

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, special for high efficiency power management applications.

Features:

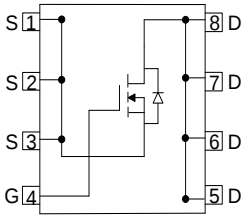
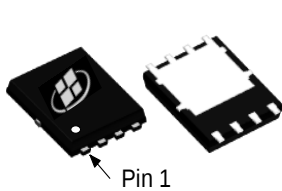
- N-channel, optimized for high-speed smooth switching
- Excellent Gate Charge $\times R_{DS(on)}$ (FOM)
- Ultra-low on-resistance
- RoHS compliant
- Halogen-free

Applications:

- DC-DC Conversion
- Power tools

Key Performance Parameters:

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



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG40N013G	PDFN5X6	AKG40N013G	Tape Reel	See the detail package 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 ($T_C = 25^\circ\text{C}$) ^(Note 1)	176	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	110	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	550	A
V_{GS}	Gate-Source Voltage	± 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	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State ^(Note 4)	50	$^\circ\text{C/W}$

Notes:

1. The max drain current rating is silicon limited
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 0.5\text{ mH}$, $V_{DD} = 20\text{ V}$, $I_{AS} = 35\text{ A}$, $R_g = 50\ \Omega$, Starting $T_J = 25\ ^\circ\text{C}$
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 V, I _D = 250 μA	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 40 V, V _{GS} = 0 V,			1	μA
I _{GSS}	Gate Leakage Current	V _{GS} = ± 20 V, V _{DS} = 0 V			±100	nA
V _{GS(th)}	Gate Threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1	1.7	3	V
R _{DS(ON)}	Drain - Source on - state resistance	V _{GS} = 10 V, I _D = 30 A		1.1	1.3	mΩ
		V _{GS} = 4.5 V, I _D = 30 A		1.6	2	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz		3970		pF
C _{oss}	Output Capacitance			1300		pF
C _{rss}	Reverse Transfer Capacitance			55		pF
R _g	Gate Resistance	f = 1 MHz		5		Ω
Switching Characteristics						
t _{d(on)}	Turn On Delay Time	V _{DD} = 20 V , R _L = 1 Ω, V _{GS} = 10 V, R _G = 4.7 Ω		8		ns
t _r	Rise Time			43		ns
t _{d(off)}	Turn Off Delay Time			82		ns
t _f	Fall Time			65		ns
Q _g	Total Gate Charge	V _{DD} = 20 V , I _D = 20 A, V _{GS} = 10 V		60		nC
Q _{gs}	Gate - Source Charge			10		nC
Q _{gd}	Gate - Drain Charge			11		nC
Drain - Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Body - Diode Forward Current				176	A
I _{SM}	Maximum Pulsed Body - Diode Forward Current				500	A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 1 A		0.67		V
t _{rr}	Reverse recovery time	V _{DD} = 20 V, I _D = 20 A, di/dt = 100 A/μs		70		ns
Q _{rr}	Reverse recovery charge			80		nC
I _{rrm}	Peak Reverse Recovery Current			2		A

