

650V 360mohm Super-Junction Power MOSFET

AK2S65N3K6KM

Description:

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

Features:

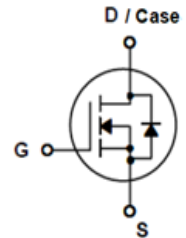
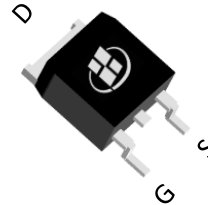
- EMI-Friendly
- RoHS compliant
- Halogen-free

Applications:

- High Frequency Switching
- Quick Charging and Adapter

Key Performance Parameters:

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



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AK2S65N3K6KM	TO-252	2S65N3K6KM	Tape Reel	2500 per reel

Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V _{DS}	Drain - Source Voltage	650	V
I _D	Drain Current - Continuous (T _C = 25°C) ^(Note 1)	11	A
	Drain Current - Continuous (T _C = 100°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)	72	mJ
P _D	Power Dissipation (T _C = 25°C)	113	W
dV/dT	MOSFET dv/dt ruggedness, V _{DS} = 0...400 V	40	V/ns
	Reverse diode dv/dt, V _{DS} = 0...400 V	20	V/ns
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	Value	Units
R _{θJC}	Thermal Resistance, Junction - to - Case, Steady State	1.1	°C/W
R _{θJA}	Thermal Resistance, Junction - to - Ambient, Steady State ^(Note 4)	60	°C/W

Notes:

1. The max drain current rating limited by maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L = 23 mH, V_{DD} = 100 V, I_{AS} = 2.5 A, R_G = 25 Ω, Starting T_J = 25 °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						
$V_{(BR)DSS}$	Drain - Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2	3.5	5	V
$R_{DS(ON)}$	Drain - Source on - state resistance	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		310	360	m Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		600		pF
C_{oss}	Output Capacitance			20		pF
C_{rss}	Reverse Transfer Capacitance			5.8		pF
$C_{o(er)}$	Effective output capacitance, energy related	$V_{DS} = 0\dots 400\text{ V}, V_{GS} = 0\text{ V}$		30		pF
$C_{o(tr)}$	Effective output capacitance, time related	$V_{DS} = 0\dots 400\text{ V}, V_{GS} = 0\text{ V}, I_D = \text{constant}$		170		pF
R_g	Gate Resistance	$f = 1\text{ MHz}$		3.5		Ω
Switching Characteristics						
$t_{d(on)}$	Turn On Delay Time	$V_{DD} = 400\text{ V}, I_D = 6\text{ A}, V_{GS} = 10\text{ V}, R_G = 50\ \Omega$		90		ns
t_r	Rise Time			33		ns
$t_{d(off)}$	Turn Off Delay Time			64		ns
t_f	Fall Time			12		ns
Q_g	Total Gate Charge	$V_{DD} = 400\text{ V}, I_D = 5\text{ A}, V_{GS} = 10\text{ V}$		22		nC
Q_{gs}	Gate - Source Charge			2		nC
Q_{gd}	Gate - Drain Charge			11		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				33	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 5\text{ A}$		0.82		V
t_{rr}	Reverse recovery time	$V_{DD} = 400\text{ V}, I_D = 5\text{ A}, di/dt = 400\text{ A}/\mu\text{s}$		68		ns
Q_{rr}	Reverse recovery charge			0.9		μC
I_{rrm}	Peak Reverse Recovery Current			30		A

