

## 60V 4mohm N-channel SGT MOSFET AKG6N040KL

### Description:

This N channel SGT MOSFET has been designed to low on-state resistance and maintain superior switching performance, especial for high efficiency power management applications.

### Features:

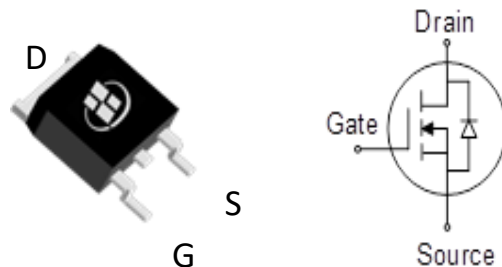
- Low  $R_{DS(ON)}$
- RoHS compliant <sup>(Note 1)</sup>
- Halogen-free <sup>(Note 1)</sup>

### Applications:

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

### Key Performance Parameters:

Parameter	Value	Unit
$V_{DS}$	60	V
$R_{DS(ON), max} @ V_{GS} = 10V$	4	m $\Omega$
$I_D$	70	A



### Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG6N040KL	TO252	G6N040KL	Tape Reel	2500PCS

### 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	60	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) <sup>(Note 1)</sup>	125	A
	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) <sup>(Note 2)</sup>	70	A
	Drain Current - Continuous ( $T_C = 100^\circ\text{C}$ )	47	A
$I_{DM}$	Drain Current - Pulsed <sup>(Note 3)</sup>	280	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(Note 4)</sup>	225	mJ
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	113	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	1.1	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State <sup>(Note 5)</sup>	54	$^\circ\text{C}/\text{W}$

### 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.  $L = 0.5 \text{ mH}$ ,  $V_{DD} = 30 \text{ V}$ ,  $I_{AS} = 30 \text{ A}$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$
5. Mount on minimum PCB layout

<b>Electrical Characteristics</b> ( $T_J = 25^\circ\text{C}$ unless otherwise noted)						
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V},$			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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.9	3	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 60\text{ A}$		3.5	4	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 60\text{ A}$		4.5	5.5	m $\Omega$
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input Capacitance	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		3677		pF
$C_{OSS}$	Output Capacitance			773		pF
$C_{RSS}$	Reverse Transfer Capacitance			69		pF
$R_G$	Gate Resistance	$F = 1\text{ MHz}$		1.2		$\Omega$
<b>Switching Characteristics</b>						
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 30\text{ V}, R_L = 0.5\ \Omega,$ $V_{GS} = 10\text{ V}, R_G = 4.7\ \Omega$		16		nS
$T_R$	Rise Time			52		nS
$T_{D(OFF)}$	Turn Off Delay Time			54		nS
$T_F$	Fall Time			116.5		nS
$Q_G$	Total Gate Charge	$V_{DD} = 30\text{ V}, I_D = 60\text{ A},$ $V_{GS} = 10\text{ V}$		66.5		nC
$Q_{GS}$	Gate-Source Charge			12		nC
$Q_{GD}$	Gate-Drain Charge			17.5		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Body-Diode Forward Current				70	A
$I_{SM}$	Maximum Pulsed Body-Diode Forward Current <sup>(NOTE 1)</sup>				280	A
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 120\text{ A}$		1.1		V
$T_{RR}$	Reverse recovery time	$V_{DD} = 30\text{ V}, I_D = 60\text{ A},$ $di/dt = 100\text{ A}/\mu\text{S}$		46.5		nS
$Q_{RR}$	Reverse recovery charge			27.5		nC
$I_{RRM}$	Peak Reverse Recovery Current			1		A

