

## 40V 1.2mohm N-channel SGT MOSFET AKG4N012TM

### Description:

This N channel SGT MOSFET has been designed to very low on-state resistance and superior UIS performance, especial for BMS application.

### Features:

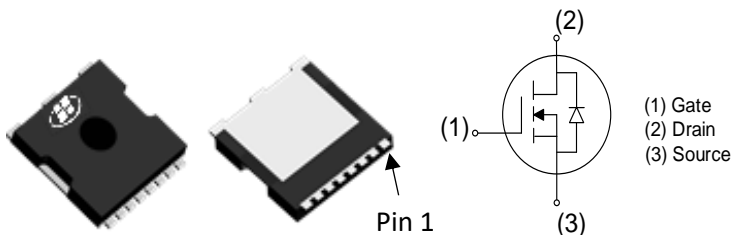
- Ultra Low  $R_{DS(ON)}$
- RoHS compliant <sup>(Note 1)</sup>
- Halogen-free <sup>(Note 1)</sup>
- 100% UIS tested

### Applications:

- Battery Management System
- Motor Drivers
- DC-DC Converter

### Key Performance Parameters:

Parameter	Value	Unit
$V_{DS}$	40	V
$R_{DS(ON), max} @ V_{GS} = 10V$	1.2	m $\Omega$
$I_D$	160	A



### Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG4N012TM	TOLL	G4N012TM	Tape Reel	1200PCS

### 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	40	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) <sup>(Note 1)</sup>	380	A
	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) <sup>(Note 2)</sup>	160	A
	Drain Current - Continuous ( $T_C = 100^\circ\text{C}$ )	160	A
$I_{DM}$	Drain Current - Pulsed <sup>(Note 3)</sup>	530	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(Note 4)</sup>	841	mJ
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	278	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

