

650V 360mohm Super-Junction Power MOSFET
AKS65N3K6FM

Description:

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

Features:

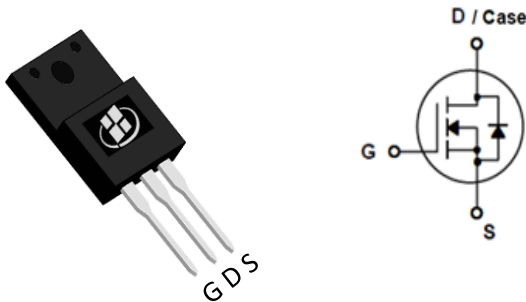
- Low FOM $R_{DS(ON)} \times Q_G$
- Better EMI
- 100% UIS tested
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

Applications:

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

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	650	V
$R_{DS(ON), max} @ V_{GS} = 10V$	360	mΩ
I_D	11	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKS65N3K6FM	TO-220F	S65N3K6FM	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)	11	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	7	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	33	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy ^(Note 3)	80	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	23	W
dV/dT	MOSFET dv/dt ruggedness ($V_{DS}=0\dots 400\text{V}$)	130	V/ns
	Reverse diode dv/dt ($V_{DS}=0\dots 400\text{V}$)	33	
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	5.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady-State ^(Note 4)	55	$^\circ\text{C/W}$

Notes:

1. The max drain current limited by maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 10\text{ mH}$, $V_{DD} = 150\text{V}$, $I_{AS} = 4\text{A}$, $R_G = 25\ \Omega$, 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	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	650			V
		$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ $T_J = 150^\circ\text{C}$	700			
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V},$			1	μA
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V},$ $T_J = 150^\circ\text{C}$			100	
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}$		300	360	m Ω

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		841		pF
C_{OSS}	Output Capacitance			45.1		pF
C_{RSS}	Reverse Transfer Capacitance			2.8		pF
R_G	Gate Resistance	$F = 1\text{ MHz}$		5		Ω

Switching Characteristics

$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 520\text{ V}, I_D = 5.5\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 25\Omega$		18.2		nS
T_R	Rise Time			25.8		nS
$T_{D(OFF)}$	Turn Off Delay Time			81.8		nS
T_F	Fall Time			26.8		nS
Q_G	Total Gate Charge	$V_{DD} = 520\text{ V}, I_D = 5.5\text{ A},$ $V_{GS} = 10\text{ V}$		23.3		nC
Q_{GS}	Gate-Source Charge			5.5		nC
Q_{GD}	Gate-Drain Charge			9.7		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Body-Diode Forward Current			11	A
I_{SM}	Maximum Pulsed Body-Diode Forward Current ^(NOTE 1)			33	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 11\text{ A}$		0.85	V
T_{RR}	Reverse recovery time	$V_{DD} = 100\text{ V}, I_D = 5.5\text{ A},$ $di/dt = 100\text{ A}/\mu\text{S}$		250	ns
Q_{RR}	Reverse recovery charge			2.55	μC
I_{RRM}	Peak Reverse Recovery Current			-22.3	A

