

650V 190mohm Super-Junction Power MOSFET

AKS65N1K9DM

Description:

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

Features:

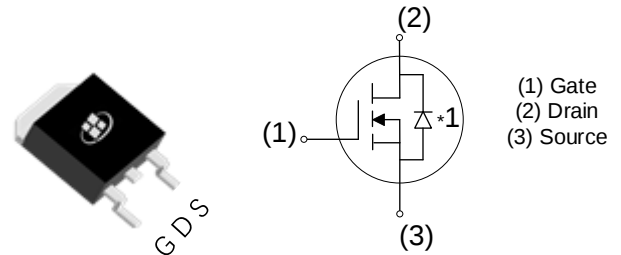
- Low FOM $R_{DS(ON)} \times Q_G$
- Better EMI
- 100% UIS and Isolation tested
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

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
AKS65N1K9DM	TO-263	S65N1K9DM	Reel	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 ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 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

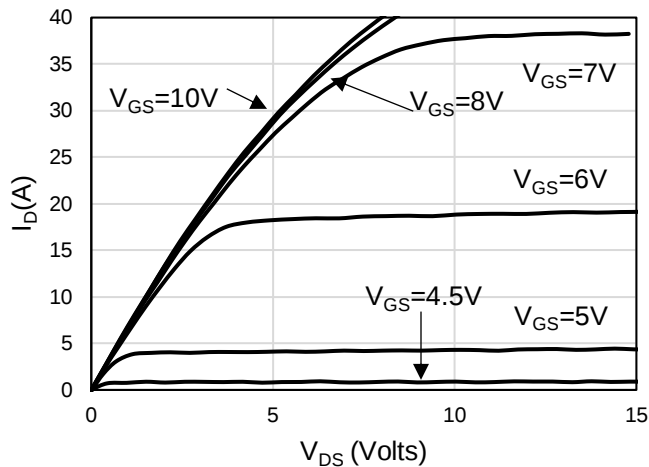


Figure 1: On-Region Characteristics

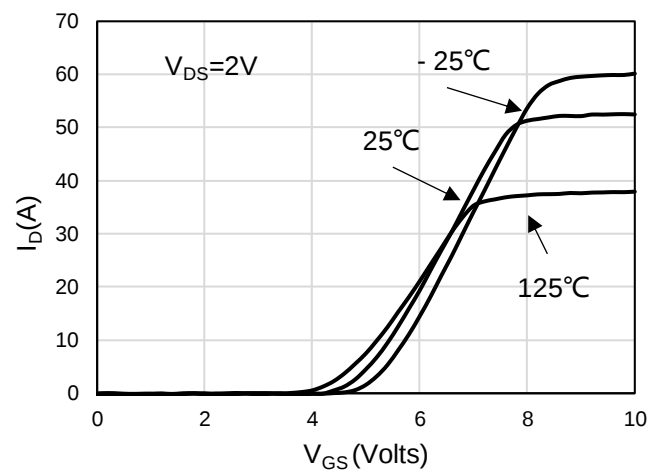


Figure 2: Transfer Characteristics

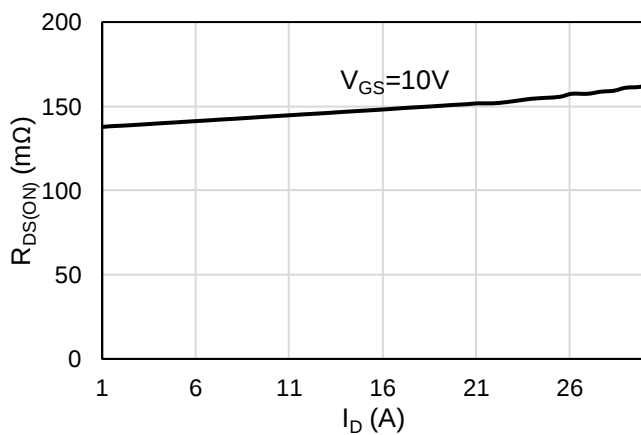


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

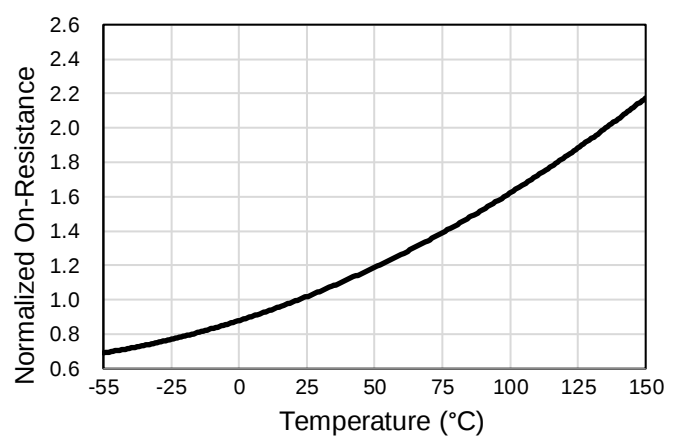


Figure 4: On-Resistance vs. Junction Temperature

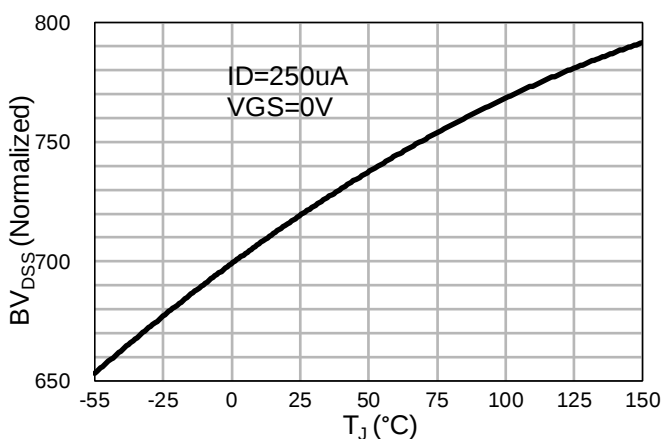


Figure 5: Break Down vs. Junction Temperature

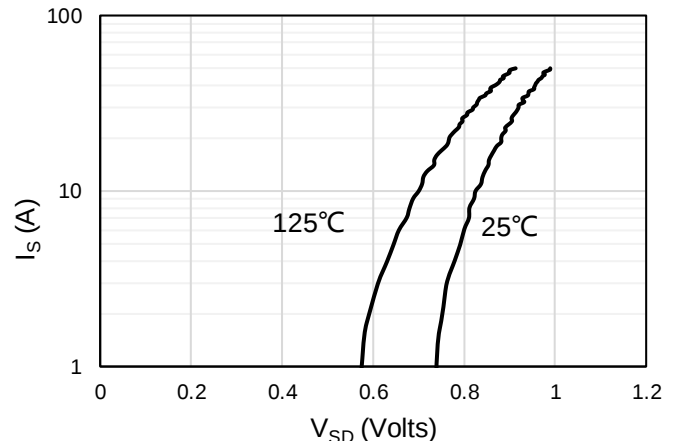


Figure 6: Body-Diode Characteristics

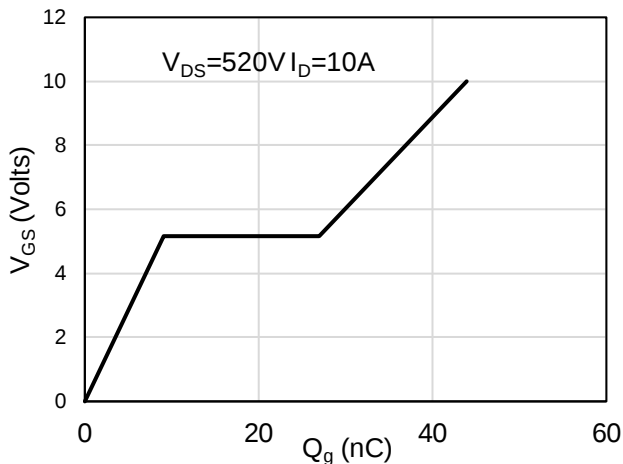