# Electrical Characteristics Diagrams

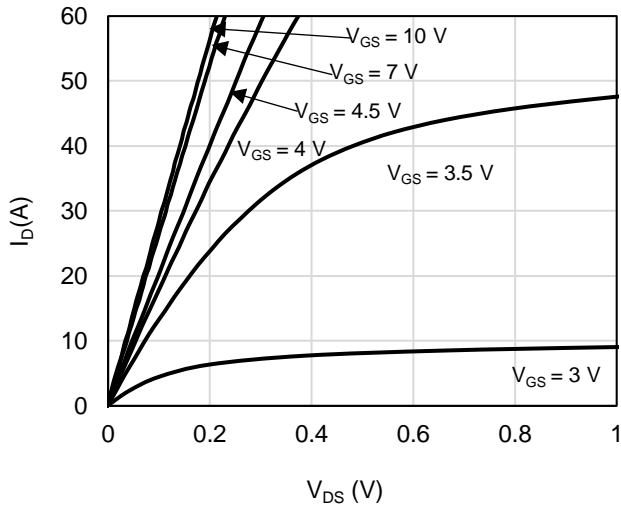


Figure 1: On-Region Characteristics

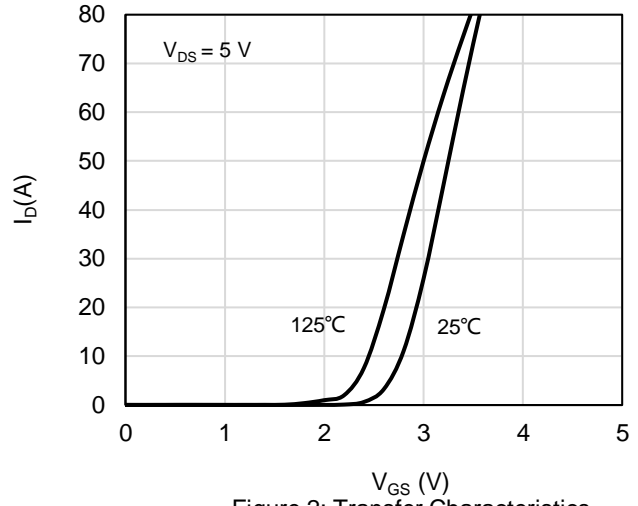


Figure 2: Transfer Characteristics

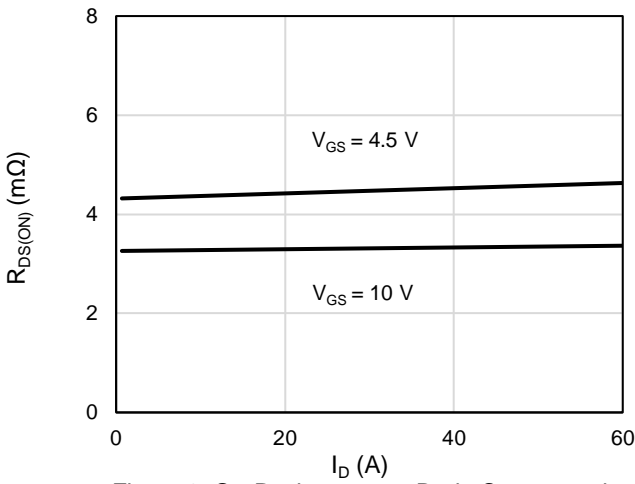