Electrical Characteristics Diagrams

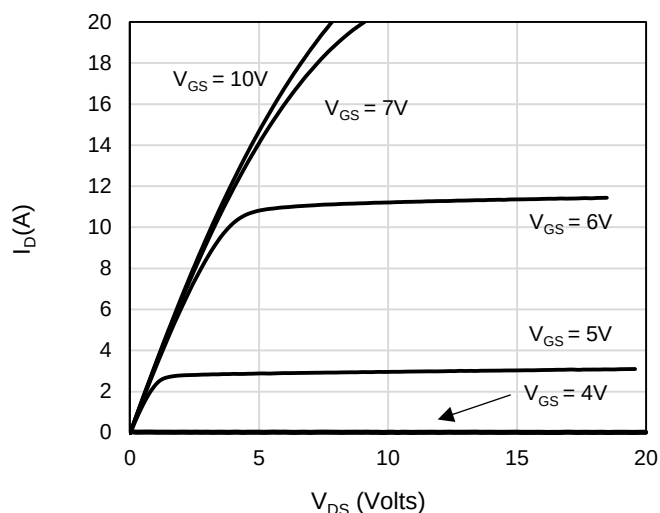


Figure 1: On-Region Characteristics

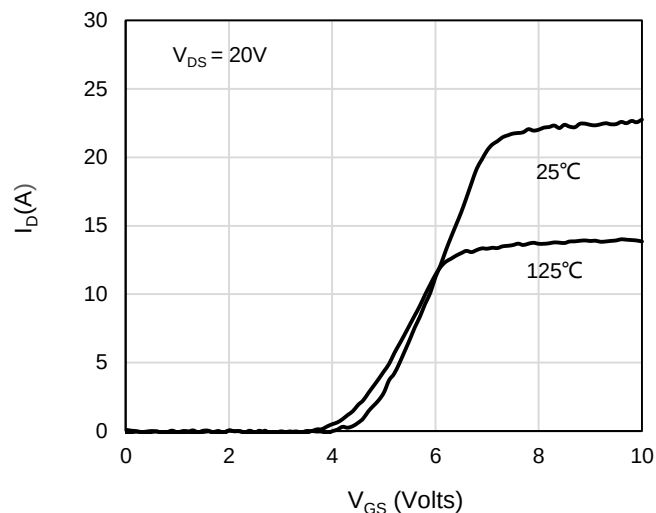


Figure 2: Transfer Characteristics

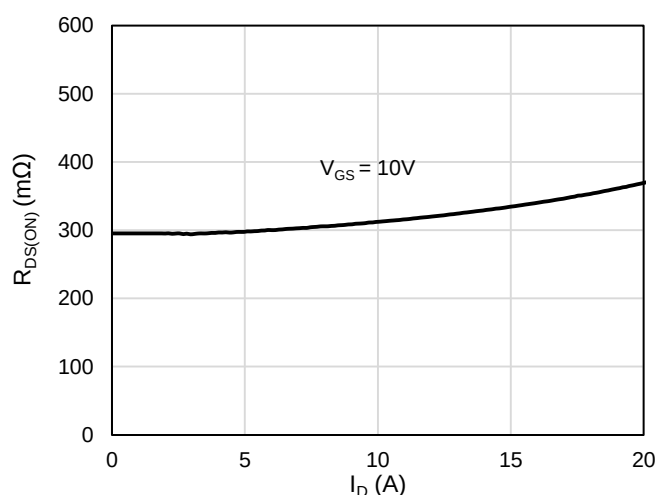


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

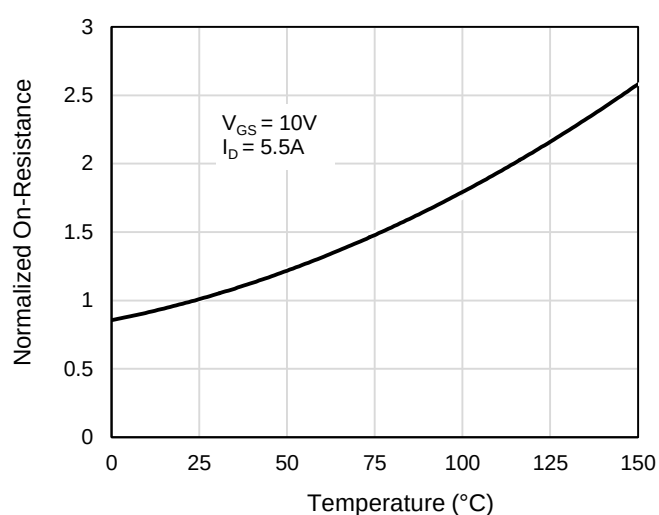


Figure 4: On-Resistance vs. Junction Temperature