Electrical Characteristics Diagrams

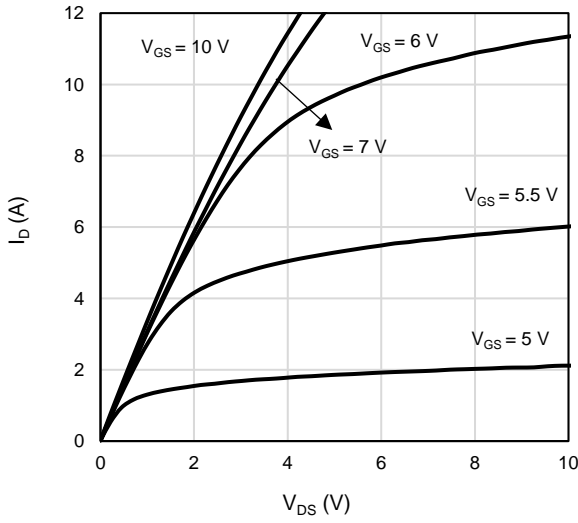


Figure 1: On-Region Characteristics

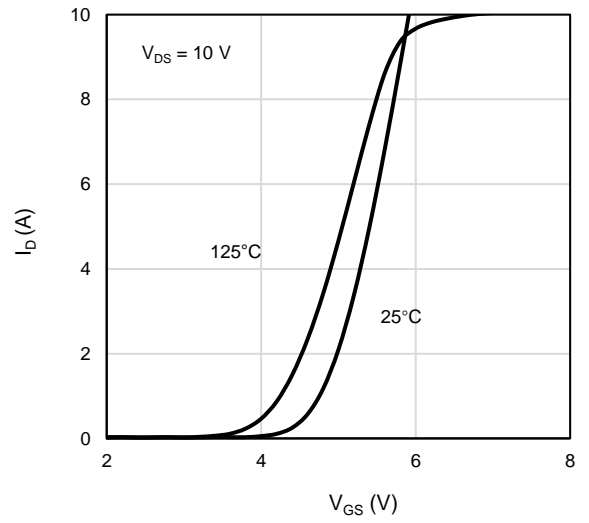


Figure 2: Transfer Characteristics

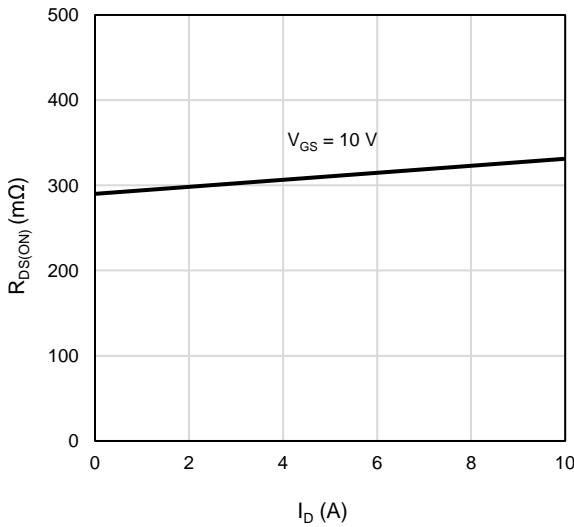


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

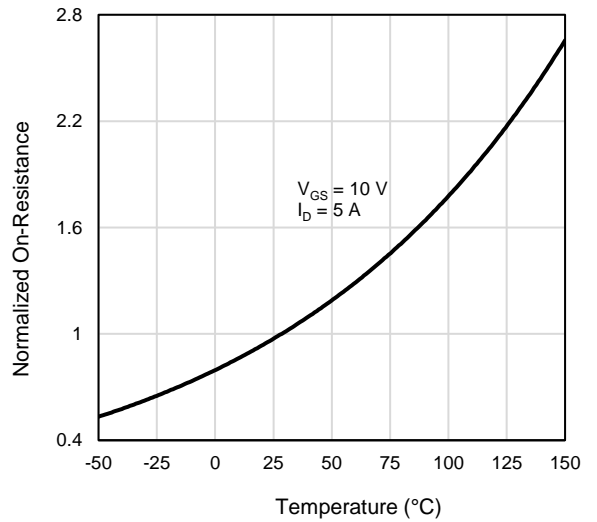


Figure 4: On-Resistance vs. Junction Temperature