Electrical Characteristics Diagrams

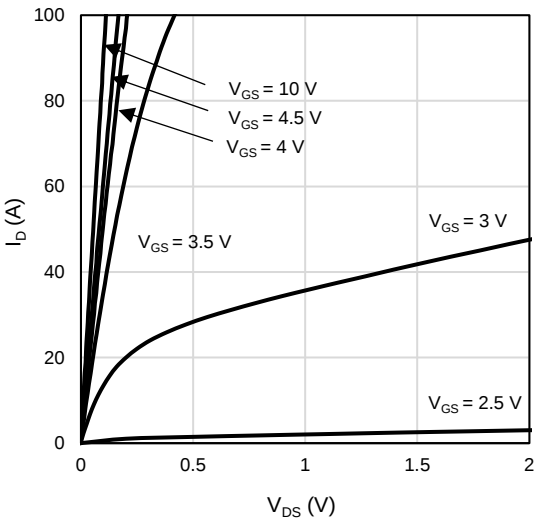


Figure 1: On-Region Characteristics

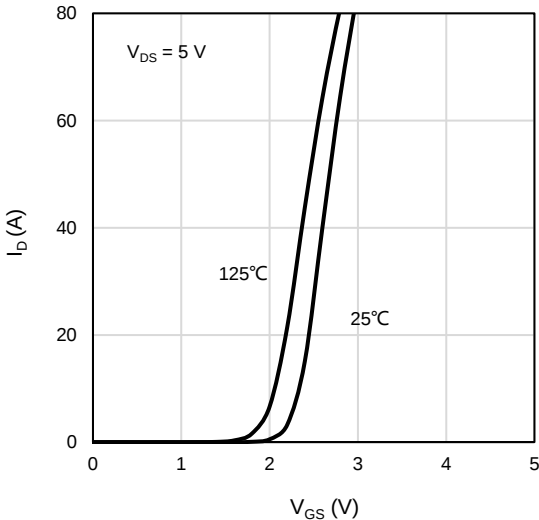


Figure 2: Transfer

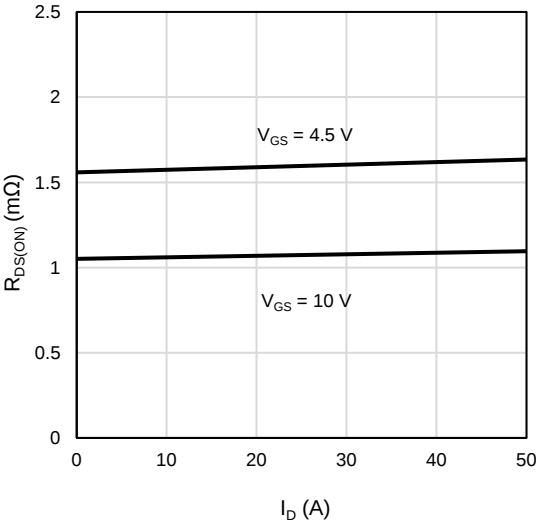


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

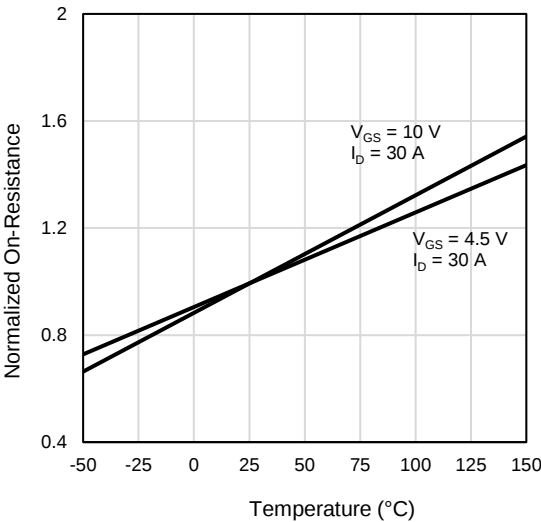


Figure 4: On-Resistance vs. Junction Temperature

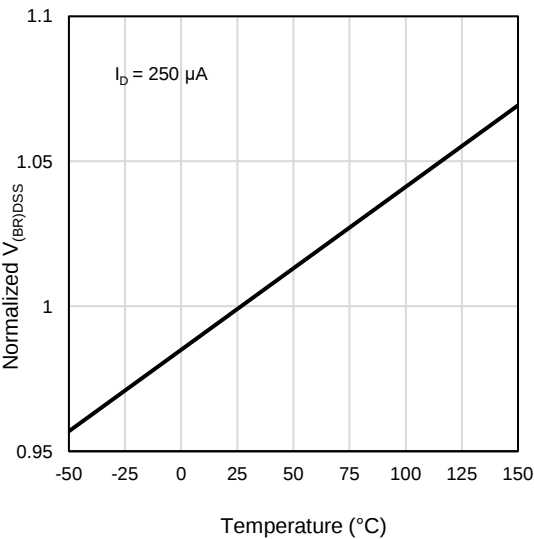


Figure 5: Breakdown Voltage vs. Junction Temperature