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

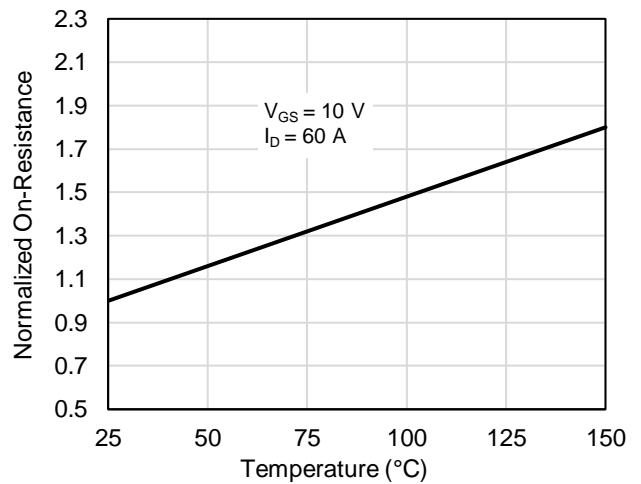


Figure 4: On-Resistance vs. Junction Temperature

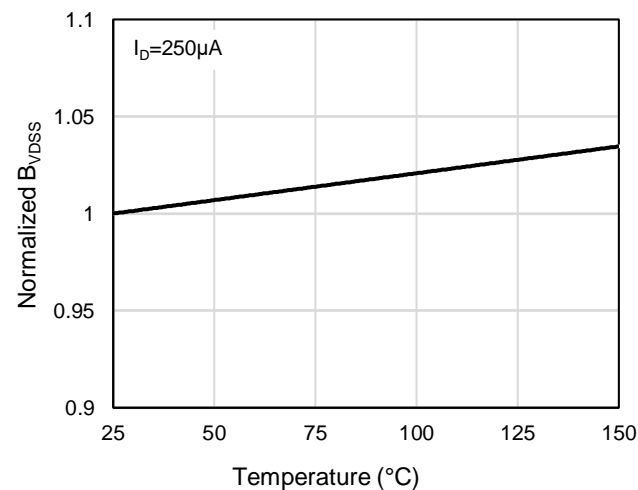


Figure 5: Breakdown Voltage vs. Junction Temperature

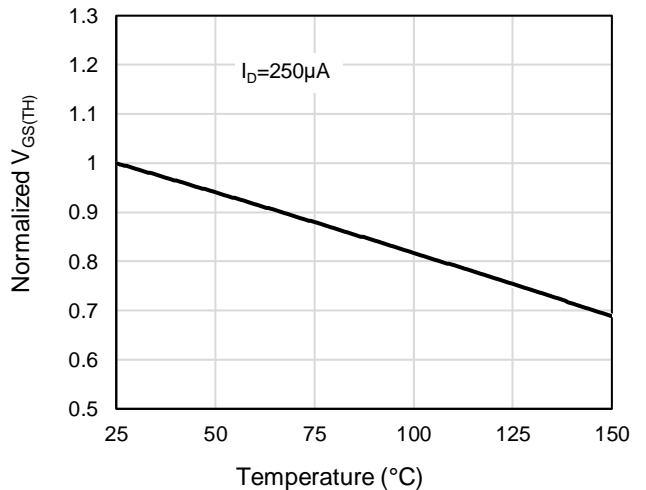
