

# 40V 1.3mohm N-channel SGT MOSFET

## AKG40N013G

### Description:

This N channel SGT MOSFET has been designed to ultra-low on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, especial for high efficiency power management applications.

### Features:

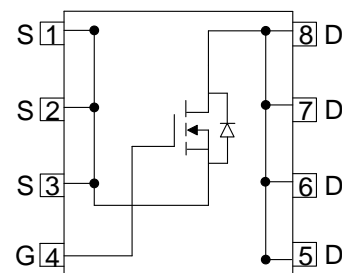
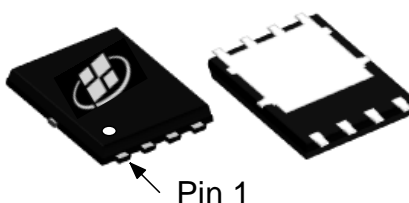
- N-channel, optimized for high-speed smooth switching
- Excellent Gate Charge  $\times R_{DS(on)}$  (FOM)
- Ultra-low on-resistance
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

### Applications:

- DC-DC Conversion
- Power Tools
- Motor Driving
- Power Management

### Key Performance Parameters:

Parameter	Value	Unit
$V_{DS}$	40	V
$R_{DS(on), max} @ V_{GS} = 10V$	1.3	m $\Omega$
$I_D$	176	A



### Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG40N013G	PDFN5X6-8L	AKG40N013G	13 inches Reel	5000

### 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 ( $T_C = 25^\circ\text{C}$ )	176	A
	Drain Current -Continuous ( $T_C = 100^\circ\text{C}$ )	110	A
$I_{DM}$	Drain Current - Pulsed (Note 1,2)	550	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 3)	306	mJ
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	64	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	1.94	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Steady State (Note 4)	46	$^\circ\text{C}/\text{W}$