Figure 7: Gate-Charge Characteristics

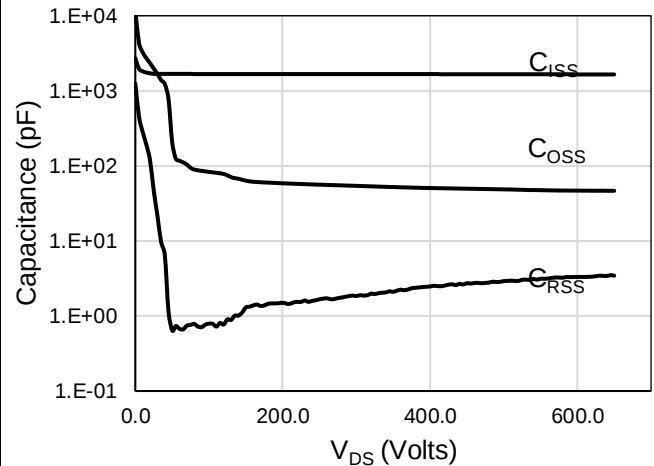


Figure 8: Capacitance Characteristics

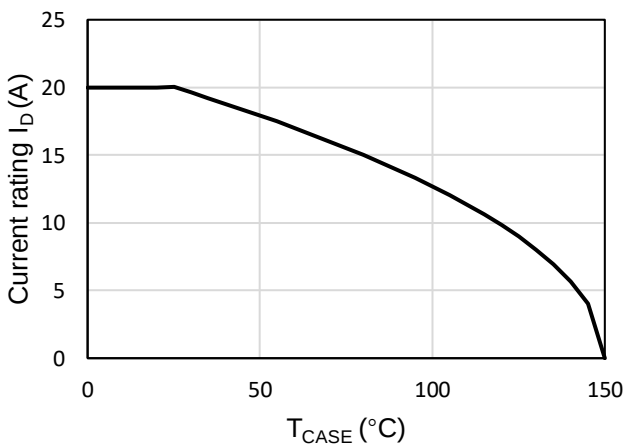


Figure 9: Current De-rating

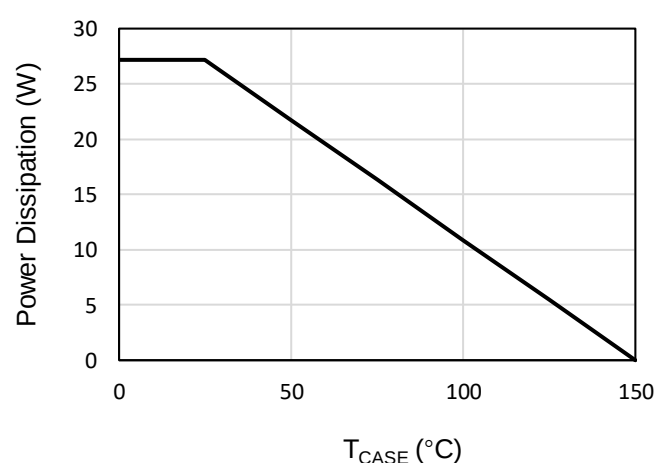


Figure 10: Power De-rating

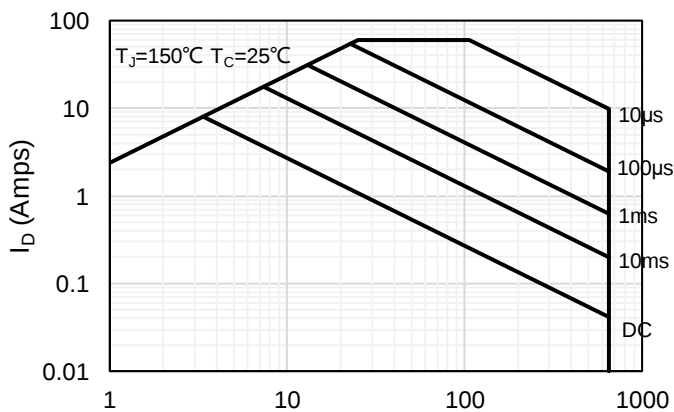


Figure 11: Maximum Forward Biased Safe Operating Area

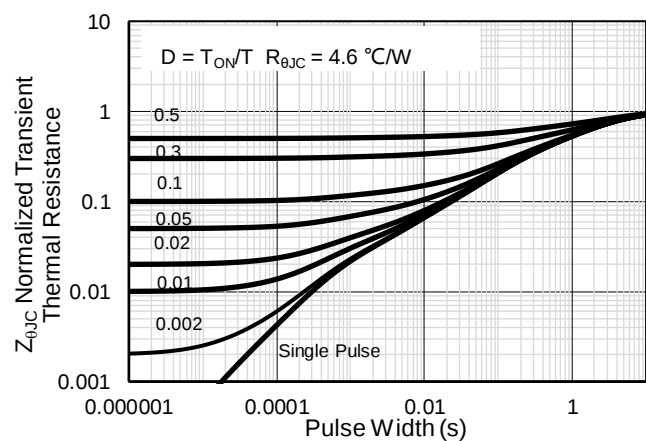


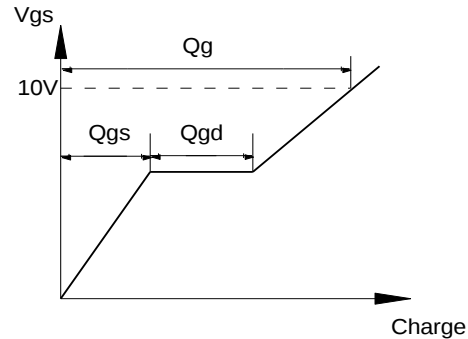
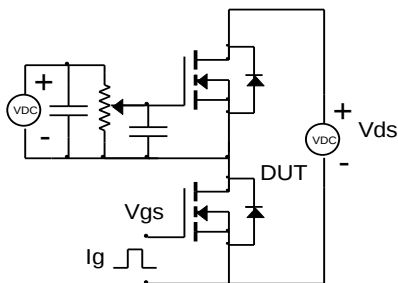
Figure 12: Normalized Maximum Transient Thermal Impedance

