJ
P_D	Power Dissipation ($T_C = 25^{\circ}\text{C}$)	623	W
dv/dt	MOSFET dv/dt ruggedness	40	V/ns
	Reverse diode dv/dt	40	V/ns
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	0.2	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Steady State (Note 4)	28.8	$^{\circ}\text{C/W}$

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. $L = 80\text{ mH}$, $V_{DD} = 100\text{V}$, $I_{AS} = 8\text{ A}$, $R_G = 25\text{ }\Omega$, Starting $T_J = 25\text{ }^{\circ}\text{C}$, guarantee by design
4. Mount on minimum PCB layout

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 1 mA	600			V
		V _{GS} = 0 V, I _D = 1 mA T _J = 150 °C	650			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 600 V, V _{GS} = 0 V, T _J = 25 °C			3.5	μA
I _{GSS}	Gate Leakage Current	V _{GS} = ±30 V, V _{DS} = 0 V			±100	nA
V _{GS(TH)}	Gate Threshold voltage	V _{DS} = V _{GS} , I _D = 2 mA	2.5	3.5	4.5	V
R _{DS(ON)}	Drain-Source on-state resistance	V _{GS} = 10 V, I _D = 40 A		25	30	mΩ
Dynamic Characteristics						
C _{ISS}	Input capacitance	V _{DS} = 50 V, V _{GS} = 0 V, F = 100 kHz		7699		pF
C _{OSS}	Output capacitance			3091		pF
C _{RSS}	Reverse transfer capacitance			2.1		pF
R _G	Gate resistance	F = 1 MHz		6.8		Ω
Switching Characteristics						
T _{D(ON)}	Turn On Delay Time	V _{DS} = 400 V, I _D = 40 A, V _{GS} = 10 V, R _{GEN} = 2 Ω		61.8		ns
T _R	Rise Time			55.2		ns
T _{D(OFF)}	Turn Off Delay Time			233.4		ns
T _F	Fall Time			50.6		ns
Q _G	Total Gate Charge	V _{DS} = 400 V, I _D = 40 A, V _{GS} = 10 V		200.8		nC
Q _{GS}	Gate-Source Charge			44.9		nC
Q _{GD}	Gate-Drain Charge			91.6		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Body-Diode Forward Current			80		A
I _{SM}	Maximum Pulsed Body-Diode Forward Current ^(NOTE 1)			240		A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 80 A		0.87		V
T _{RR}	Reverse recovery time	I _F = 40 A, dI/dT = 100 A/μS		180		ns
Q _{RR}	Reverse recovery charge			1.55		μC
I _{RM}	Peak Reverse Recovery Current			16		A