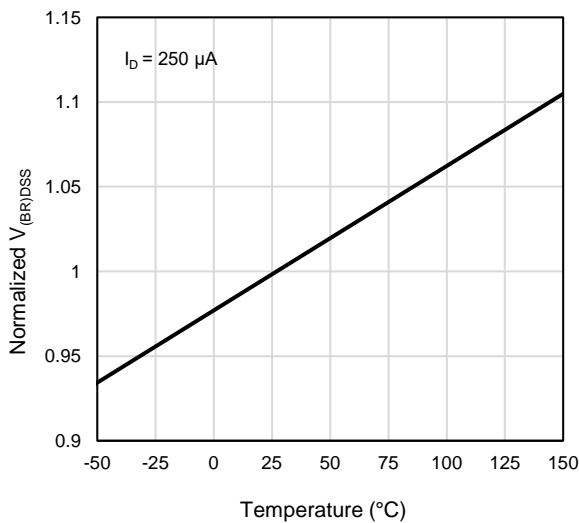


Figure 5: Breakdown Voltage vs. Junction Temperature

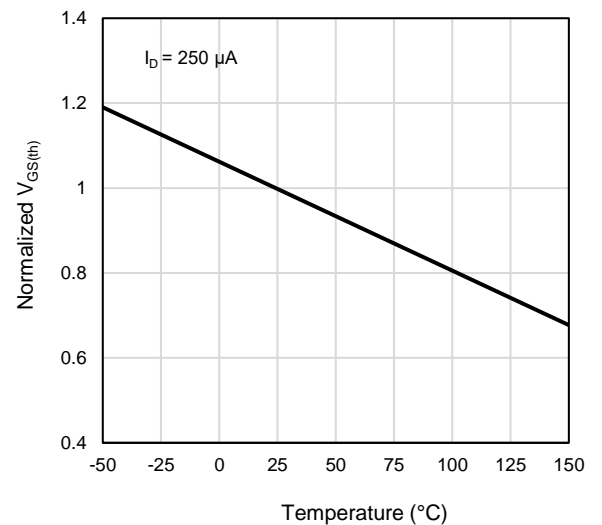


Figure 6: Threshold Voltage vs. Junction Temperature

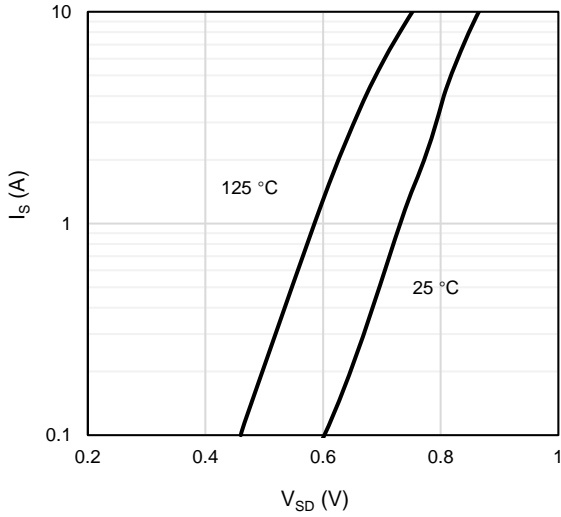


Figure 7: Body-Diode Characteristics

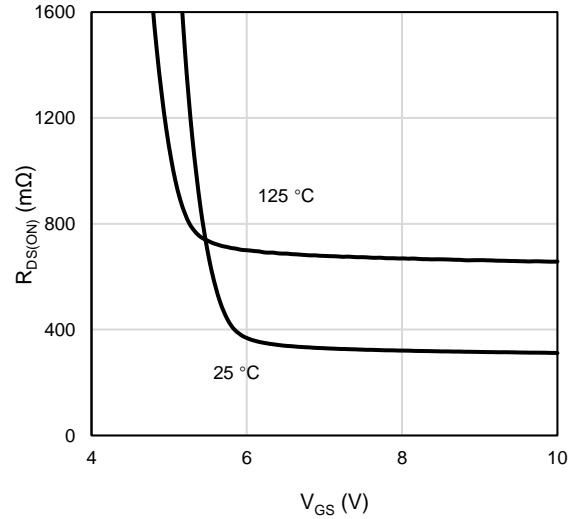


Figure 8: On-Resistance vs. Gate-Source Voltage

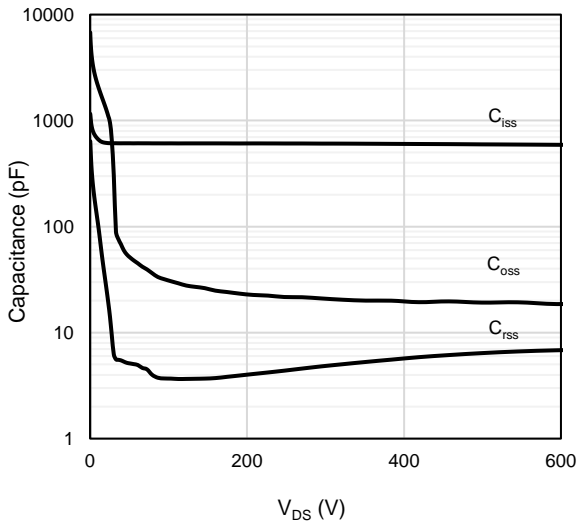