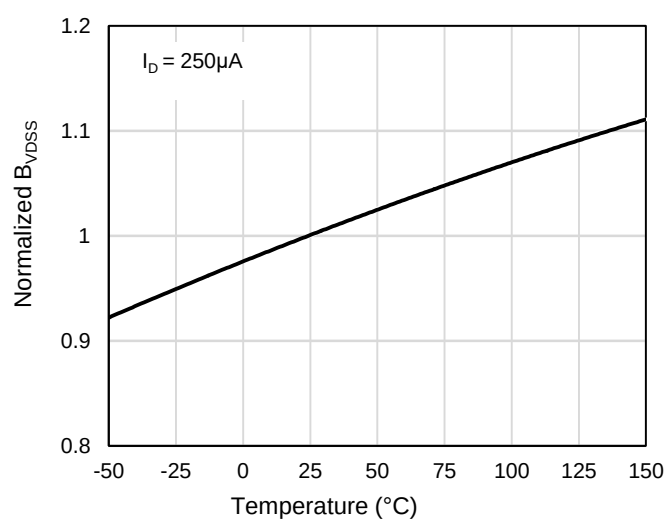


Figure 5: Breakdown Voltage vs. Junction Temperature

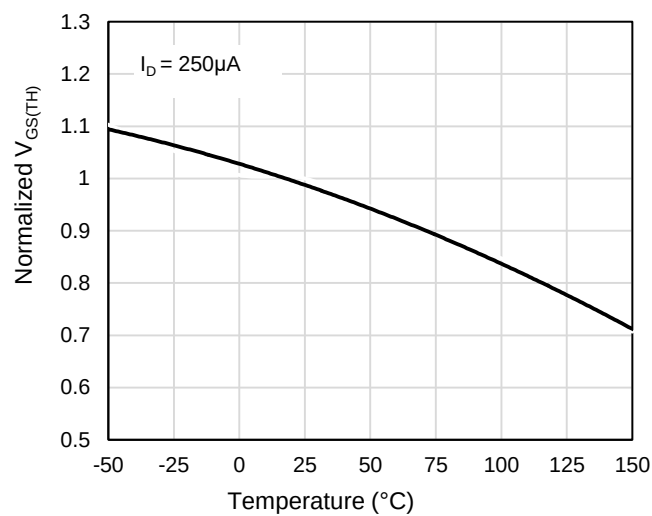


Figure 6: Threshold Voltage vs. Junction Temperature

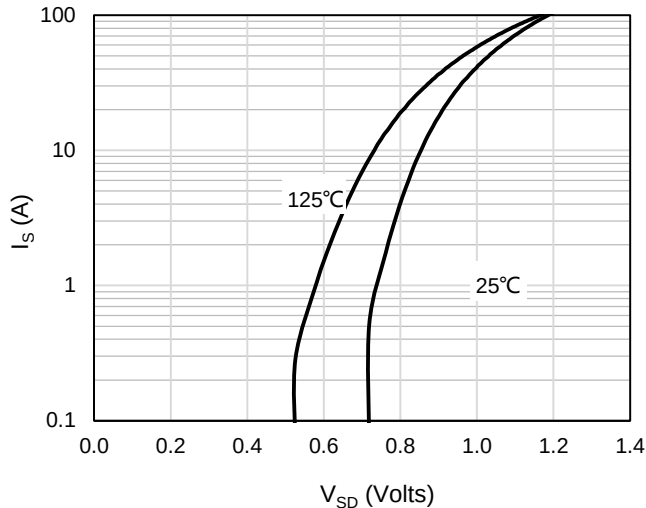


Figure 7: Body-Diode Characteristics

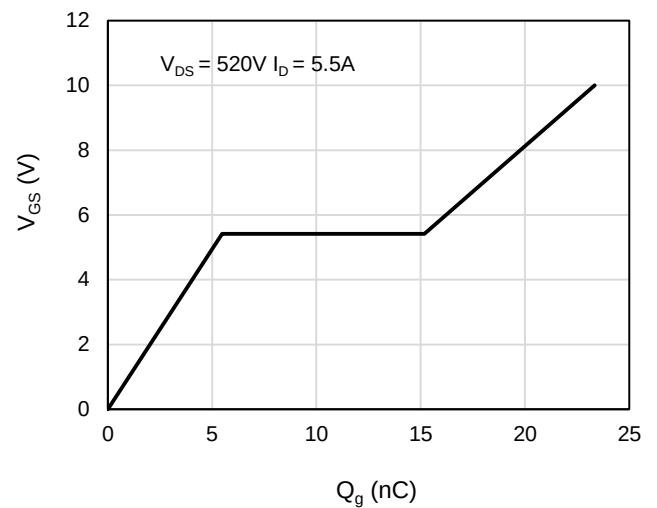


Figure 8: Gate-Charge Characteristics