Electrical Characteristics Diagrams

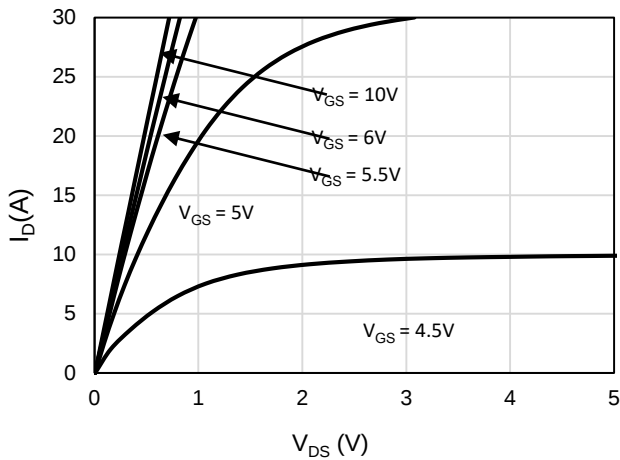


Figure 1: On-Region Characteristics

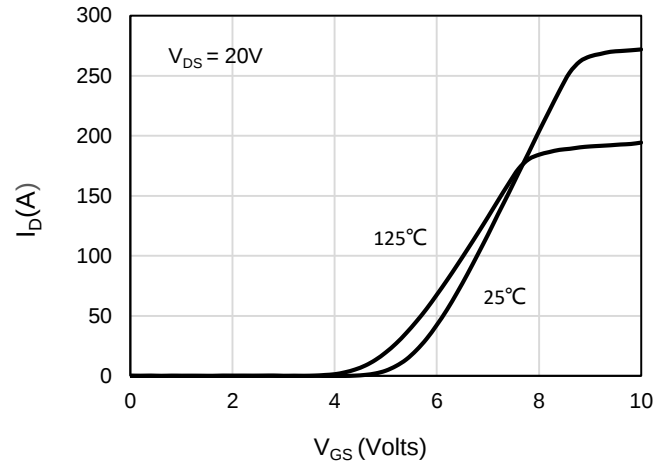


Figure 2: Transfer Characteristics

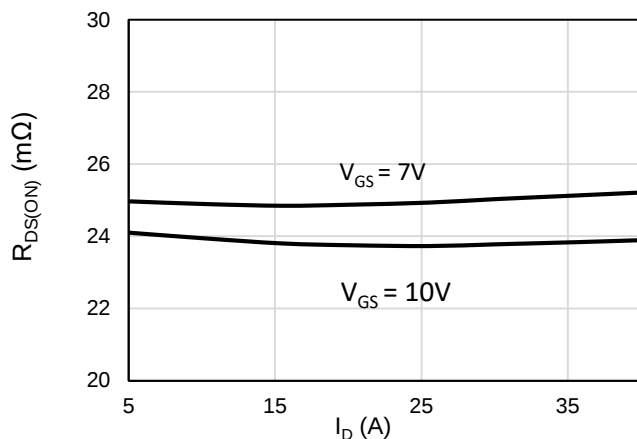


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

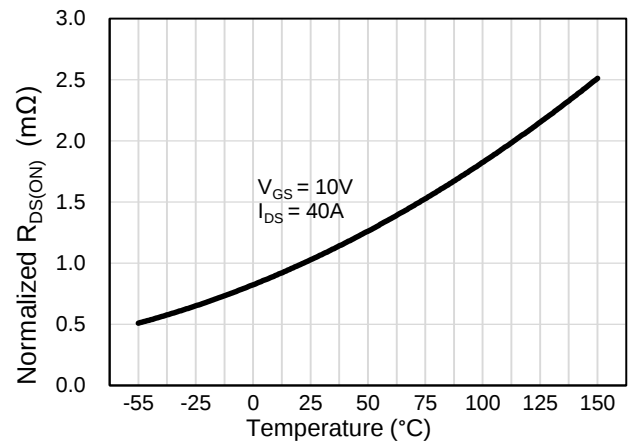


Figure 4: On-Resistance vs. Junction Temperature