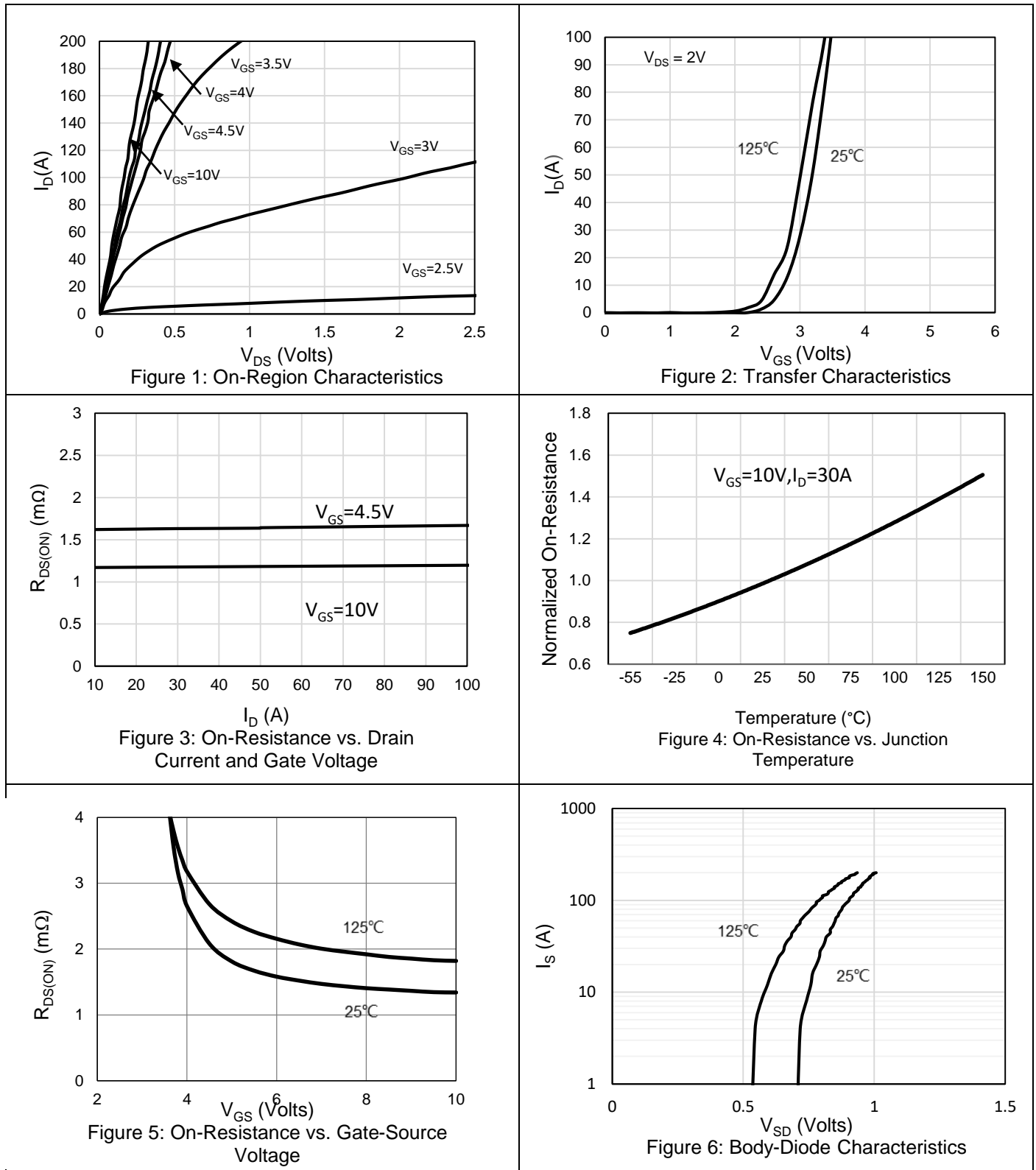
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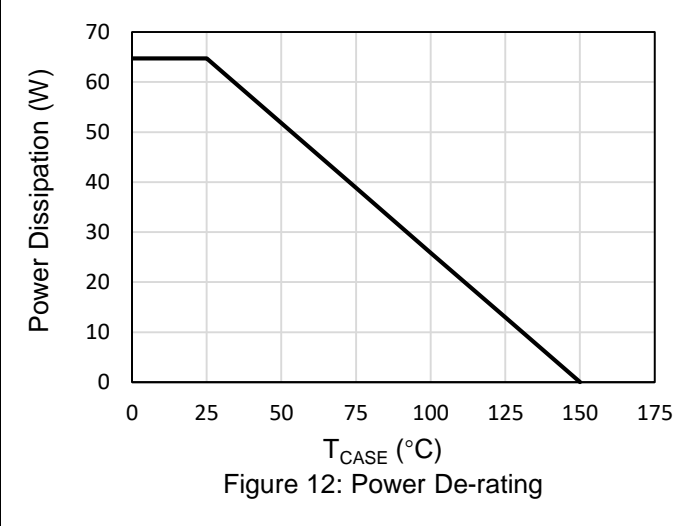
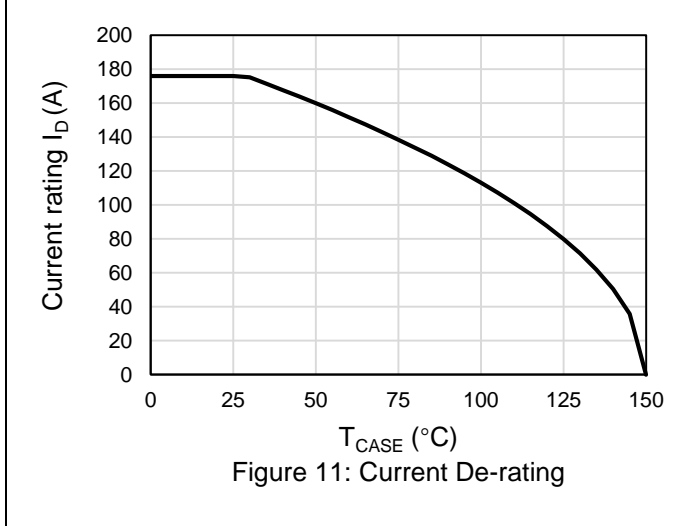
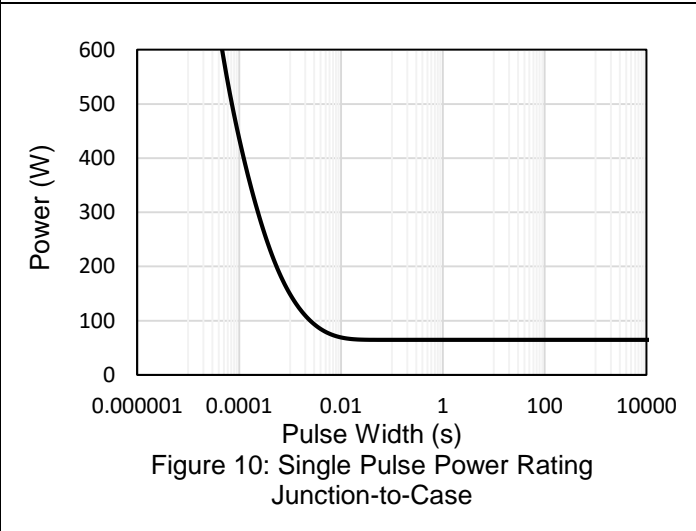
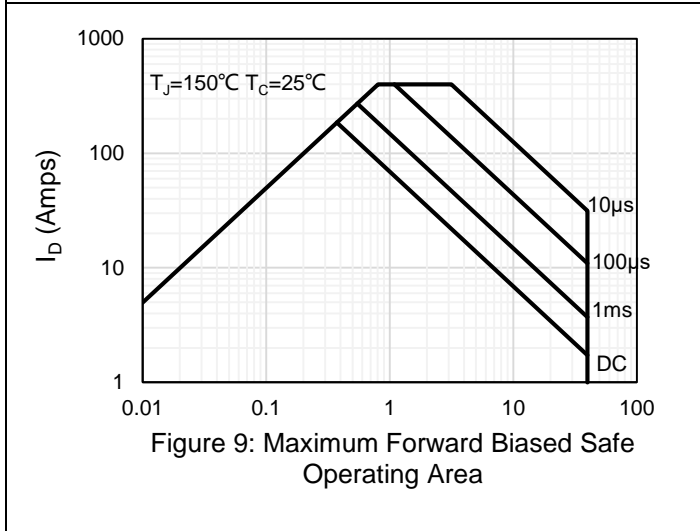
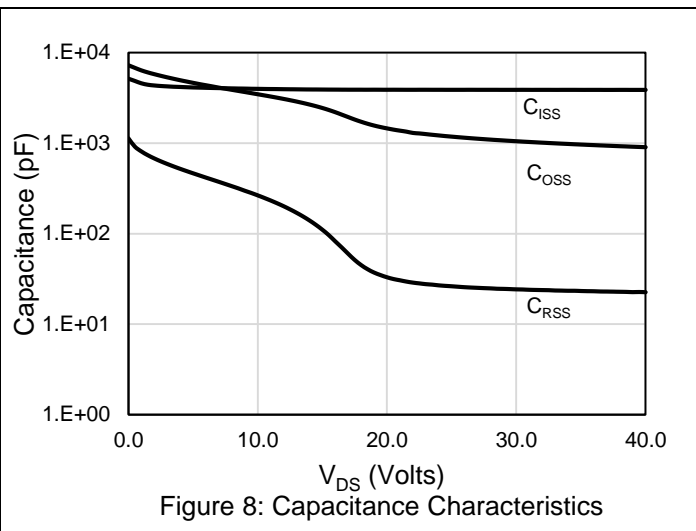
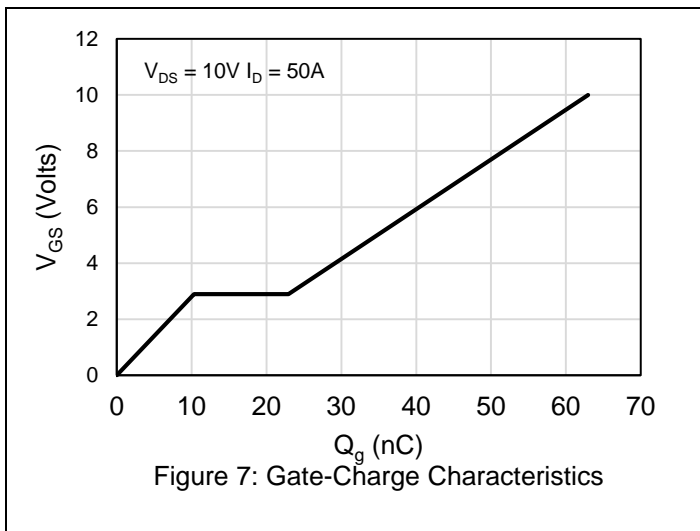
1. The max drain current rating is package limited
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3.  $L = 0.5\text{ mH}$ ,  $V_{DD} = 15\text{ V}$ ,  $I_{AS} = 35\text{ A}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25\ ^\circ\text{C}$
4. Mount on 1 inch X 1 inch 2 oz FR-4 copper PCB
5. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$
6. Essentially independent of operating temperature