**Thermal Characteristics**

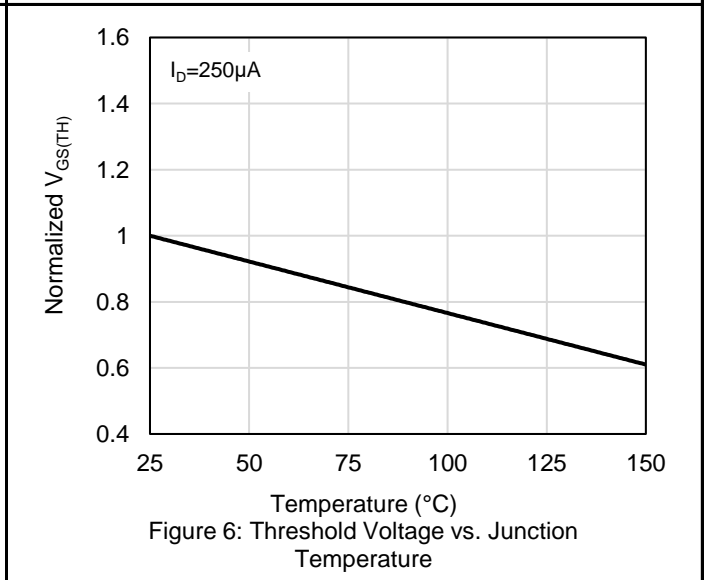
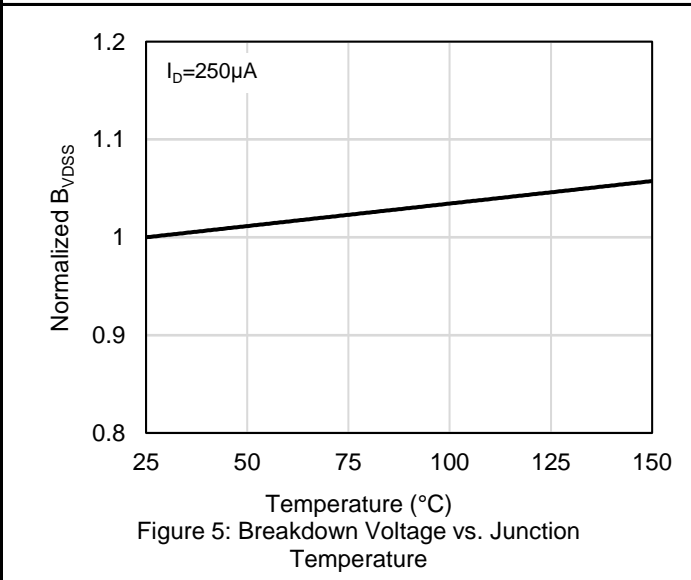
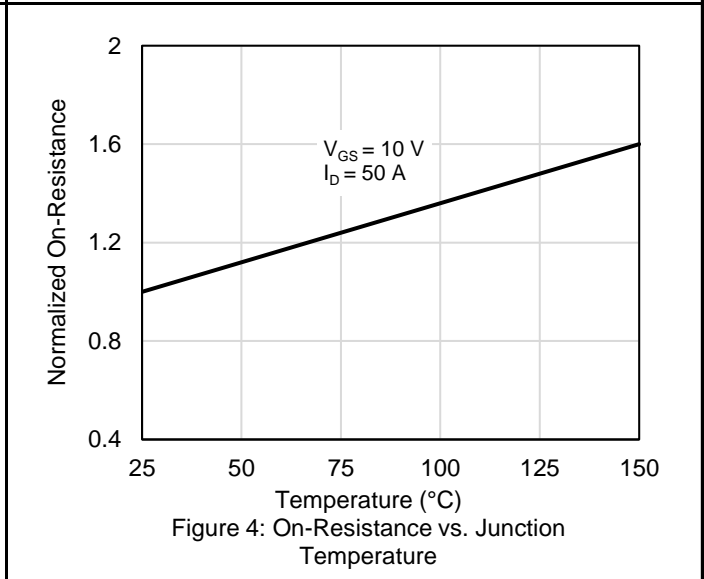
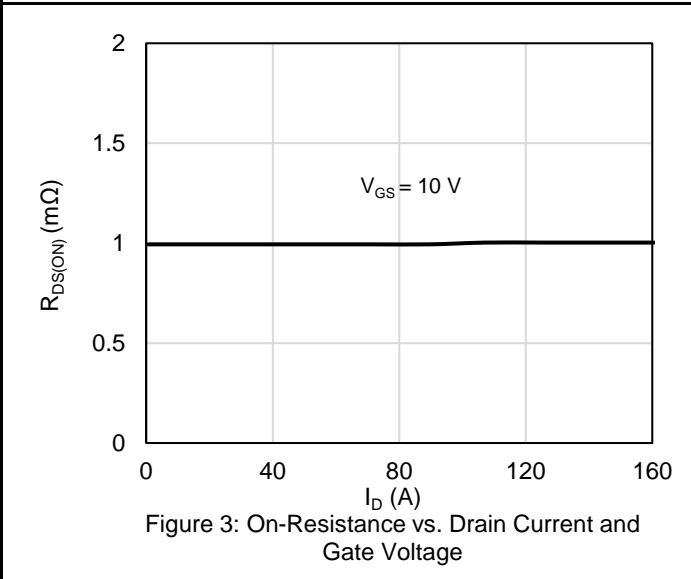
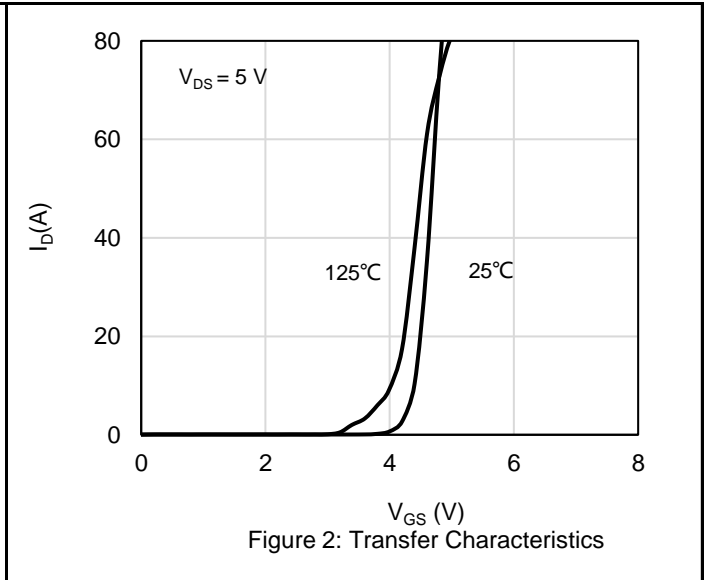