Notes:

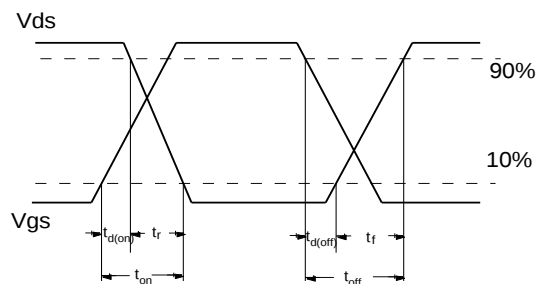
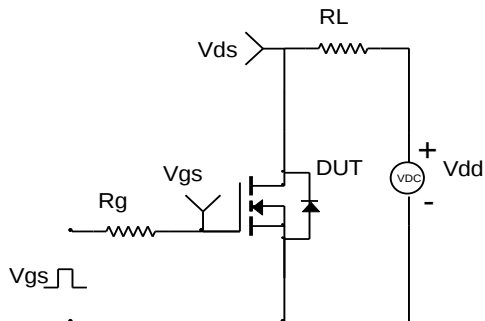
1. Pulse Test: Pulse width $\leq 300 \mu s$, Duty cycle $\leq 2\%$
2. Essentially independent of operating temperature

Test Circuit and Waveform

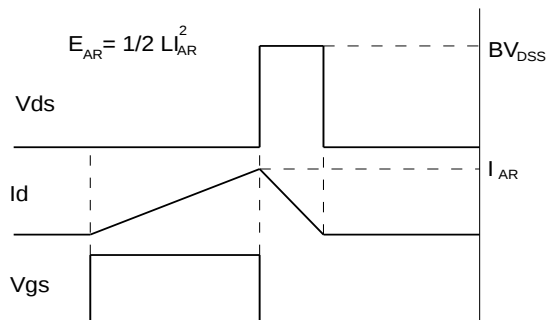
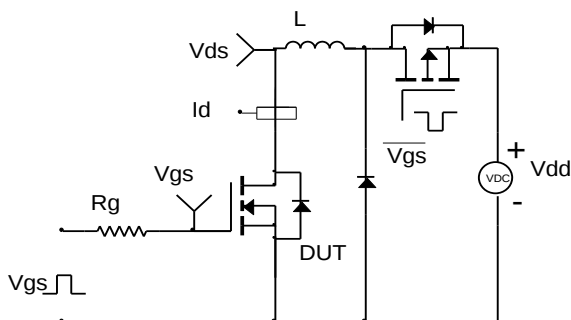
Gate Charge Test Circuit & Waveform



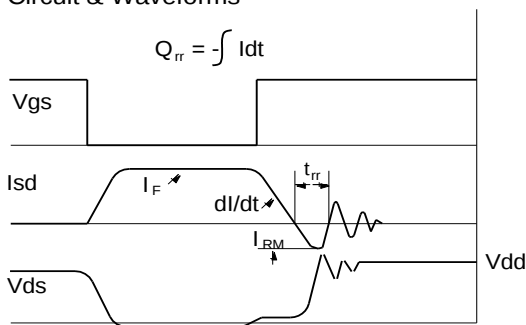
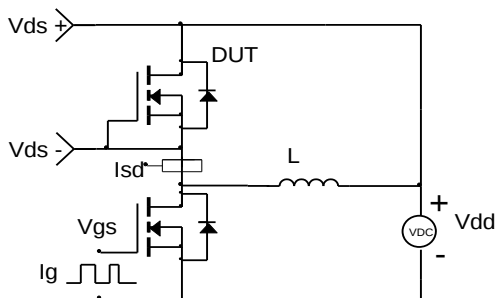
Resistive Switching Test Circuit & Waveforms