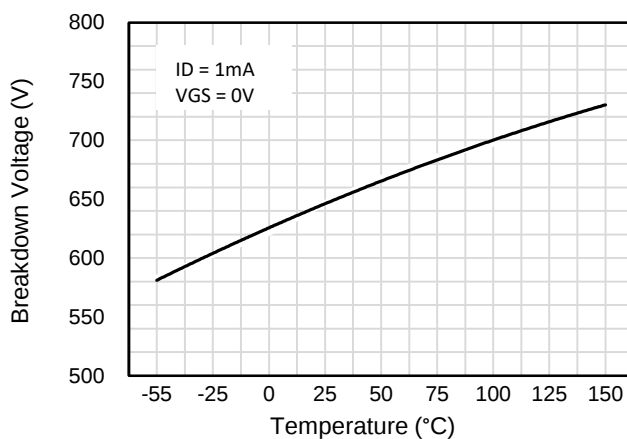


Figure 5: Breakdown Voltage vs. Junction Temperature

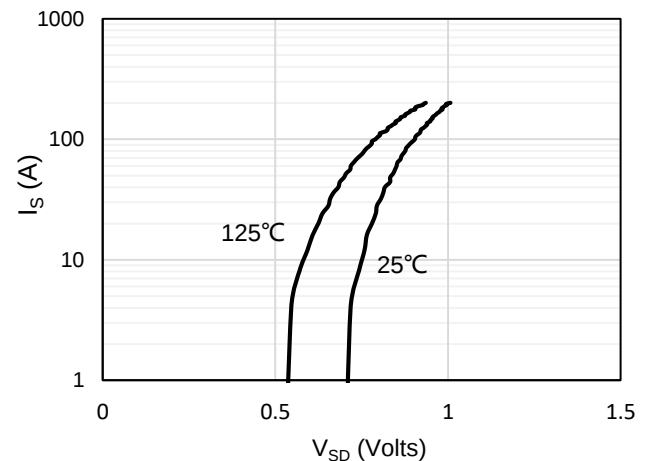


Figure 6: Body-Diode Characteristics

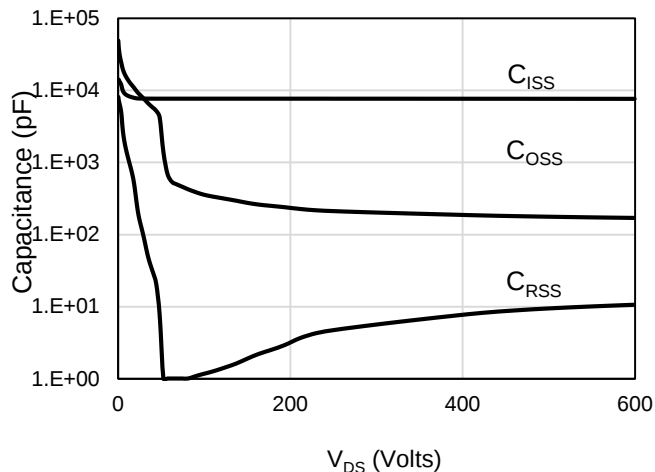


Figure 7: Capacitance Characteristics

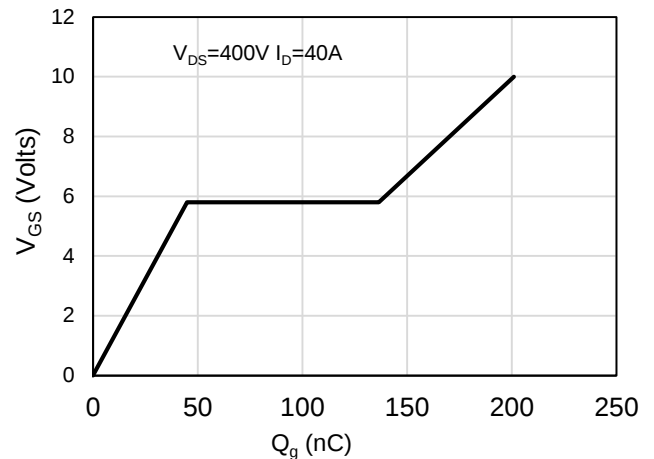


Figure 8: Gate-Charge Characteristics