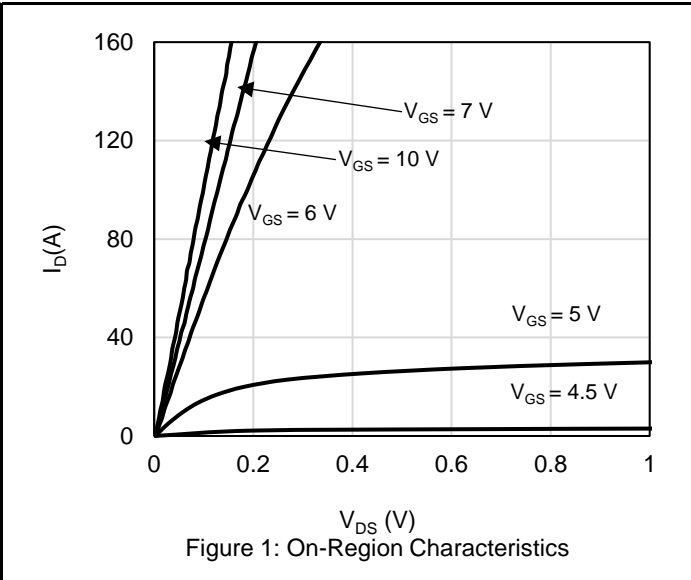
Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	0.45	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State <sup>(Note 5)</sup>	35	$^\circ\text{C/W}$