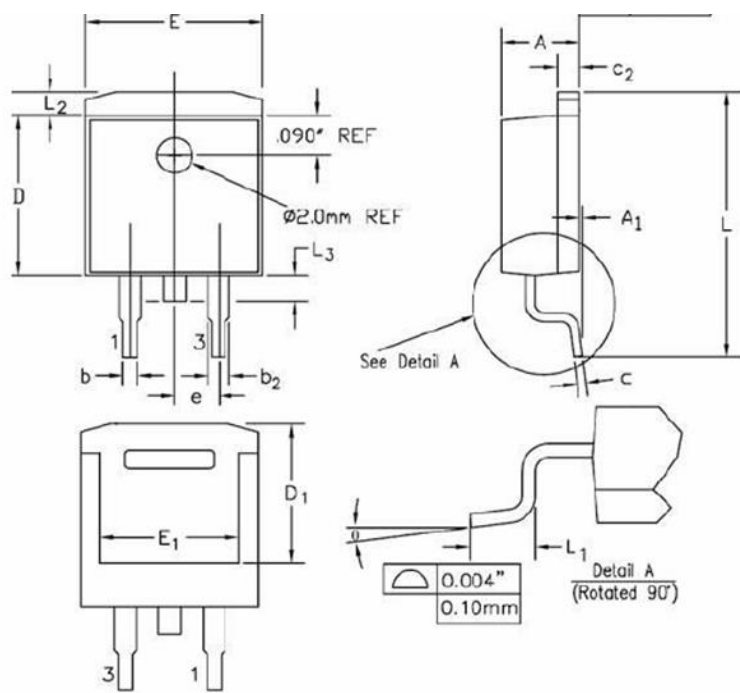
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outlines



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.170	0.180	4.32	4.57	
A1	-	0.010	-	0.25	
b	0.028	0.037	0.71	0.94	
b2	0.045	0.055	1.15	1.40	
c	0.018	0.024	0.46	0.61	
c2	0.048	0.055	1.22	1.40	
D	0.350	0.370	8.89	9.40	
D1	0.315	0.324	8.01	8.23	
E	0.395	0.405	10.04	10.28	
E1	0.310	0.318	7.88	8.08	
e	0.100 BSC.		2.54 BSC.		
L	0.580	0.620	14.73	15.75	
L1	0.090	0.110	2.29	2.79	
L2	0.045	0.055	1.15	1.39	
L3	0.050	0.070	1.27	1.77	
θ	0°	8°	0°	8°	

Marking Information



S65N1K9DM
XXXX

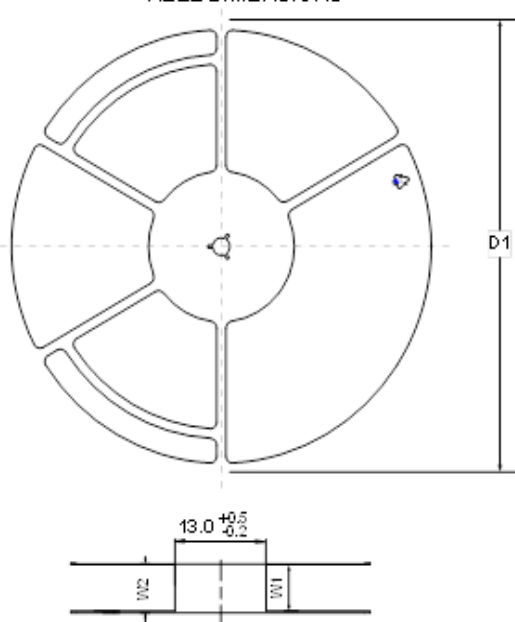
Note:

YYWW = Date code

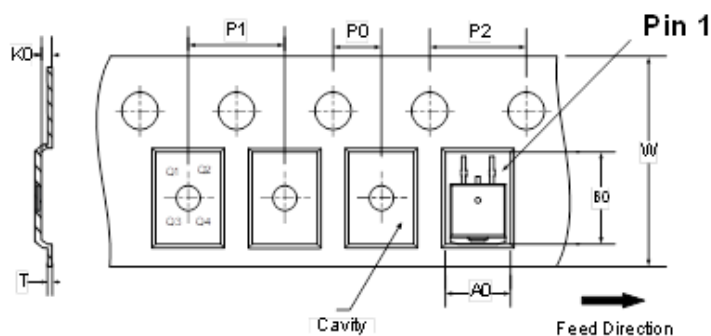
S65N1K9DM = Product Name Code

Contact ALKAIDSEMI sales for detail information

REEL DIMENSIONS



TAPE DIMENSIONS



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 sprocket hole
 P1: Pitch between successive cavity centers
 P2: Pitch between successive cavity centers and sprocket hole
 T: Tape material thickness
 D1: Reel Diameter
 W1: Reel Width

DIMENSIONS										(Unit: mm)
Reel	D1	W1	W2							Material
	330	25.65	31							Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
	4	12	2	24	10.5	16.1	5.1	0.4	Q2	PC

All dimensions are nominal

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.