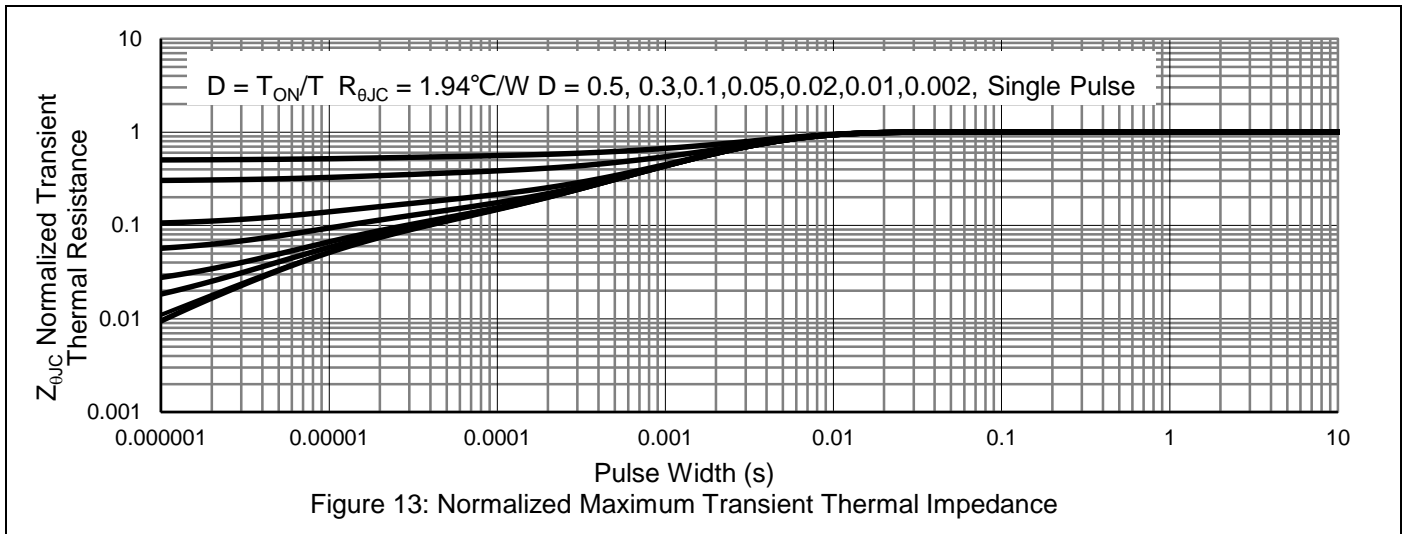
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.5	2	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		1.1	1.3	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		1.6	2.0	m $\Omega$
$G_{FS}$	Forward Transconductance <sup>(NOTE 5)</sup>	$V_{DS} = 2\text{ V}, I_D = 25\text{ A}$		90		S
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input capacitance	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		3900		pF
$C_{OSS}$	Output capacitance			1460		pF
$C_{RSS}$	Reverse transfer capacitance			32.9		pF
$R_G$	Gate resistance	$F = 1\text{ MHz}$		4.5		$\Omega$
<b>Switching Characteristics</b>						
$T_{D(ON)}$	Turn On Delay Time	$V_{DS} = 20\text{ V}, I_D = 25\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 4.7\ \Omega$		11.8		ns
$T_R$	Rising Time			30.2		ns
$T_{D(OFF)}$	Turn Off Delay Time			78.7		ns
$T_F$	Fall Time			37.4		ns
$Q_G$	Total Gate Charge	$V_{DS} = 20\text{ V}, I_D = 25\text{ A},$ $V_{GS} = 10\text{ V}$		63.1		nC
$Q_{GS}$	Gate-Source Charge			10.4		nC
$Q_{GD}$	Gate-Drain Charge			12		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Body-Diode Forward Current				176	A
$I_{SM}$	Maximum Pulsed Body-Diode Forward Current <sup>(NOTE 1)</sup>				400	A
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}$		0.84		V
$T_{RR}$	Reverse recovery time	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{S}$		49.5		ns
$Q_{RR}$	Reverse recovery charge			46.8		nC