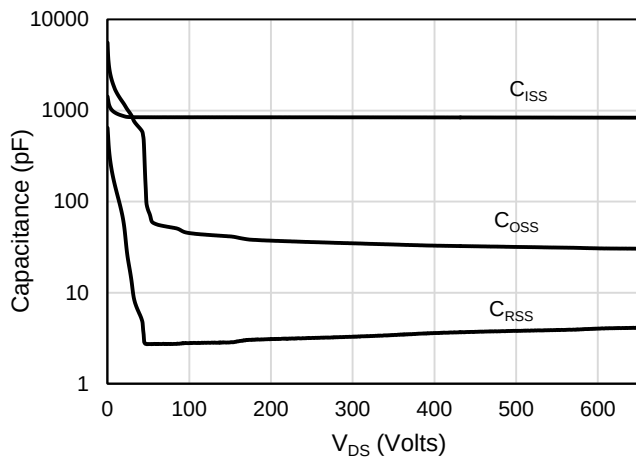


Figure 9: Capacitance Characteristics

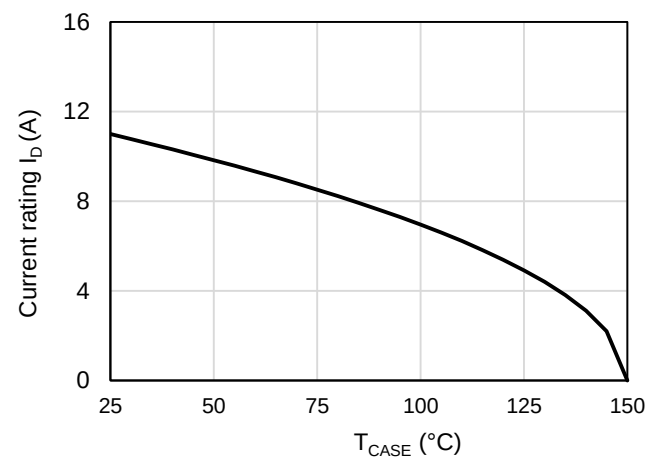


Figure 10: Current De-rating(Note 1)

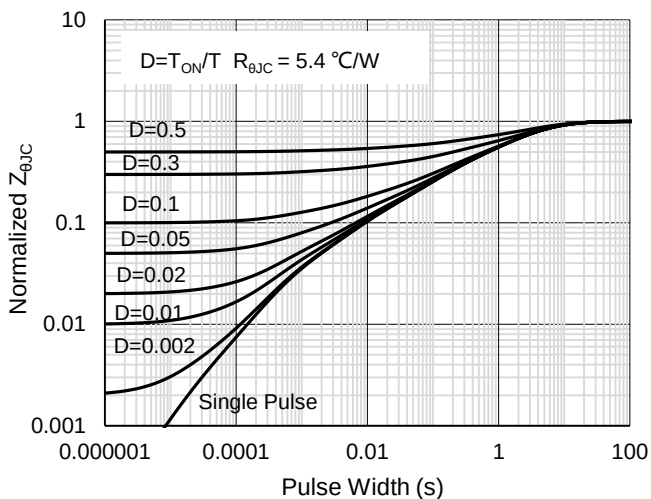


Figure 11: Normalized Maximum Transient Thermal Impedance

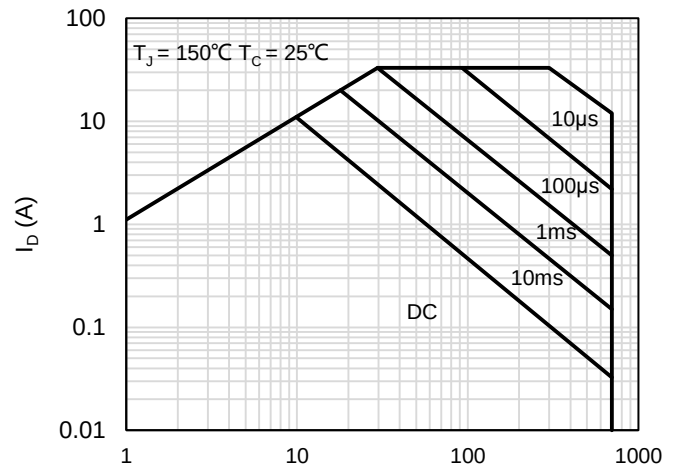
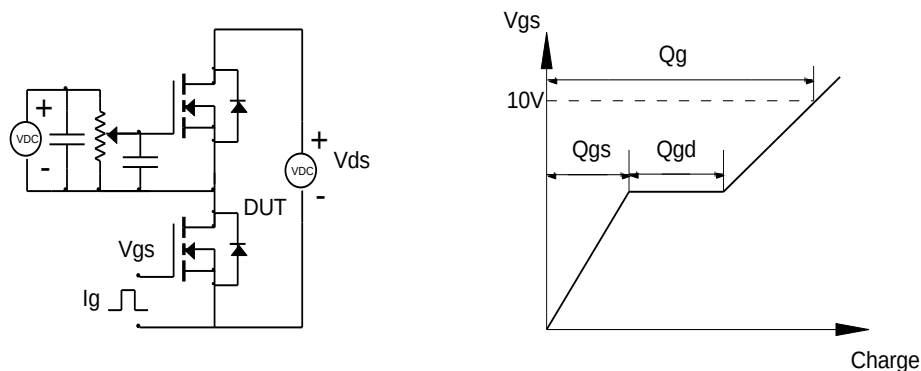