Figure 9: Capacitance Characteristics

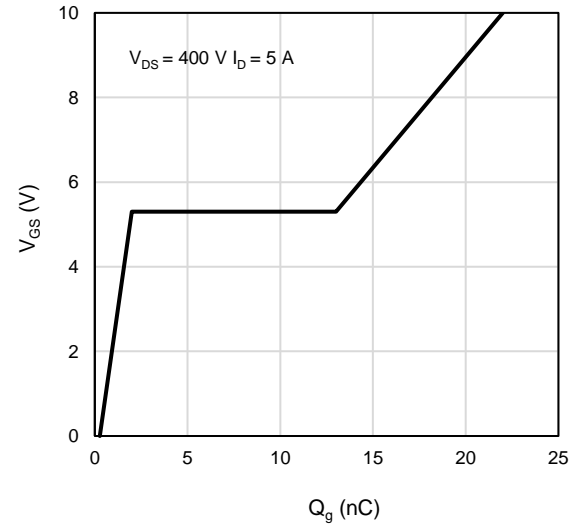


Figure 10: Gate-Charge Characteristics

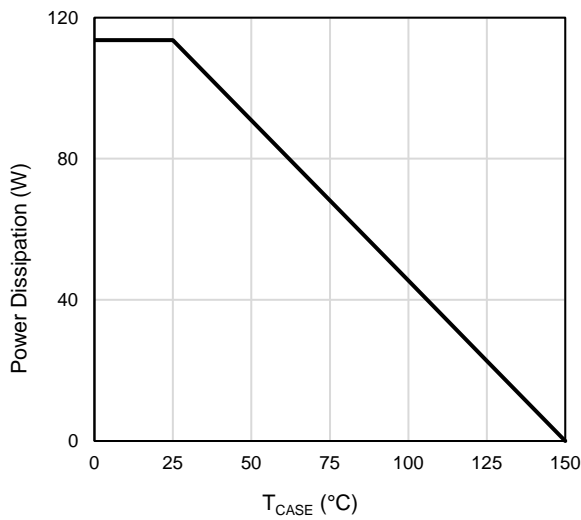


Figure 11: Power De-rating

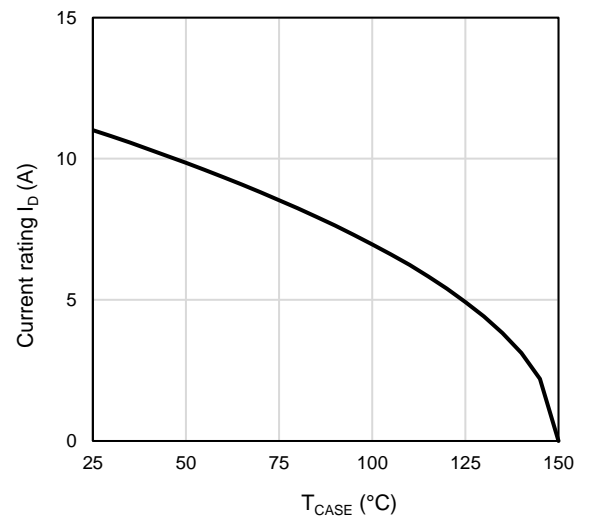


Figure 12: Current De-rating

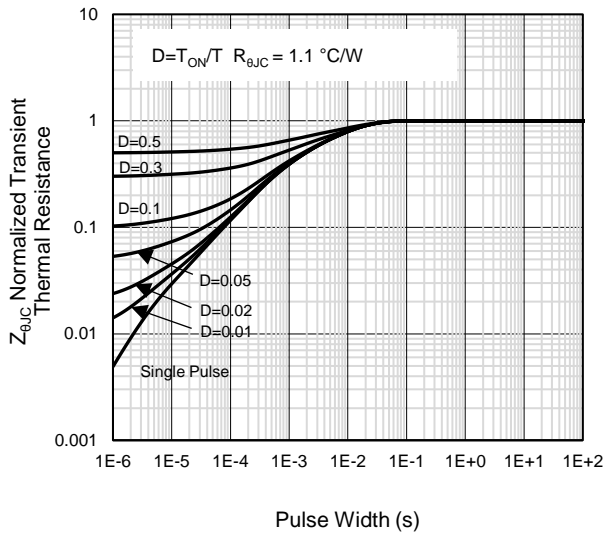


Figure 13: Normalized Maximum Transient Thermal Impedance