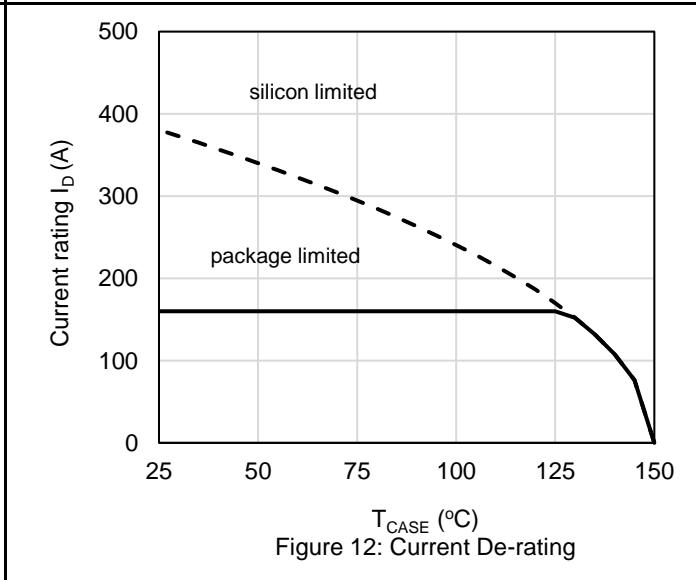
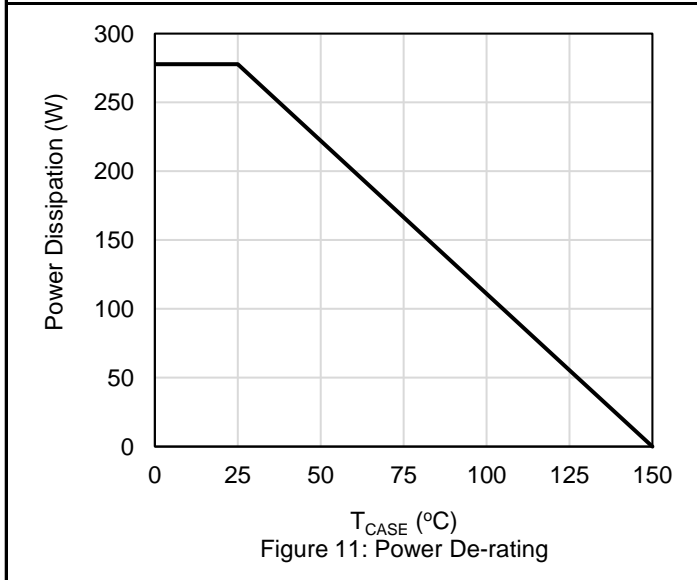
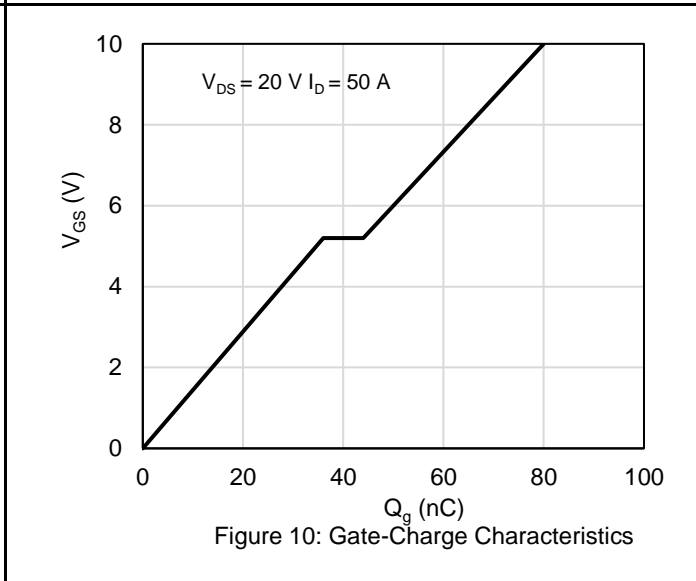
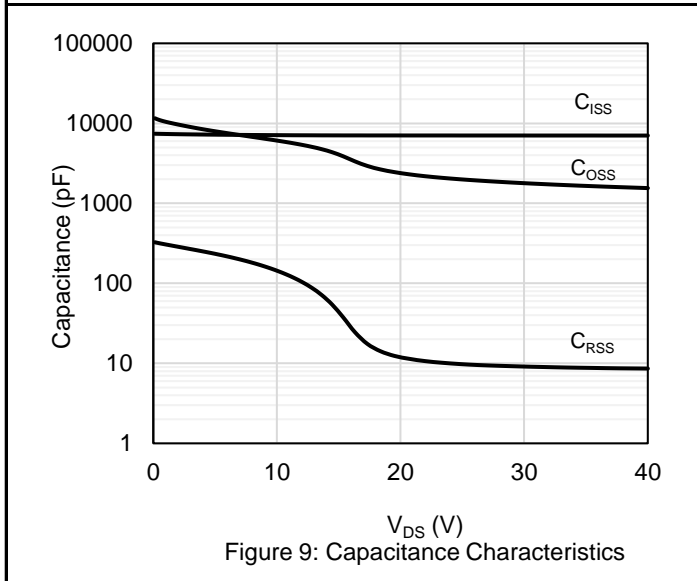
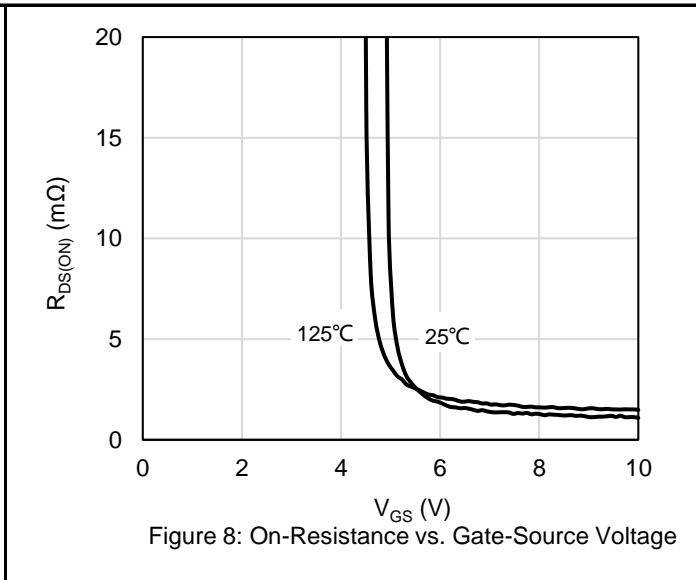
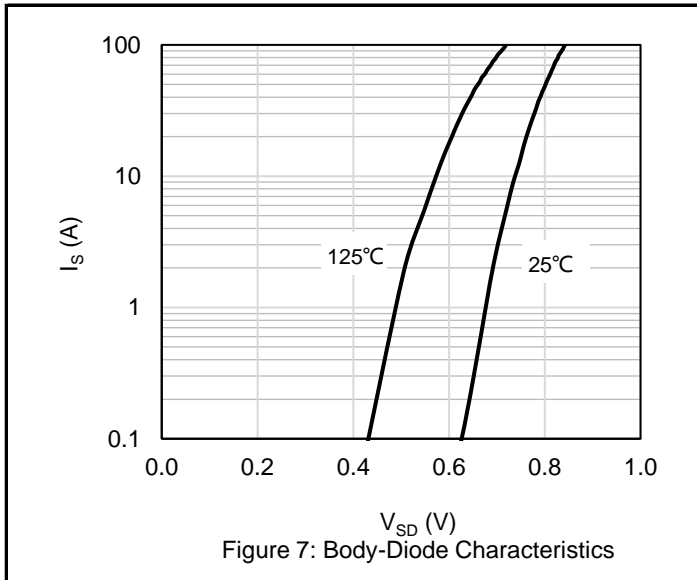
**Notes:**

