

650V 190mohm Super-Junction Power MOSFET

AKS65N1K9PM

Description:

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

Features:

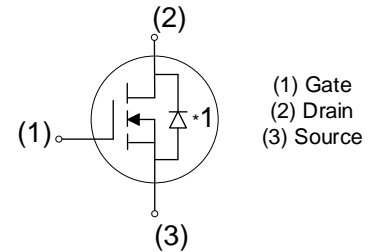
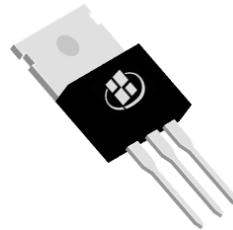
- Low FOM $R_{DS(ON)} \times Q_G$
- Better EMI
- 100% UIS and Isolation tested
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

Applications:

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

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	650	V
$R_{DS(ON), max} @ V_{GS} = 10 V$	190	m Ω
I_D	20	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKS65N1K9PM	TO-220	S65N1K9PM	Tube	1000 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)	20	A
	Drain Current -Continuous ($T_C = 100^\circ\text{C}$) (Note 1)	13	A
I_{DM}	Drain Current - Pulsed (Note 1,2)	60	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 3)	390	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	208	W
dV/dT	MOSFET dv/dt ruggedness	50	V/ns
	Reverse diode dv/dt	24	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	0.6	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Steady State (Note 4)	50.6	$^\circ\text{C/W}$