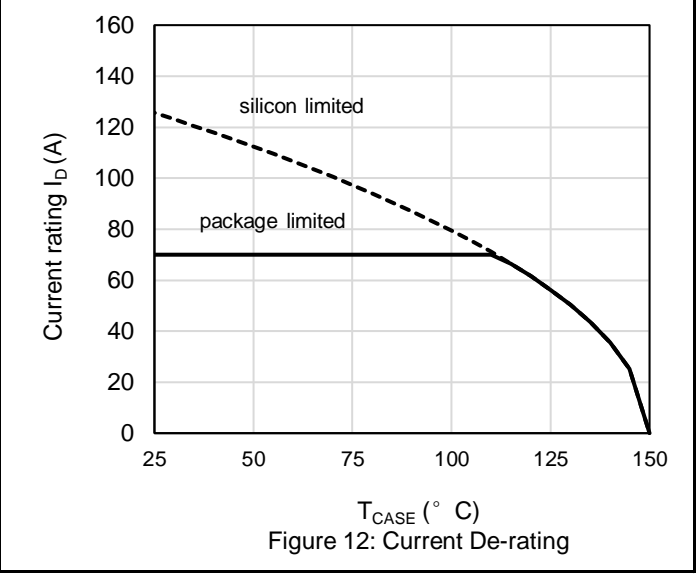
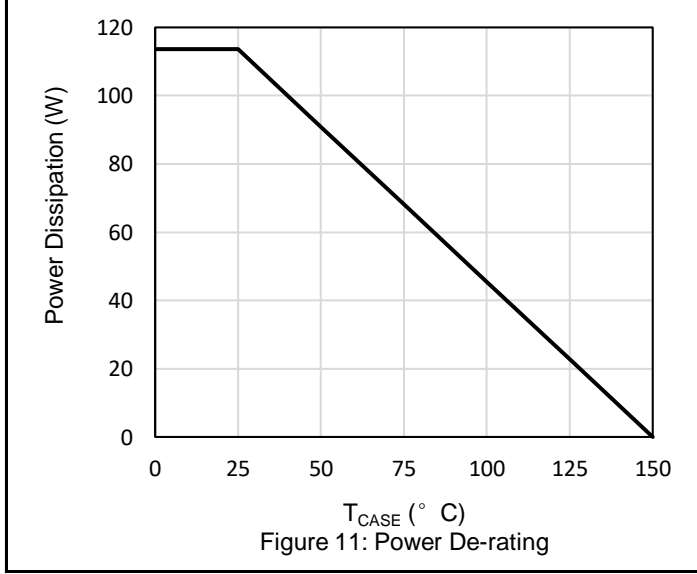
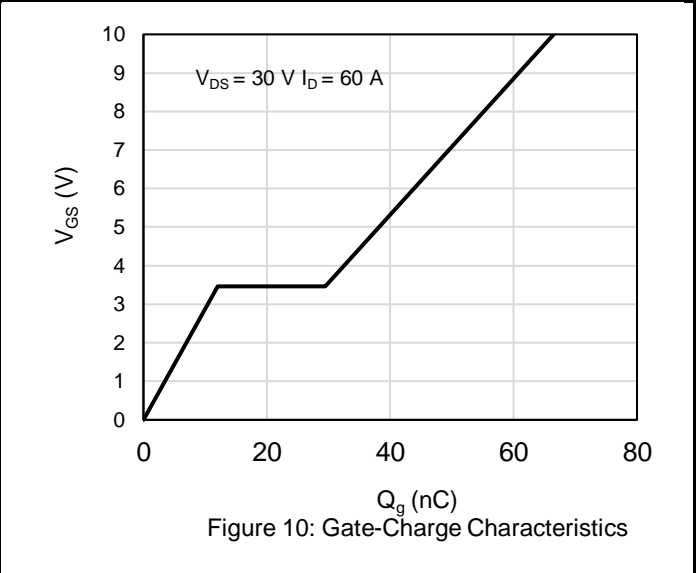
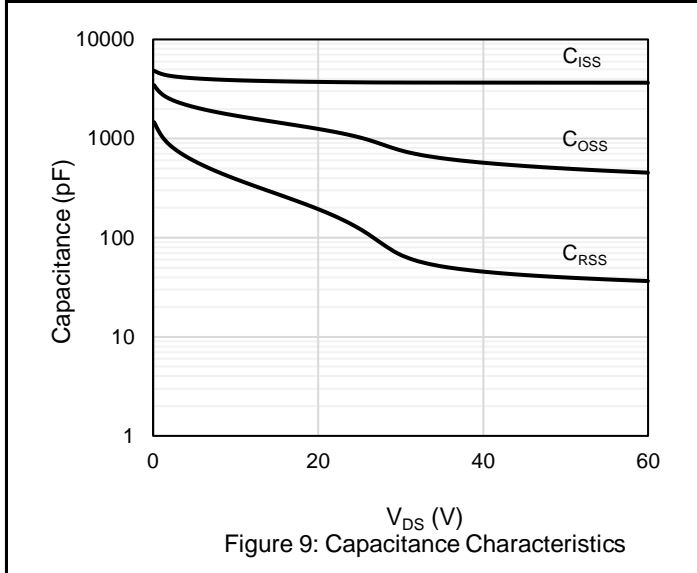
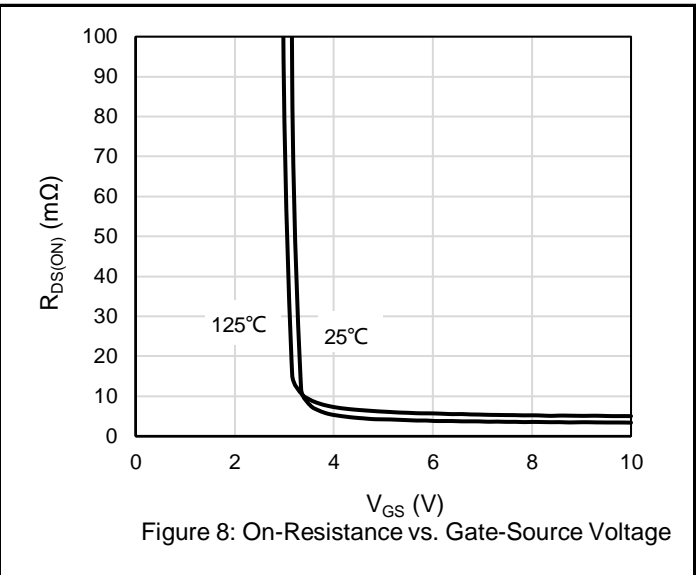
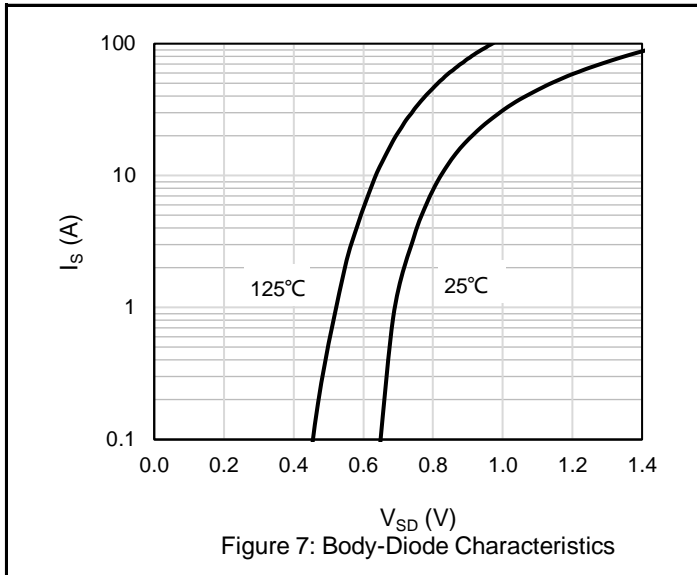