1. The max drain current rating is silicon limited
2. The max drain current rating is package limited
3. Repetitive Rating: Pulse width limited by maximum junction temperature
4.  $L = 0.5\text{ mH}$ ,  $V_{DD} = 40\text{ V}$ ,  $I_{AS} = 58\text{ A}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25\ ^\circ\text{C}$
5. Mount on minimum PCB layout

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V},$			1	$\mu\text{A}$
$I_{GSS}$	Gate Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 100$	nA
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		1	1.2	m $\Omega$
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		7020		pF
$C_{OSS}$	Output Capacitance			2000		pF
$C_{RSS}$	Reverse Transfer Capacitance			10		pF
$R_G$	Gate Resistance	$F = 1\text{ MHz}$		6.5		$\Omega$
<b>Switching Characteristics</b>						
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 20\text{ V}, R_L = 0.4\ \Omega,$ $V_{GS} = 10\text{ V}, R_G = 4\ \Omega$		28		nS
$T_R$	Rise Time			96		nS
$T_{D(OFF)}$	Turn Off Delay Time			73		nS
$T_F$	Fall Time			116		nS
$Q_G$	Total Gate Charge	$V_{DD} = 20\text{ V}, I_D = 50\text{ A},$ $V_{GS} = 10\text{ V}$		80		nC
$Q_{GS}$	Gate-Source Charge			36		nC
$Q_{GD}$	Gate-Drain Charge			8		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Body-Diode Forward Current			160		A
$I_{SM}$	Maximum Pulsed Body-Diode Forward Current <sup>(NOTE 1)</sup>			530		A
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 40\text{ A}$		0.8	1.2	V
$T_{RR}$	Reverse recovery time	$V_{DD} = 20\text{ V}, I_D = 40\text{ A},$ $di/dt = 100\text{ A}/\mu\text{S}$		98		nS
$Q_{RR}$	Reverse recovery charge			229		nC
$I_{RRM}$	Peak Reverse Recovery Current			4		A