## Electrical Characteristics Diagrams

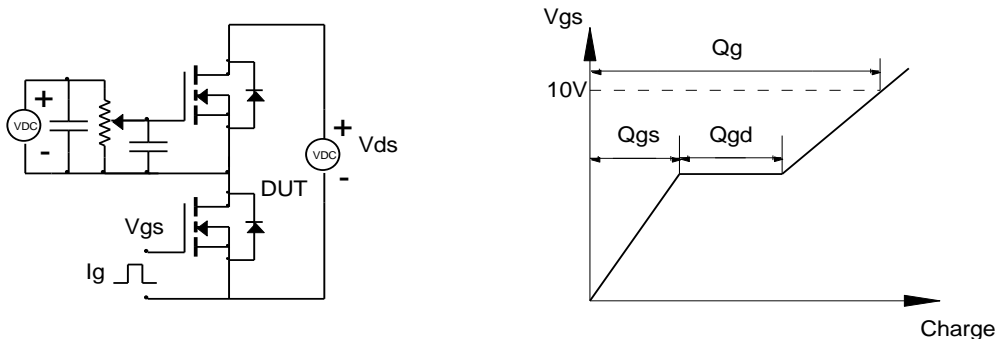




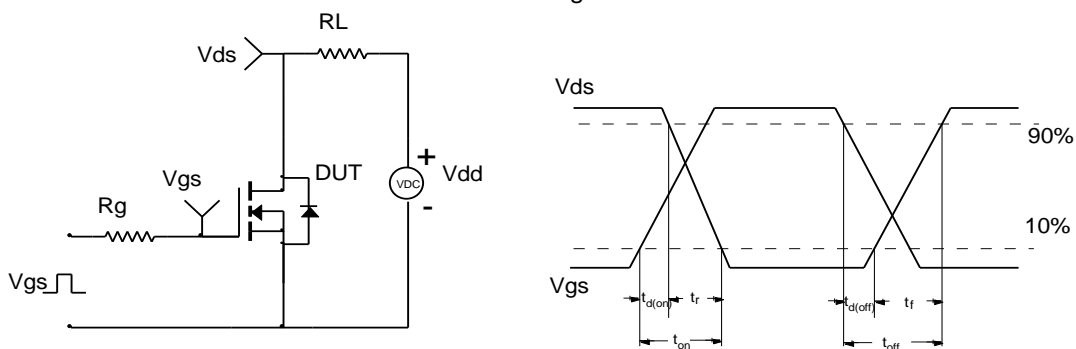


# Test Circuit and Waveform

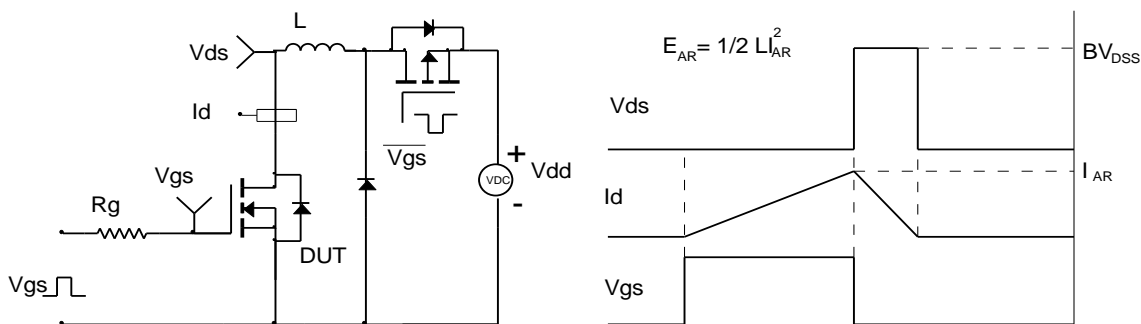