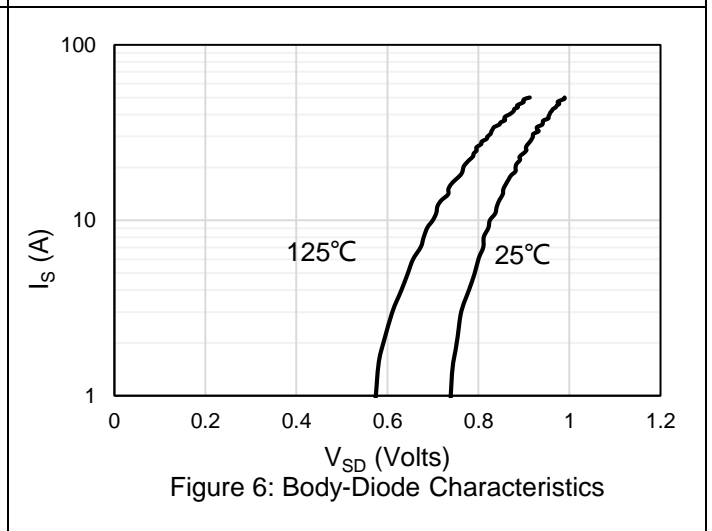
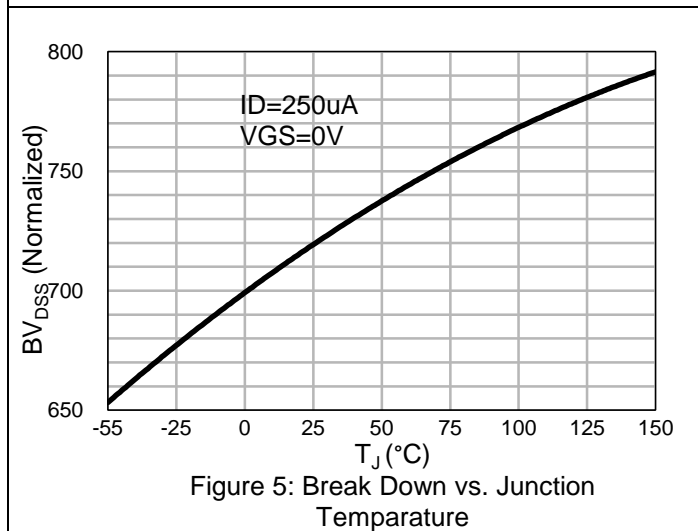
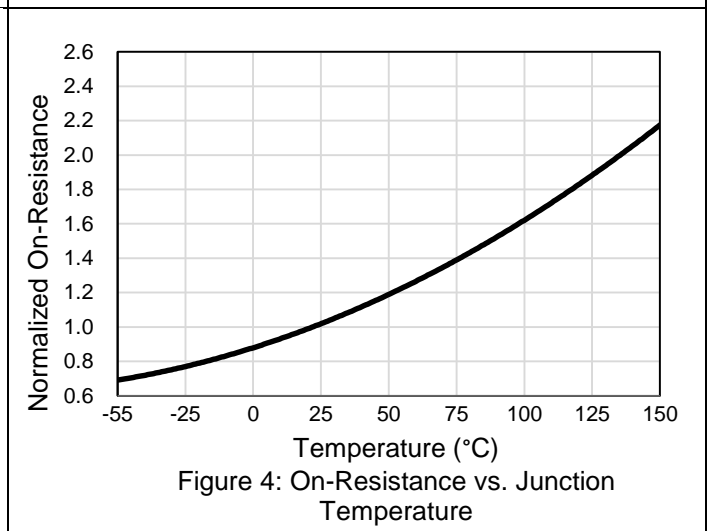