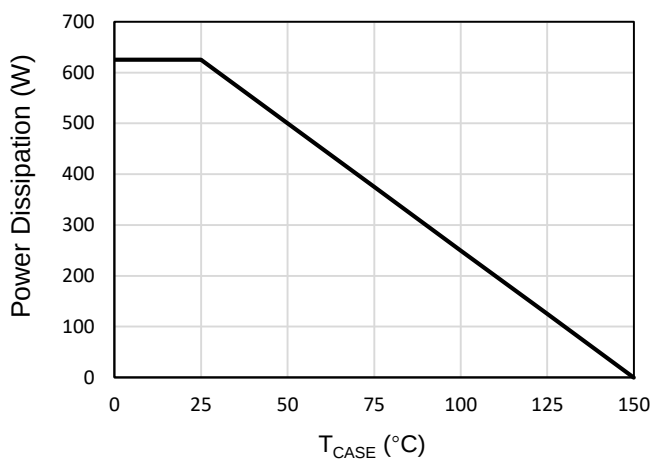


Figure 9: Power De-rating

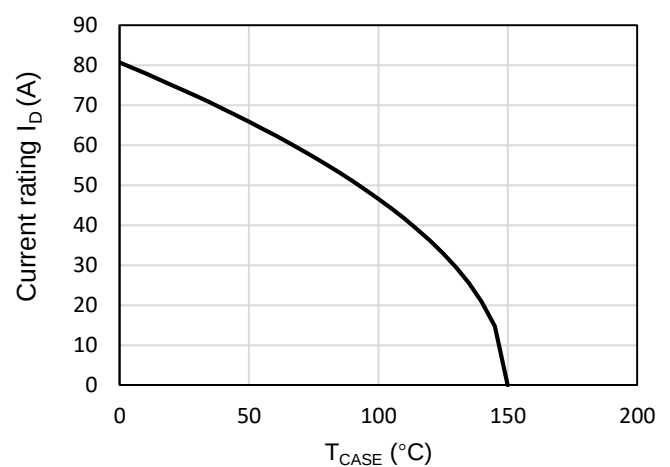


Figure 10: Current De-rating

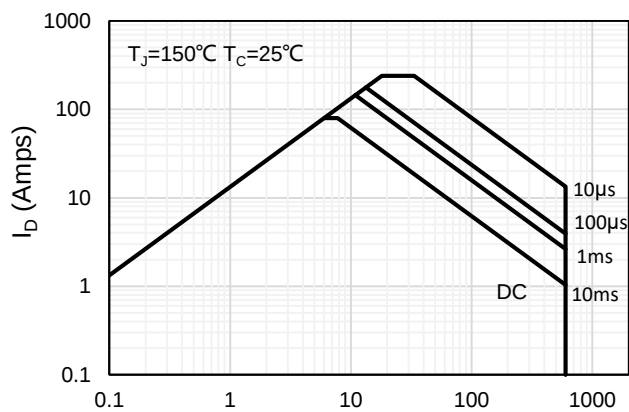


Figure 11: Maximum Forward Biased Safe Operating Area

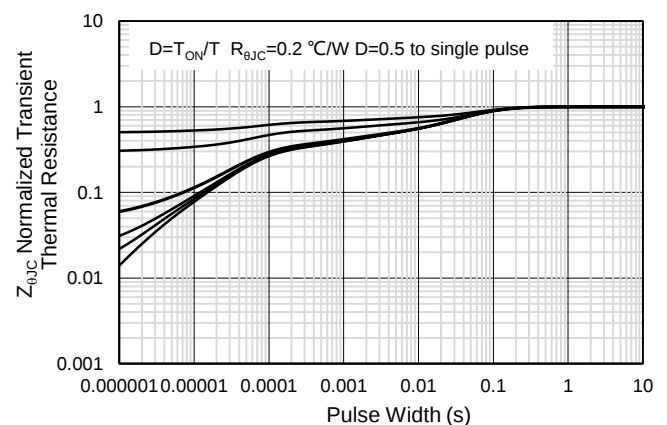
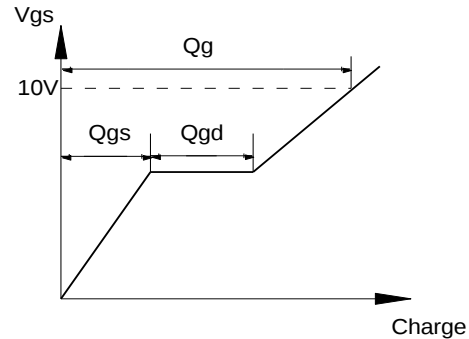
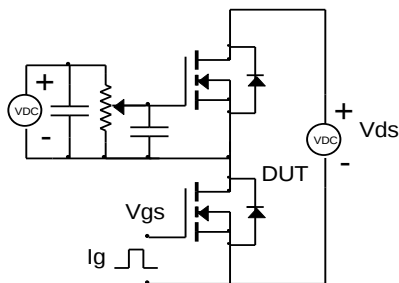