## Electrical Characteristics Diagrams





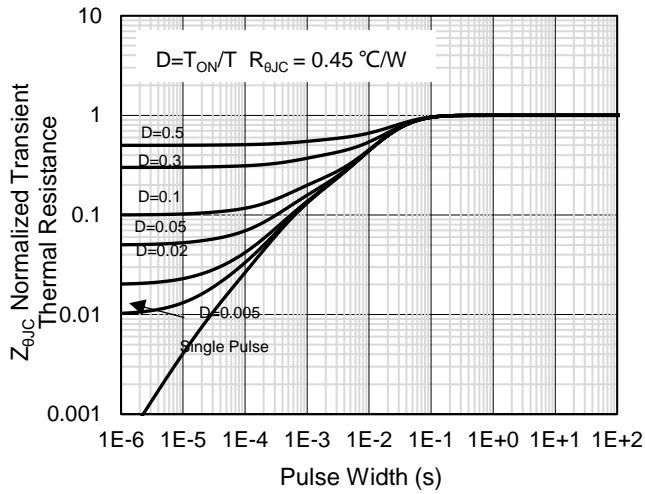


Figure 13: Normalized Maximum Transient Thermal Impedance

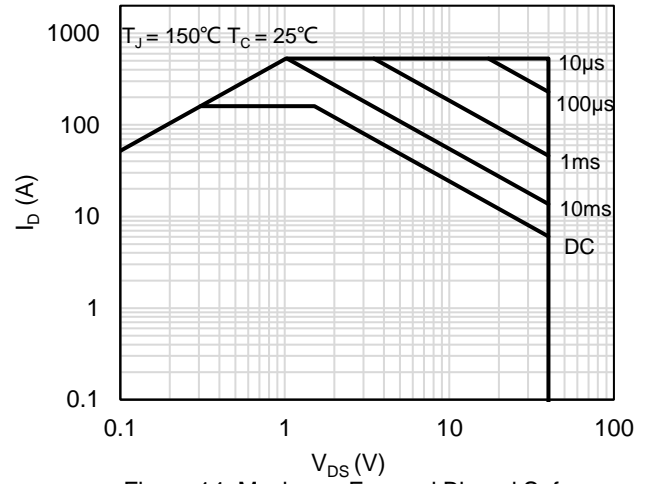
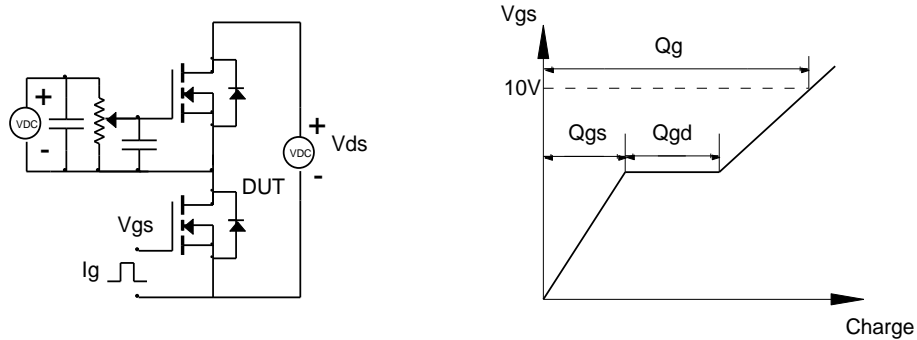


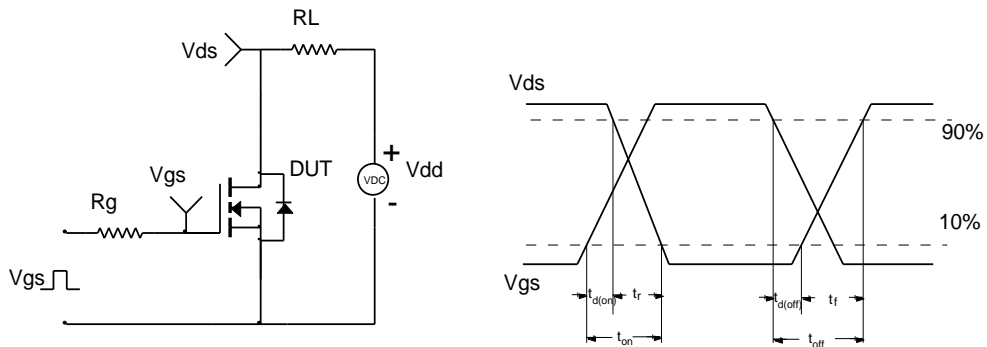
Figure 14: Maximum Forward Biased Safe Operating Area