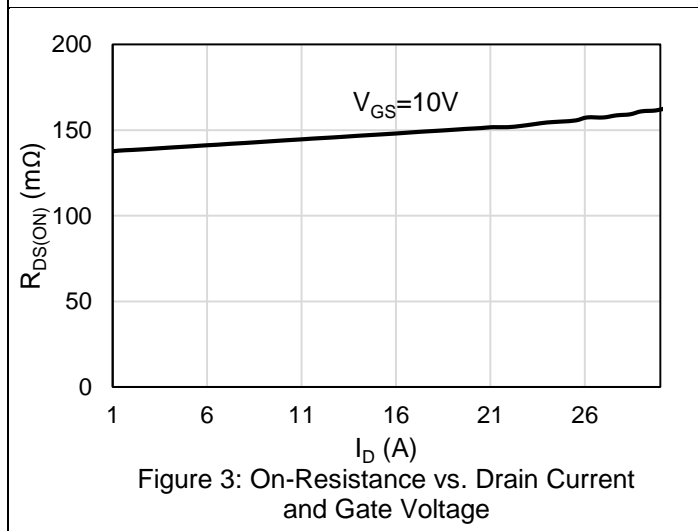
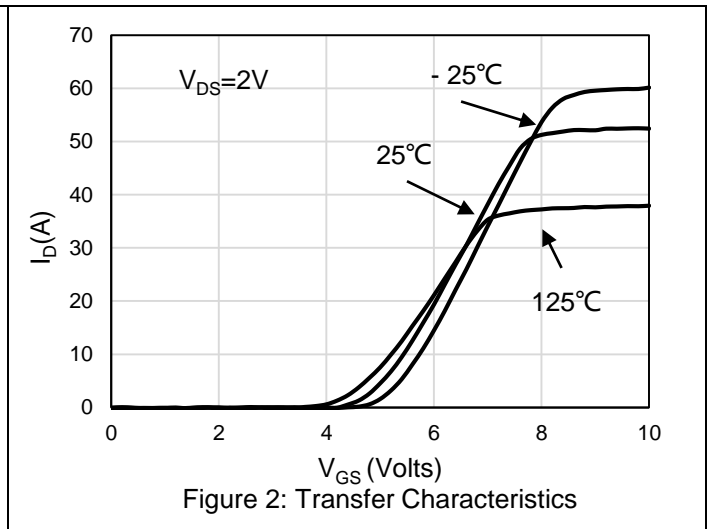
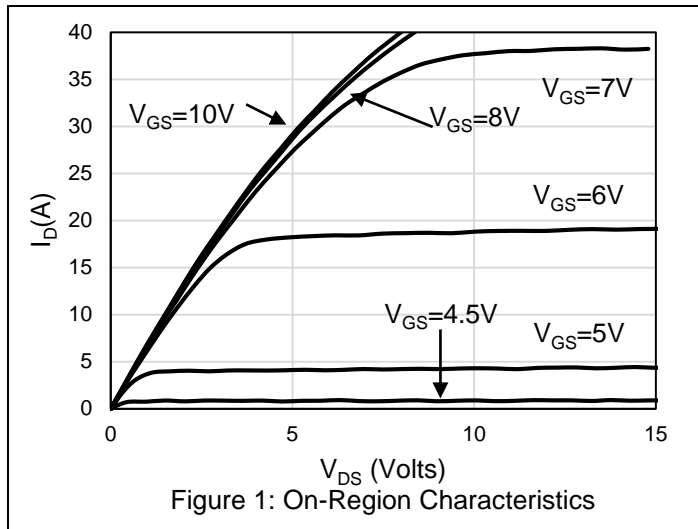
Notes:

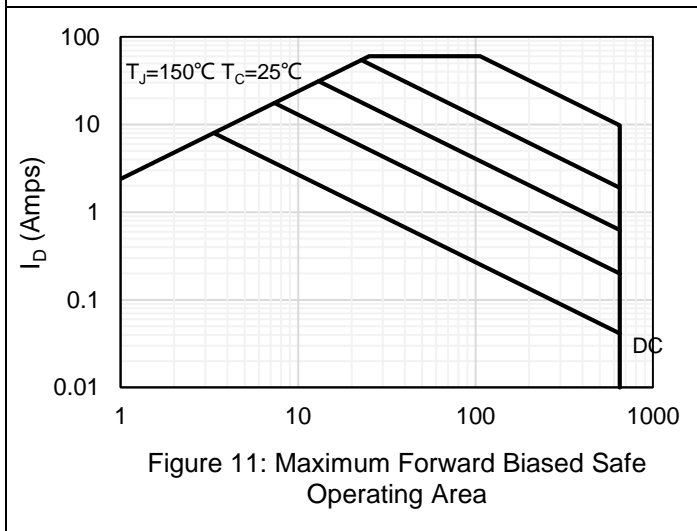
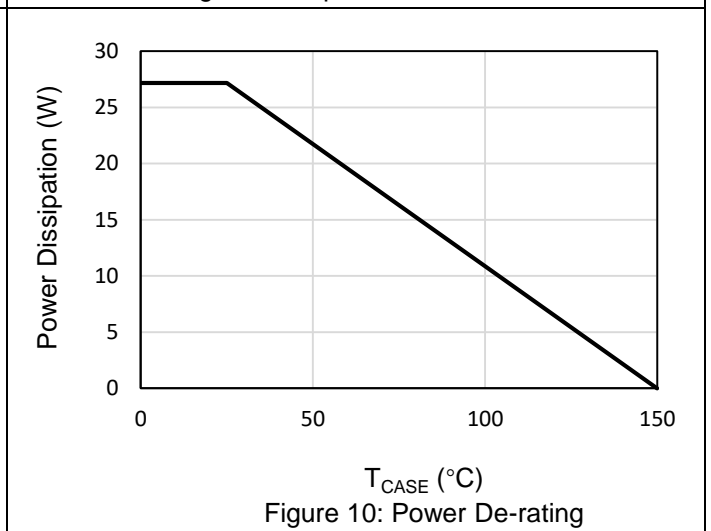
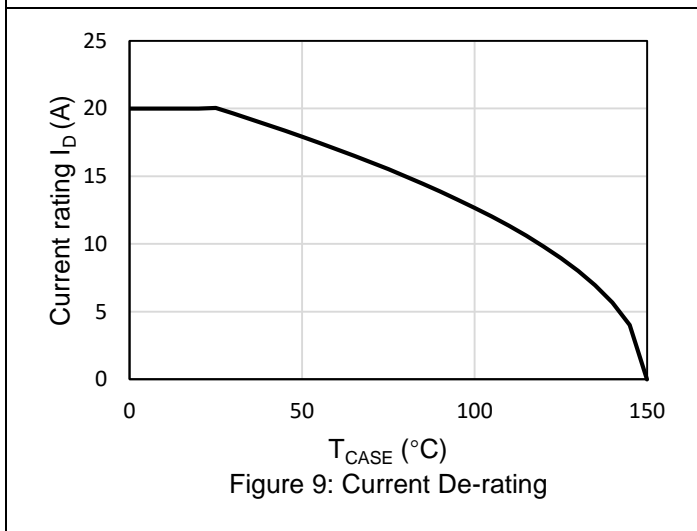
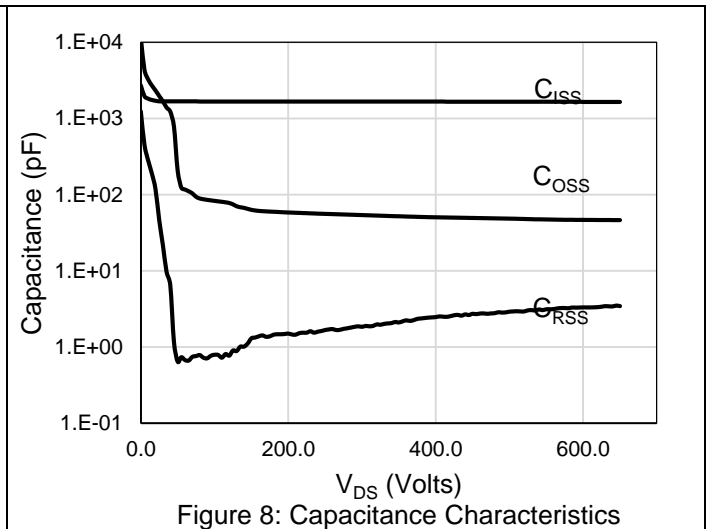
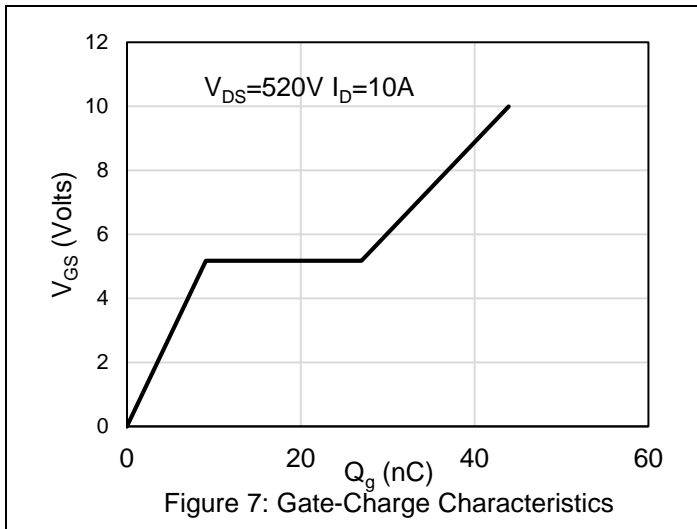
1. The max drain current rating limited by package and maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 10.8 \text{ mH}$, $V_{DD} = 150\text{V}$, $I_{AS} = 8.5\text{A}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$, guarantee by design
4. Mount on minimum PCB layout