Figure 6: Threshold Voltage vs. Junction Temperature



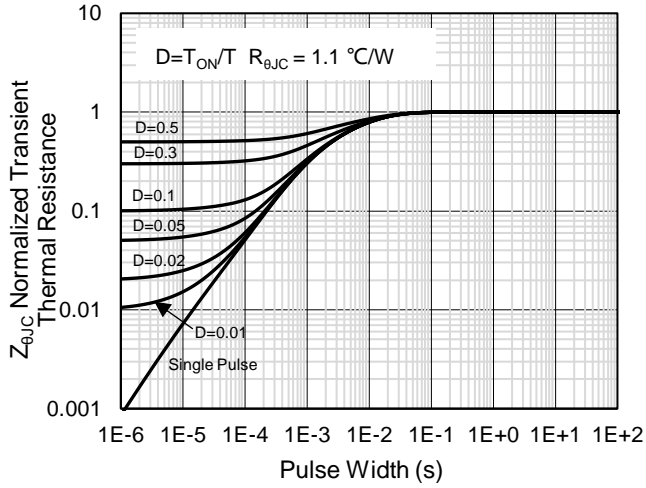


Figure 13: Normalized Maximum Transient Thermal Impedance

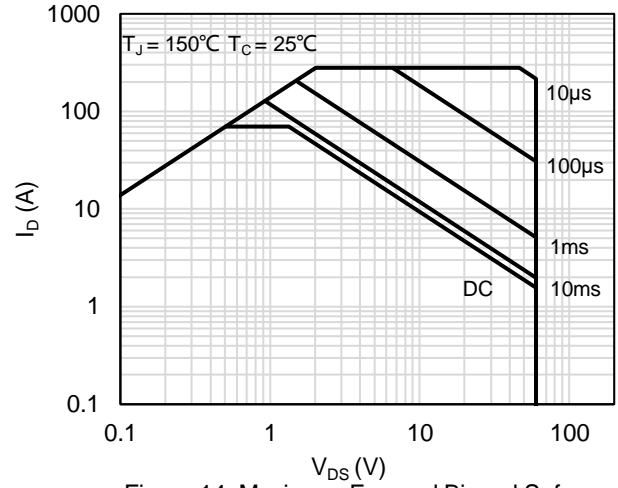
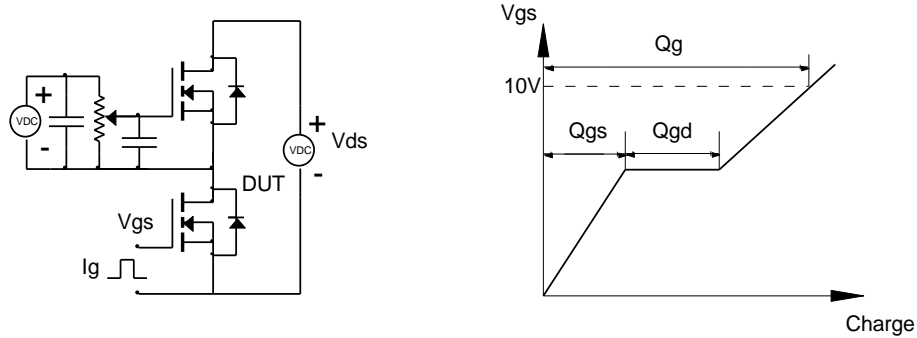