# Test Circuit and Waveform

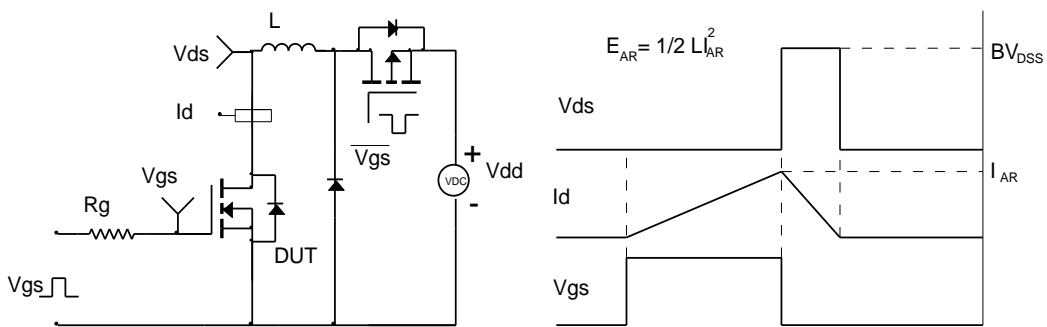
Gate Charge Test Circuit & Waveform



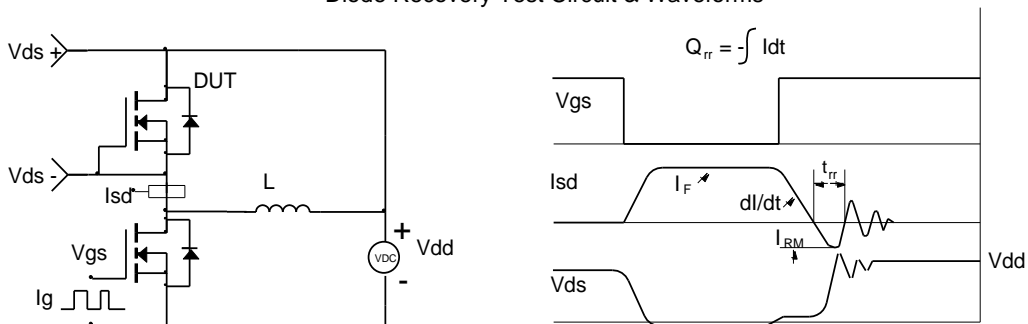
Resistive Switching Test Circuit & Waveforms



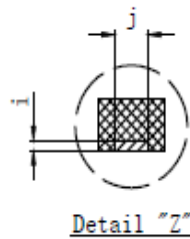
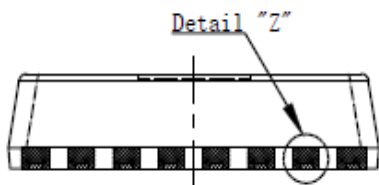
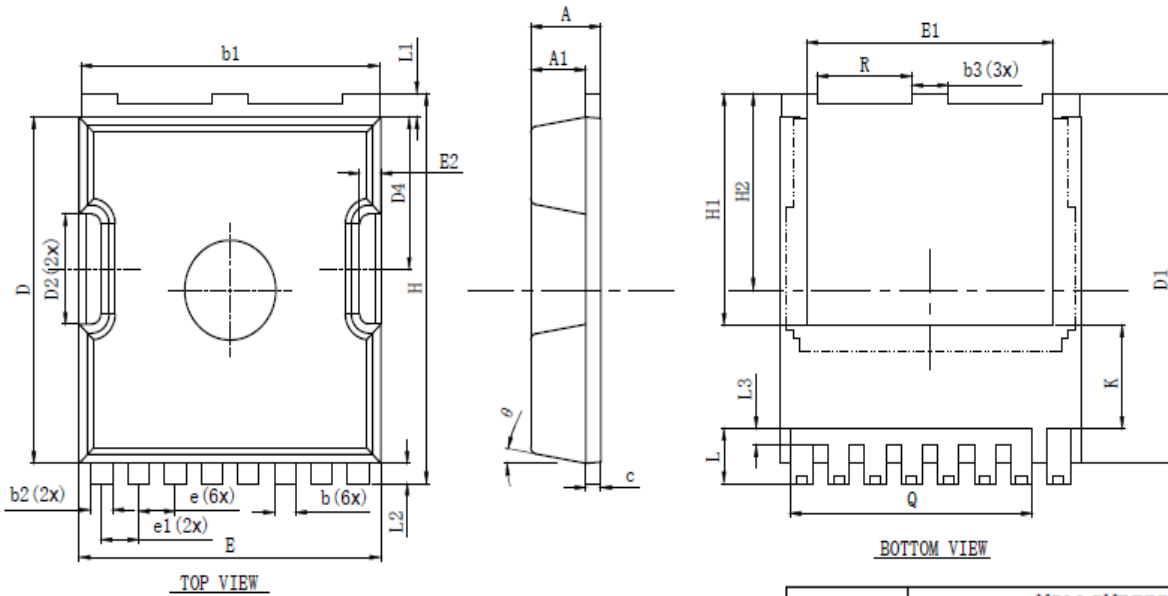
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



# Package Outlines



SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.200	2.300	2.400
A1	1.700	1.800	1.900
b	0.600	0.700	0.800
b1	9.700	9.800	9.900
b2	0.650	0.750	0.850
b3	1.100	1.200	1.300
c	0.400	0.500	0.600
D	10.300	10.400	10.500
D1	11.000	11.100	11.200
D2	3.200	3.300	3.400
D4	4.470	4.570	4.670
E	9.800	9.900	10.000
E1	8.000	8.100	8.200
E2	0.500	0.600	0.700
e	1.200 BSC		
e1	1.225 BSC		
H	11.600	11.700	11.800
H1	6.950 BSC		
H2	5.900 BSC		
i	0.100 REF.		
j	0.350 REF.		
K	3.100 REF.		
L	1.550	1.650	1.750
L1	0.600	0.700	0.800
L2	0.500	0.600	0.700
L3	0.400	0.500	0.600
Q	7.950 REF.		
R	3.000	3.100	3.200
θ	10° REF.		