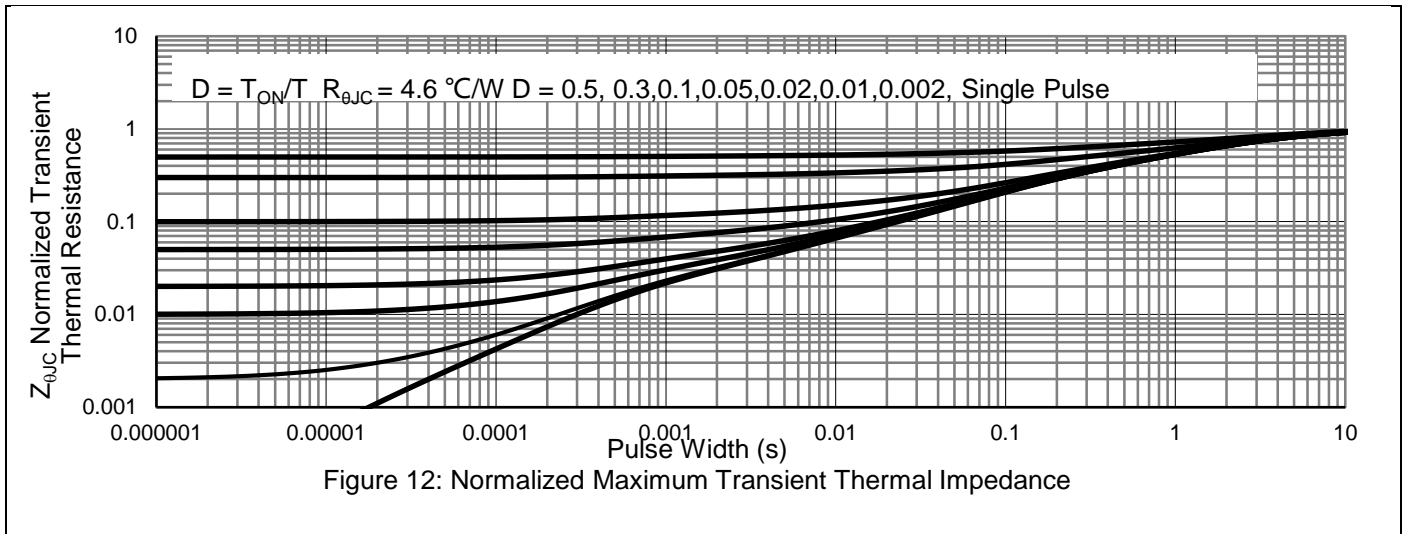
Electrical Characteristics (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA T _J = 25°C	650			V
		V _{GS} = 0 V, I _D = 250 μA T _J = 150°C	750			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V, T _J = 25°C			1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 150°C			100	
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 = 250 μA	2.6	3.3	4	V
R _{DS(ON)}	Drain-Source on-state resistance	V _{GS} = 10 V, I _D = 4A		140	190	mΩ
g _{FS}	Forward Transconductance	V _{DS} = 10V, I _D = 4A		9		S
Dynamic Characteristics						
C _{ISS}	Input capacitance	V _{DS} = 100 V, V _{GS} = 0 V, f = 100 KHZ		1670		pF
C _{OSS}	Output capacitance			83.1		pF
C _{RSS}	Reverse transfer capacitance			0.8		pF
R _G	Gate resistance	f = 1 MHz		20		Ω
Switching Characteristics						
T _{D(ON)}	Turn On Delay Time	V _{DS} = 520 V, I _D = 20 A, V _{GS} = 10 V, R _{GEN} = 25 Ω		49.8		ns
T _R	Rising Time			61.4		ns
T _{D(OFF)}	Turn Off Delay Time			195.8		ns
T _F	Fall Time			55.8		ns
Q _G	Total Gate Charge	V _{DS} = 520 V, I _D = 10 A, V _{GS} = 10 V		44		nC
Q _{GS}	Gate-Source Charge			9		nC
Q _{GD}	Gate-Drain Charge			18		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Body-Diode Forward Current				20	A
I _{SM}	Maximum Pulsed Body-Diode Forward Current (NOTE 1)				60	A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 8 A		0.81		V
T _{RR}	Reverse recovery time	I _F = 20 A, dI/dT = 100 A/μS		350		ns
Q _{RR}	Reverse recovery charge			6.2		μC
I _{RM}	Peak Reverse Recovery Current			36		A