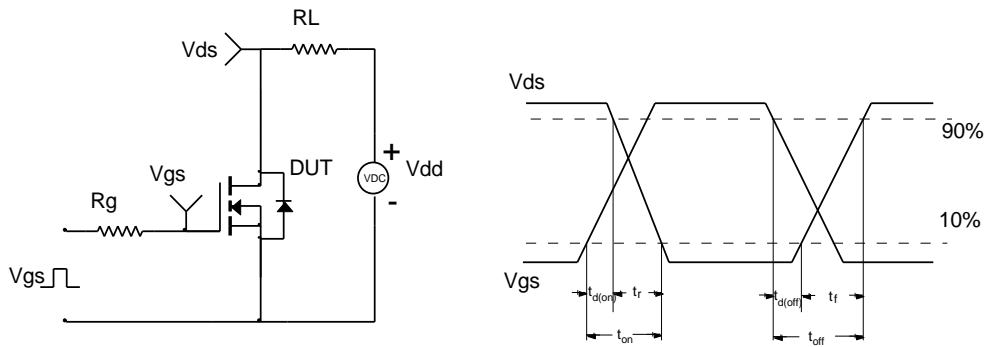
Figure 14: Maximum Forward Biased Safe Operating Area

# Test Circuit and Waveform

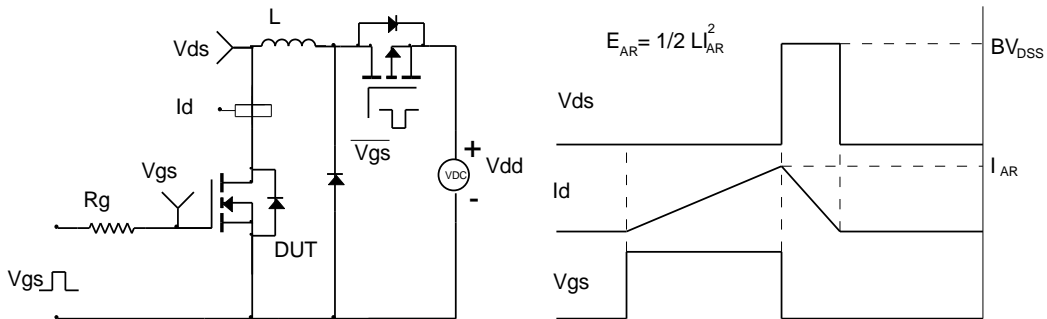
Gate Charge Test Circuit & Waveform



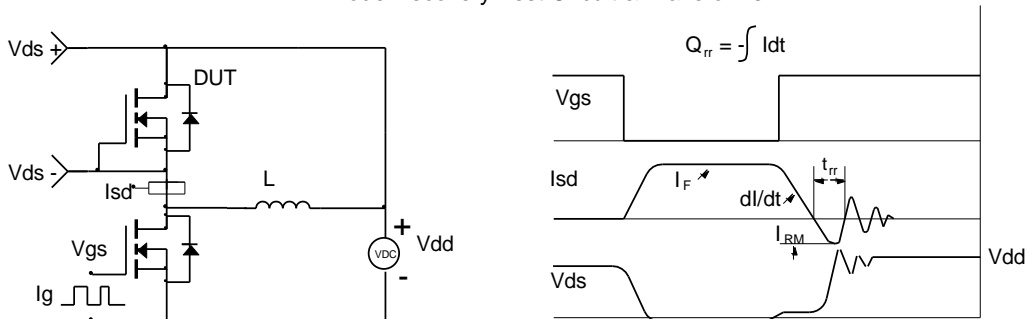
Resistive Switching Test Circuit & Waveforms



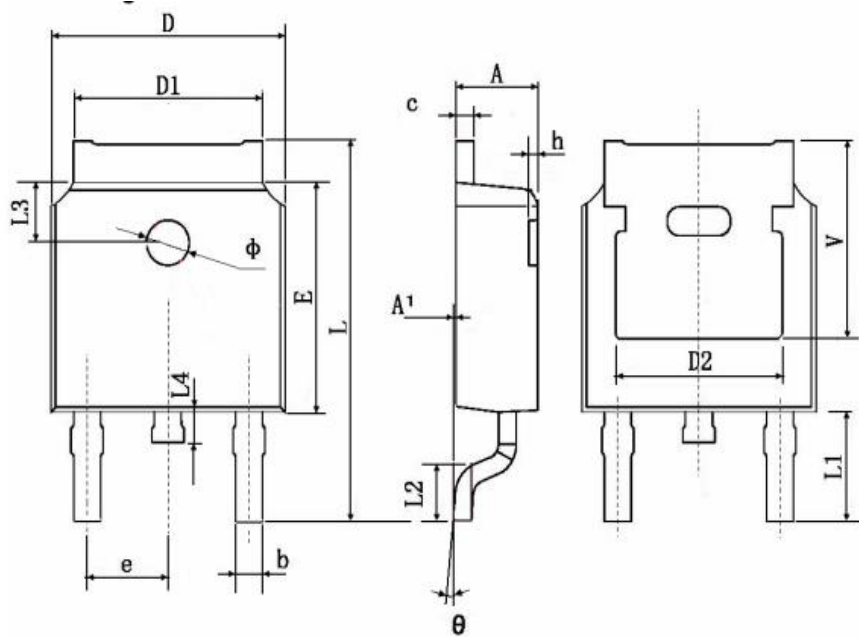
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