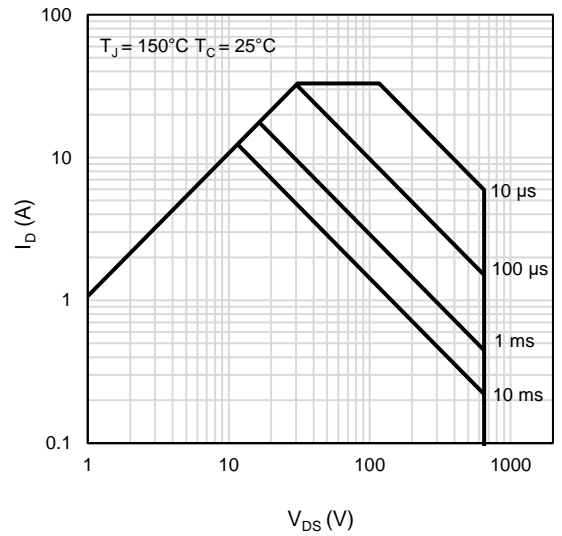
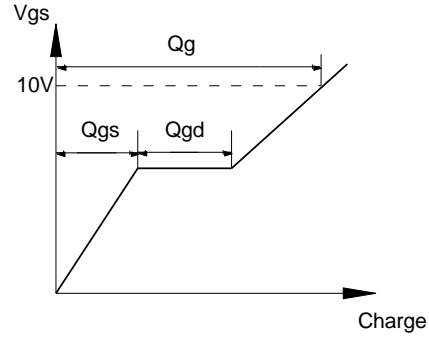
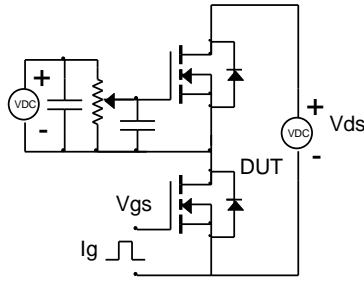


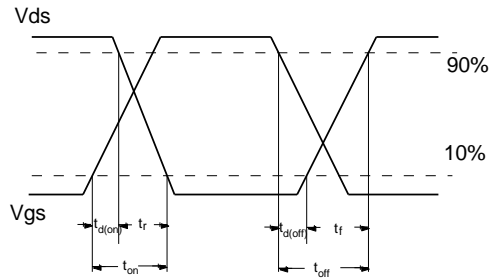
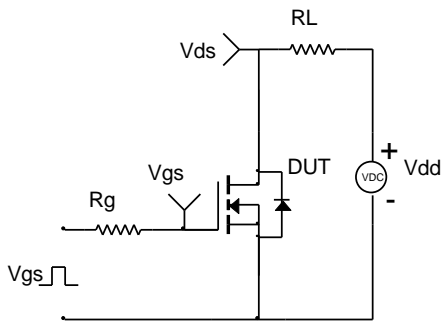
Figure 14: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

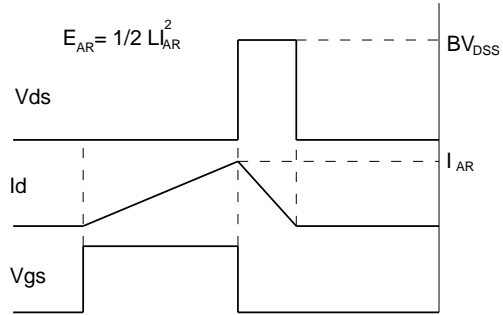
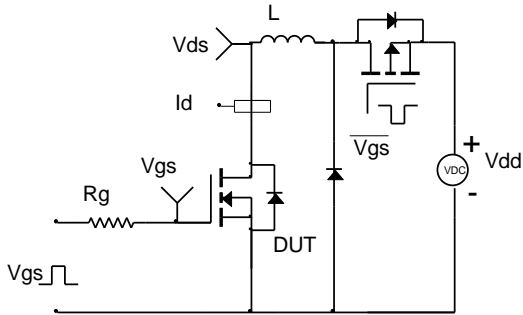
Gate Charge Test Circuit & Waveform