Electrical Characteristics Diagrams





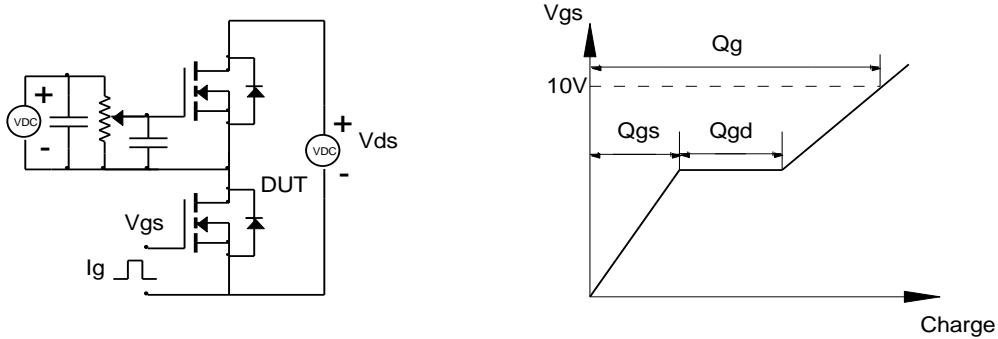


Notes:

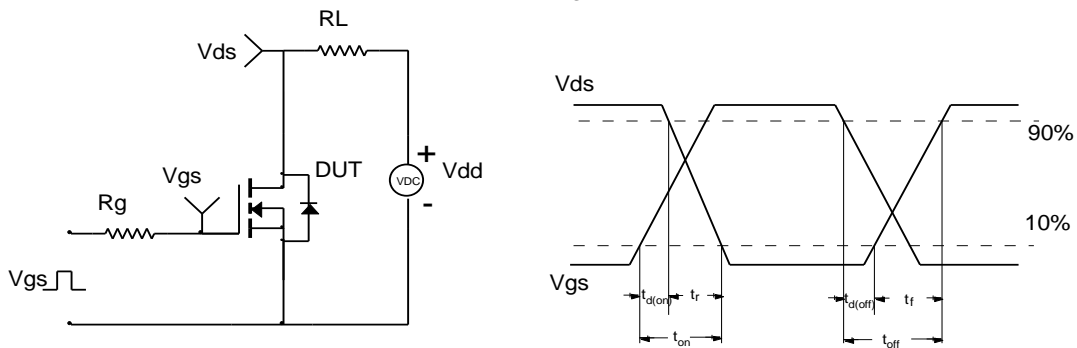
1. Pulse Test: Pulse width ≤ 300 us, Duty cycle ≤ 2%
2. Essentially independent of operating temperature