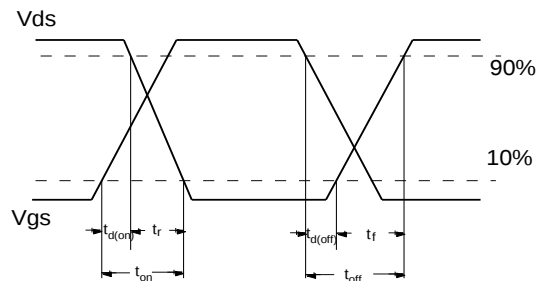
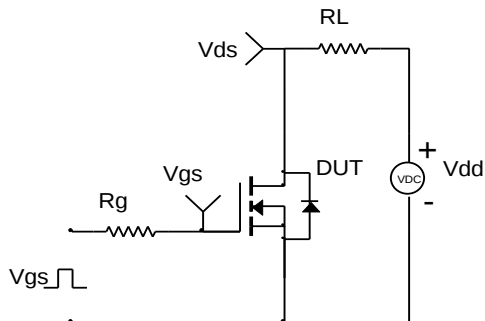
Figure 12: Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveform

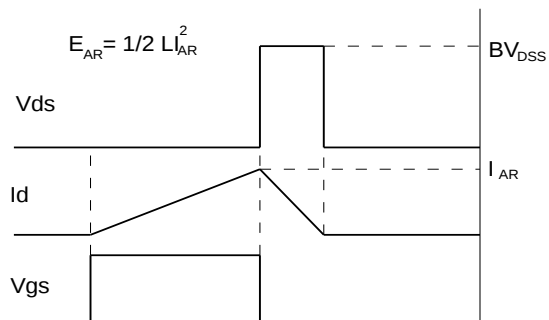
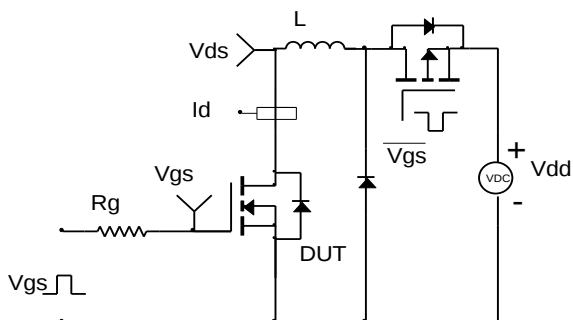
Gate Charge Test Circuit & Waveform



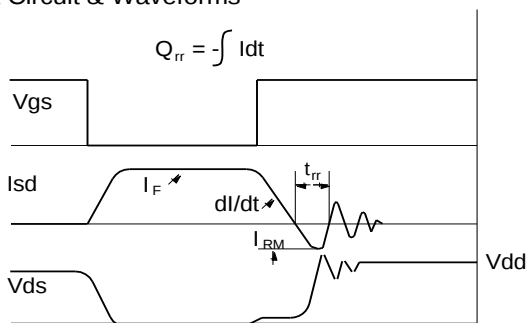
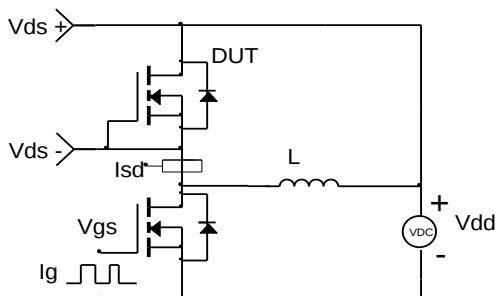
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