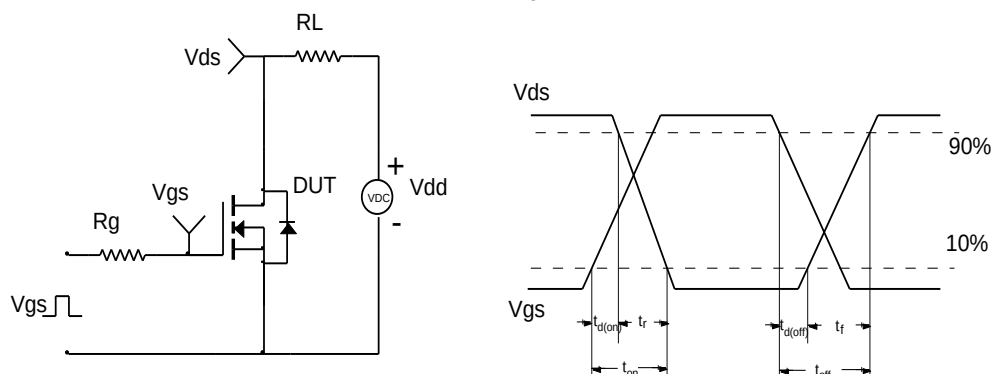
Figure 12: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

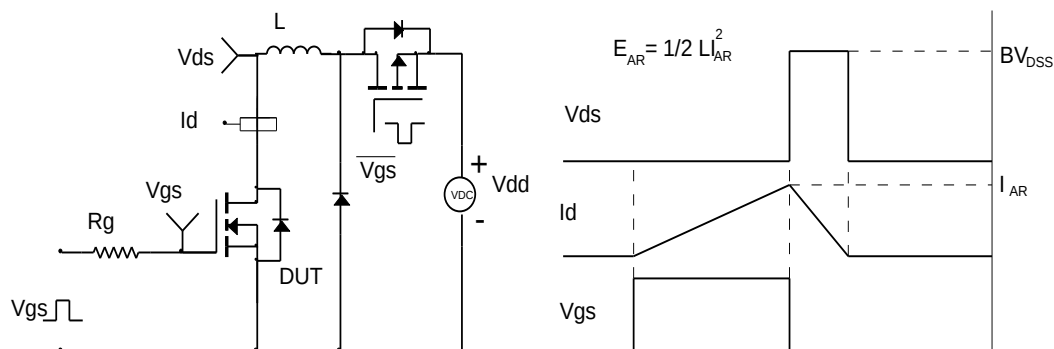
Gate Charge Test Circuit & Waveform



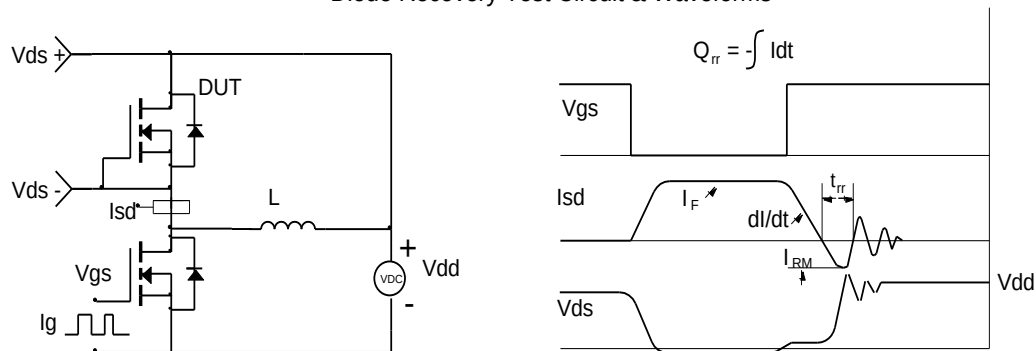
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Release Date	Remark
Rev.1.2	2023/7/10	

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.