Test Circuit and Waveform

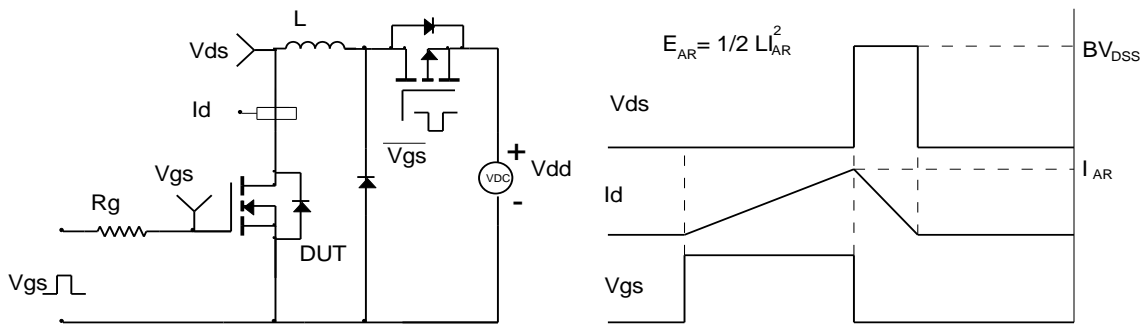
Gate Charge Test Circuit & Waveform



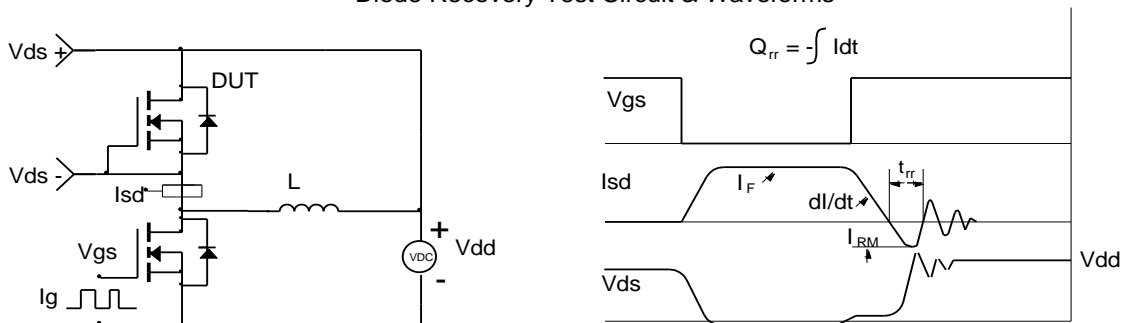
Resistive Switching Test Circuit & Waveforms



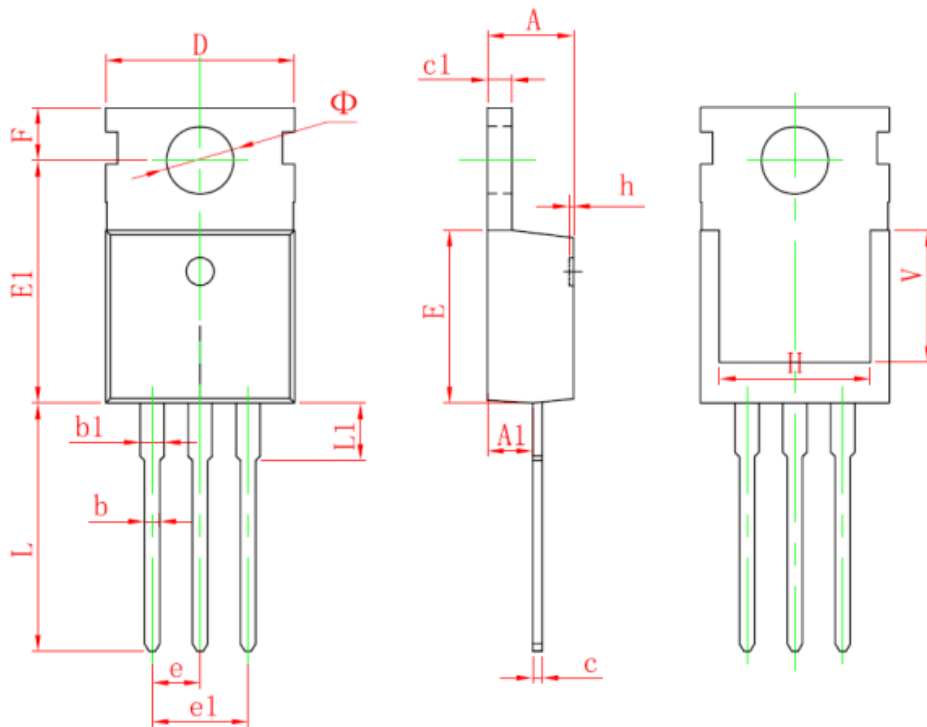
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outlines



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	13.050	0.498	0.514
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150

Marking Information



Note:

YYWW = Date code

S65N1K9FM = Product Name Code

Contact ALKAIDSEMI sales for detail information

Revision History

Revision	Release Date	Remark
Rev.1.0	2022-04-10	Initial release

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.