Gate Charge Test Circuit & Waveform



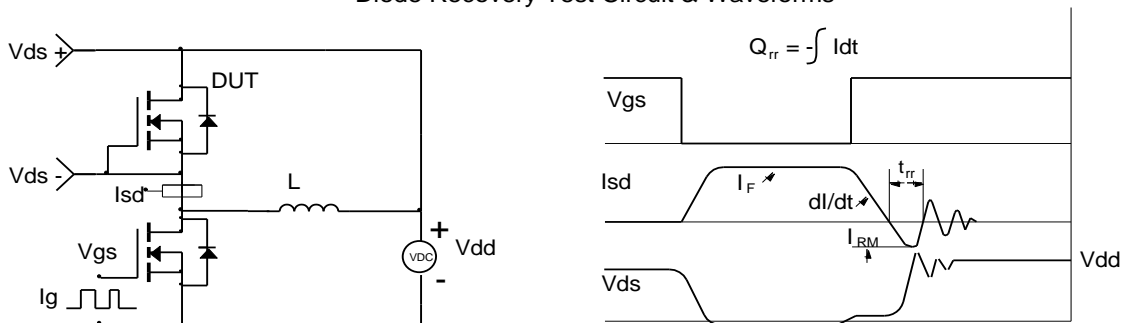
Resistive Switching Test Circuit & Waveforms



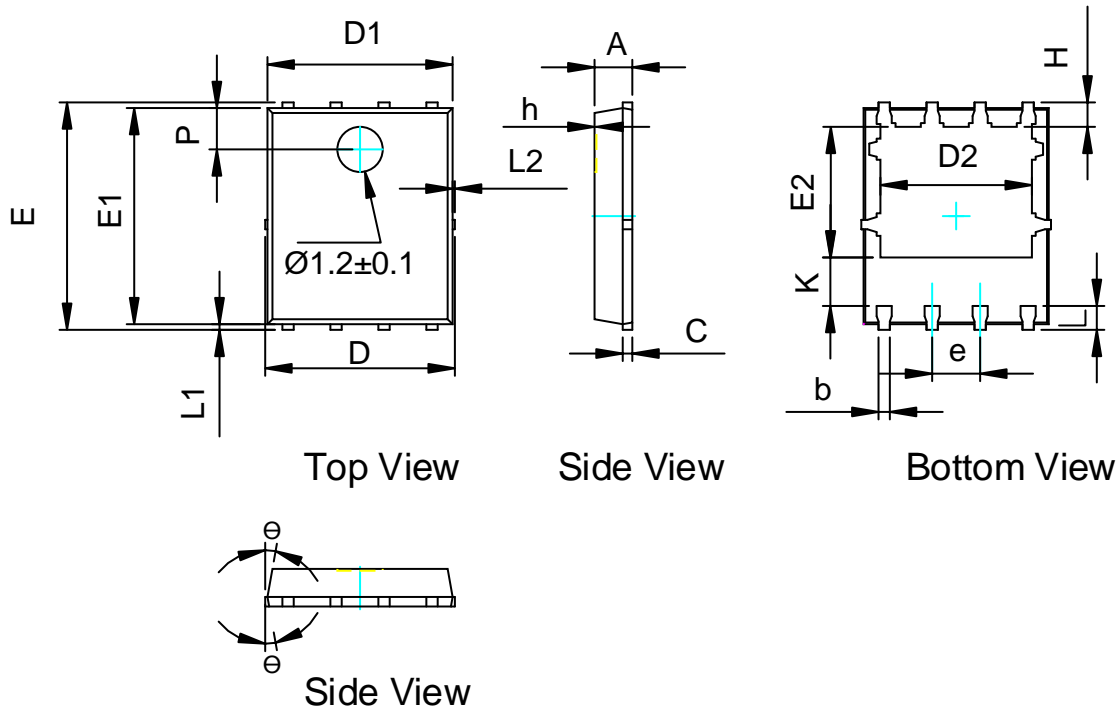
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