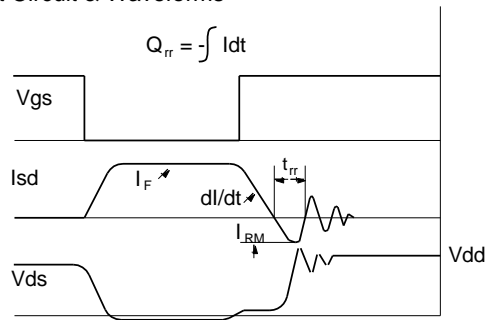
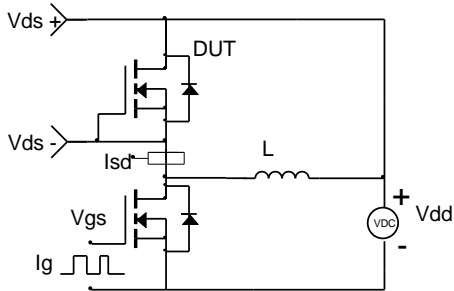
Resistive Switching Test Circuit & Waveforms



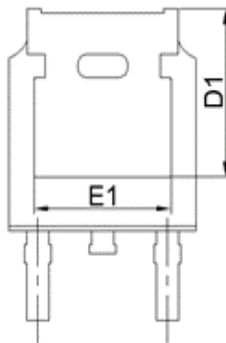
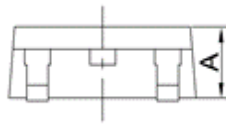
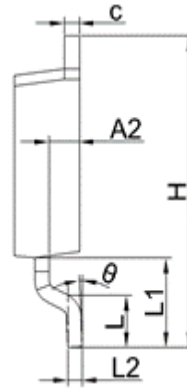
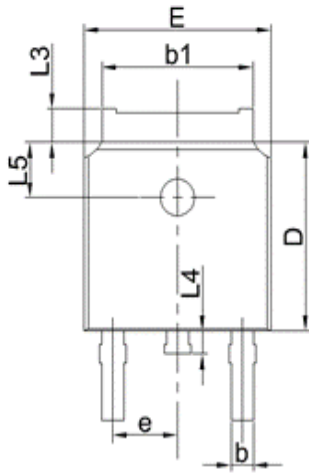
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outlines



SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	0.06	0.12
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b1	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30 REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286 BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90 REF		
L2	0.51 BSC		
L3	0.88	1.08	1.28
L4	0.50	0.75	1.00
L5	1.65	1.80	1.95
theta	0°	4°	8°

Marking Information



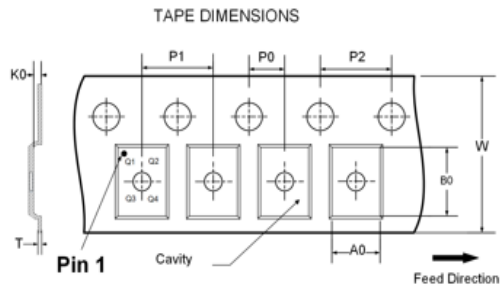
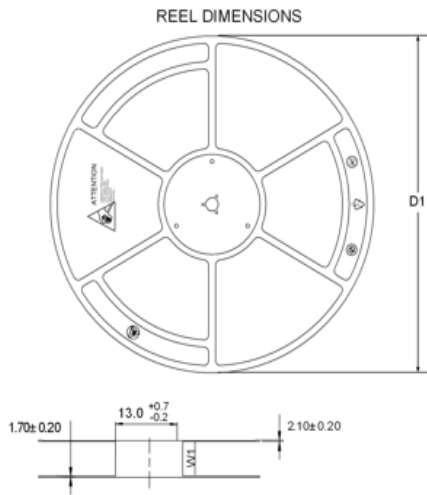
Note:

2S65N3K6KM = Product Name Code

XXXXXXX = Date code

Contact ALKAIDSEMI sales for detail information

Tape & Reel Information



- A0: Dimension designed to accommodate the component width
- B0: Dimension designed to accommodate the component length
- K0: Dimension designed to accommodate the component thickness
- W: Overall width of the carrier tape
- P0: Pitch between successive cavity centers and sprocket hole
- P1: Pitch between successive cavity centers
- P2: Pitch between sprocket hole
- T: Tape material thickness
- D1: Reel Diameter
- W1: Reel Width

DIMENSIONS(Unit:mm)										
Reel	D1	W1								Material
	330	16.4								Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
	2	8	4	16	6.9	10.5	2.7	0.3	Q1	PC
All dimensions are nominal										

Revision History

Revision	Released	Remark
Rev.1.1	2024	

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.