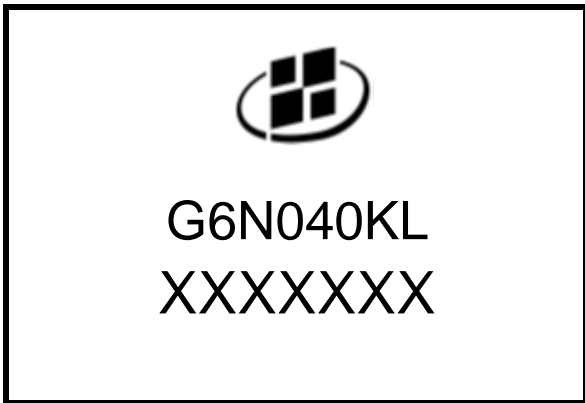
## Package Outlines



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.250	2.350	0.089	0.093
A1	0.050	0.150	0.002	0.006
b	0.660	0.860	0.026	0.034
c	0.458	0.558	0.018	0.022
D	6.550	6.650	0.259	0.263
D1	5.234	5.434	0.207	0.215
D2	4.826 TYP.		0.191 TYP.	
E	6.050	6.150	0.239	0.243
e	2.236	2.336	0.088	0.092
L	9.820	10.220	0.388	0.404
L1	3.000 TYP.		0.119 TYP.	
L2	1.400	1.600	0.055	0.063
L3	1.800 TYP.		0.071 TYP.	
L4	0.700	0.900	0.028	0.036
Φ	1.150	1.250	0.045	0.049
θ	0°	3°	0°	3°
h	0.000	0.300	0.000	0.012
V	5.399 TYP		0.213 TYP	

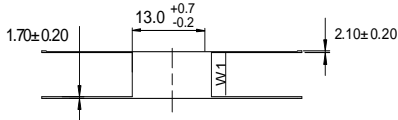
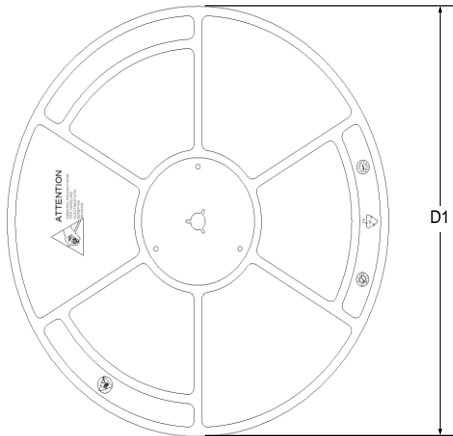


# Marking Information

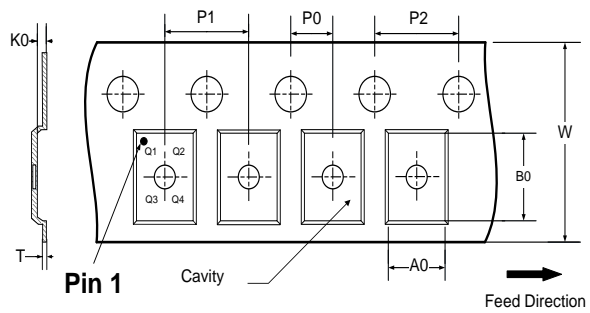


Note:  
 G6N040KL = Product Name Code  
 XXXXXXXX = Date code  
 Contact ALKAIDSEMI sales for detail information

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 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	20.5									Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material	
	4	8	2	16	6.9	10.5	2.9	0.27	Q1	PC	

All dimensions are nominal

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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.

Due to product or technical improvements, the information described or contained herein may be changed without prior notice.