# Package Outlines

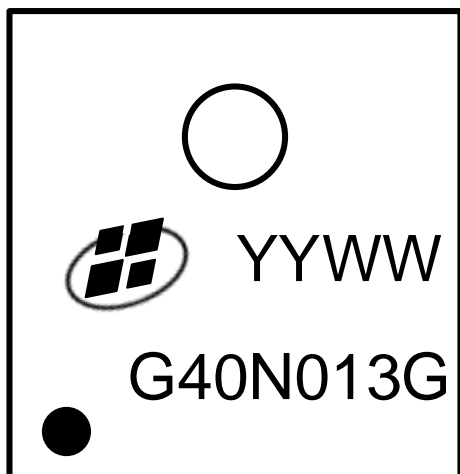


SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
b	0.20	0.30	0.40
c	0.21	0.25	0.34
D	-	-	5.10
D1	4.80	4.90	5.00
D2	3.91	4.01	4.11
e	1.27 BSC		
E	5.90	6.00	6.10
E1	5.65	5.75	5.85
E2	3.375	3.475	3.575
H	0.55	0.65	0.75
h	-	-	0.05
K	1.20	-	-
L	0.55	0.65	0.75
L1	0.05	0.15	0.25
L2	-	-	0.12
$\theta$	8°	10°	12°
P	1.00	1.10	1.20

COMMON DIMENSIONS  
( UNITS OF MEASURE = MILLIMETER )



## Marking Information



Note:

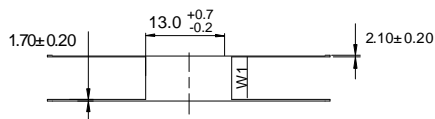
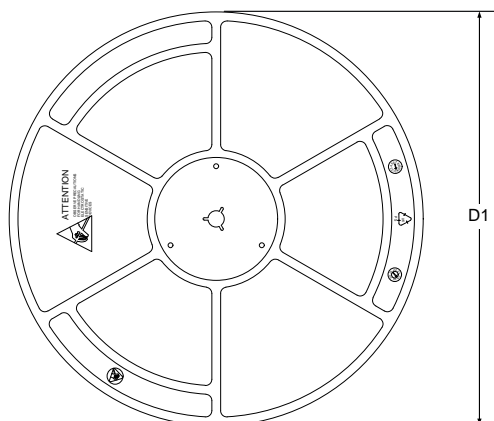
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G40N013G=Product Name Code

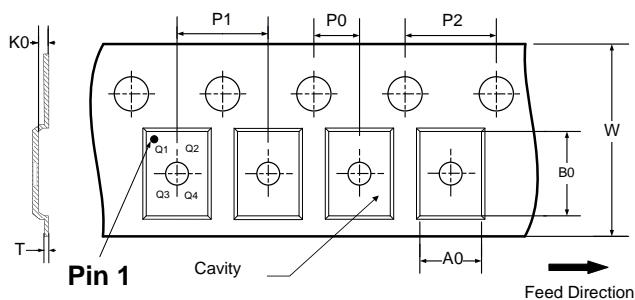
Contact ALKAIDSEMI sales for detail information

## Reel and Tube 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	12.5								Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
	4	8	2	12	6.3	5.3	1.2	0.25	Q1	PC

All dimensions are nominal

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## Revision History

Revision	Release Date	Remark
Rev.1.0	2021-11-09	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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