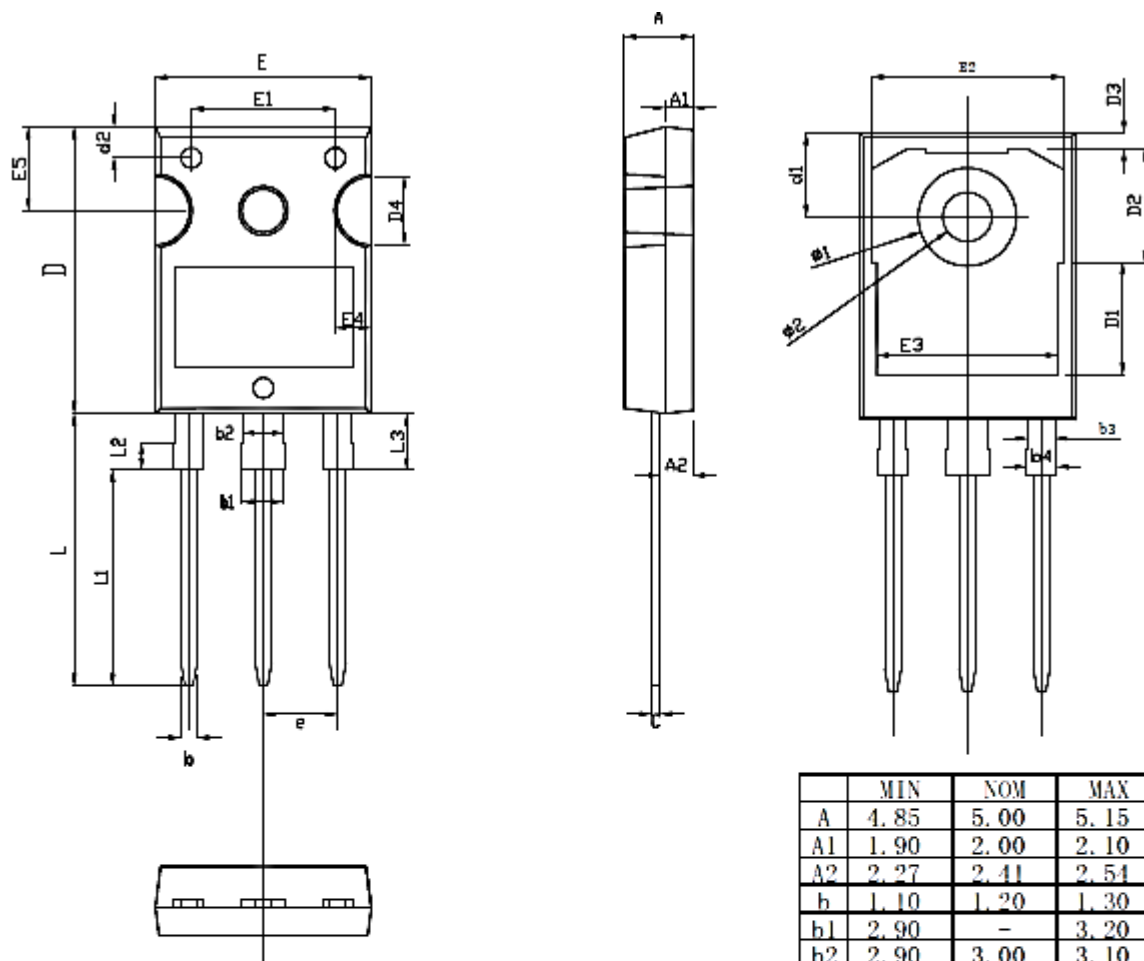


Diode Recovery Test Circuit & Waveforms

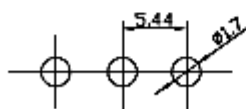


Package Outlines

POD1



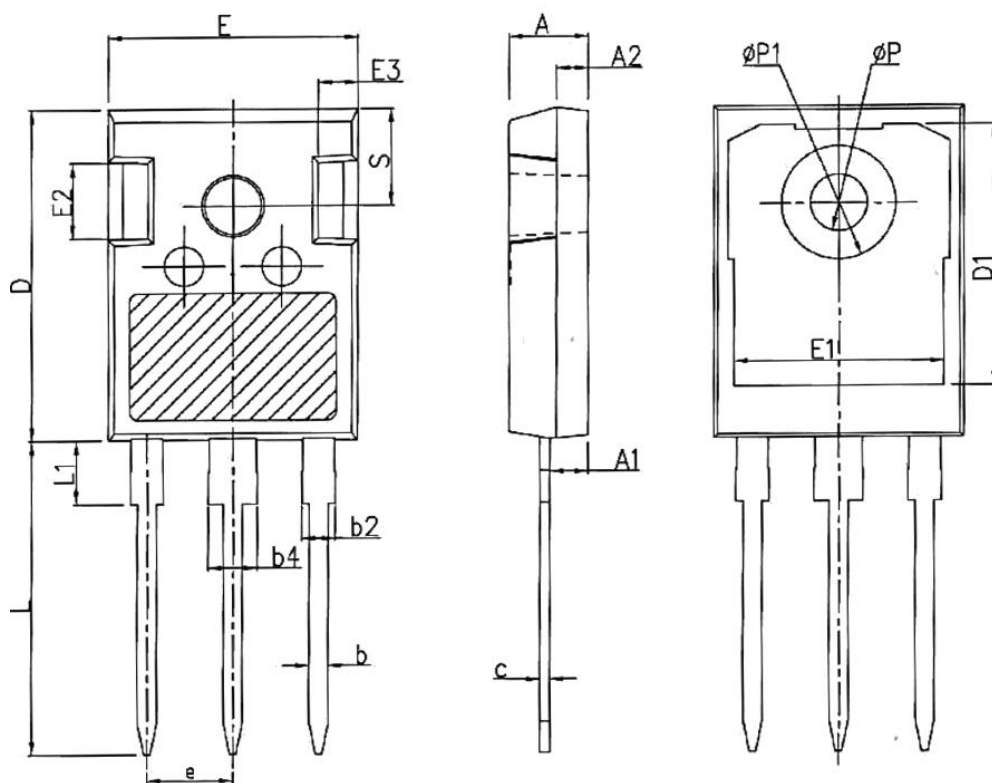
RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.85	5.00	5.15
A1	1.90	2.00	2.10
A2	2.27	2.41	2.54
h	1.10	1.20	1.30
h1	2.90	-	3.20
b2	2.90	3.00	3.10
b3	1.90	2.00	2.10
h4	2.00	-	2.20
c	0.55	0.60	0.68
D	20.80	21.00	21.10
D1		8.23	
D2		8.32	
D3		1.17	
D4	3.68	4.90	5.10
d1	6.04	6.15	6.30
d2	2.20	2.30	2.40
E	15.70	15.80	16.00
E1		10.50	
E2		14.02	
E3		13.50	
E4	2.20	2.40	2.60
E5	5.49	5.80	6.00
e	5.34	5.44	5.54
L	19.72	19.92	20.12
L1		15.79	
L2		1.98	
L3	4.00	4.10	4.47
ø1	7.10	7.19	7.30
ø2	3.50	3.60	3.70

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
ΦP1	-	-	7.30
S	6.15BSC		

Marking Information



Note:

XXXXXXX=Date code

S60N300WMF=Product Name Code

Contact ALKAIDSEMI sales for detail information

Revision History

Revision	Release Date	Remark
Rev.1.4	2022-07-06	

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.