# Marking Information

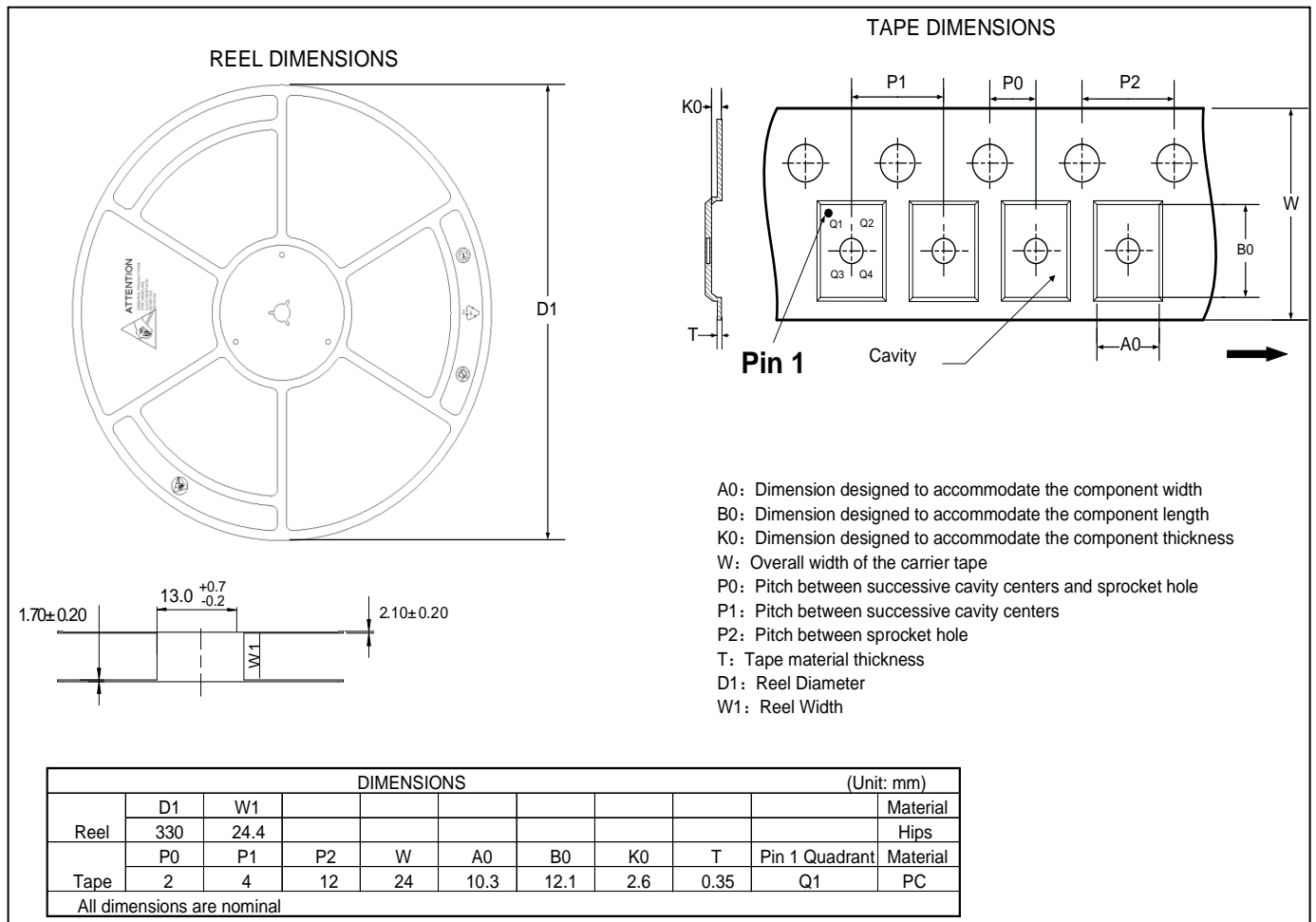


Note:

G4N012TM = Product Name Code

XXXXXXXX = Date code

Contact ALKAIDSEMI sales for detail information



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## Revision History

Revision	Release Date	Remark
Rev.1.0	2022/7/13	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.

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