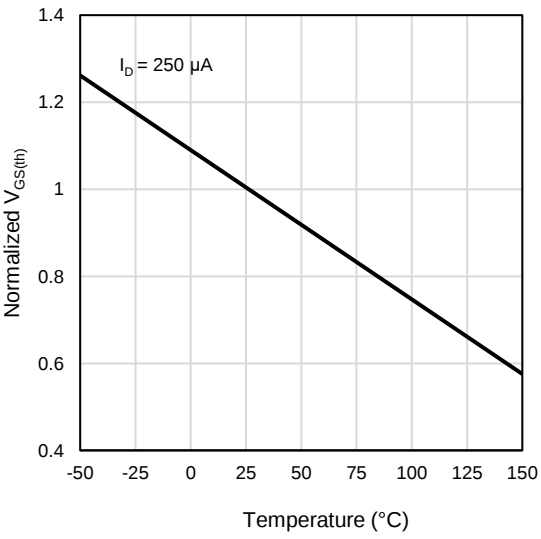


Figure 6: Threshold Voltage vs. Junction Temperature

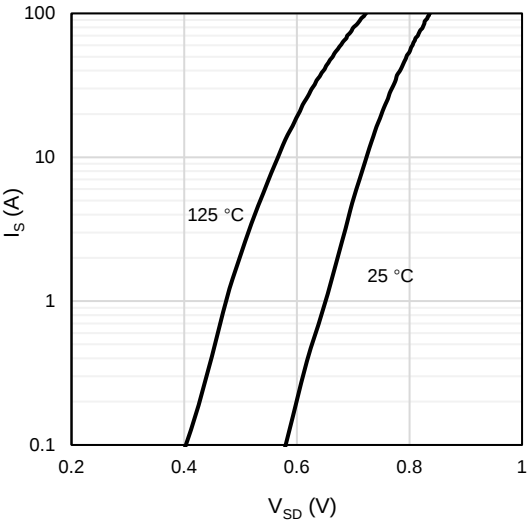


Figure 7: Body-Diode Characteristics

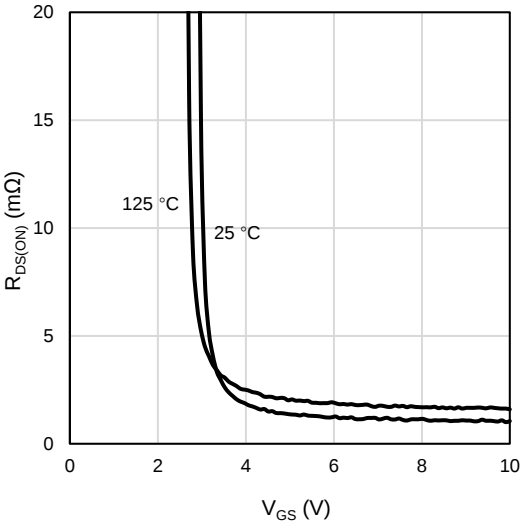


Figure 8: On-Resistance vs. Gate-Source Voltage

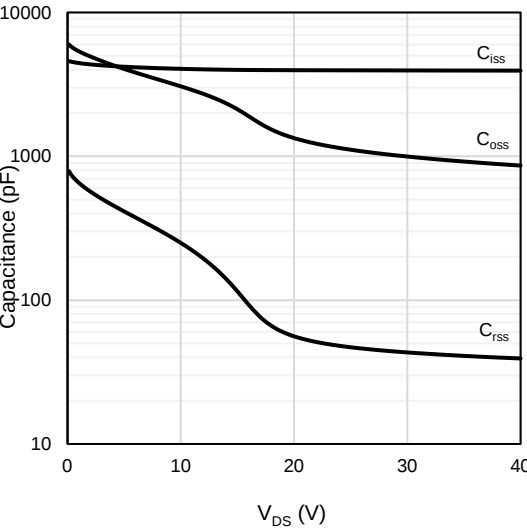


Figure 9: Capacitance Characteristics

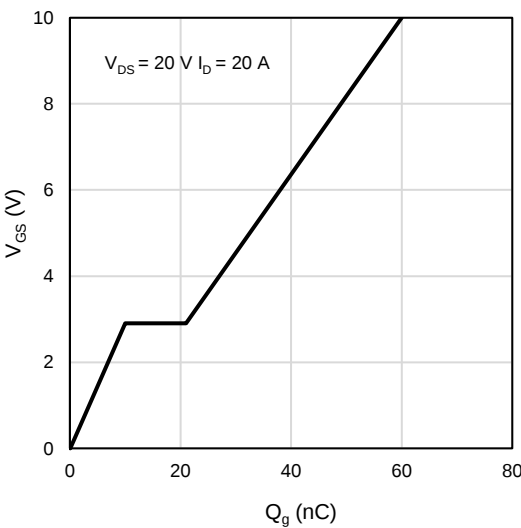


Figure 10: Gate-Charge Characteristics

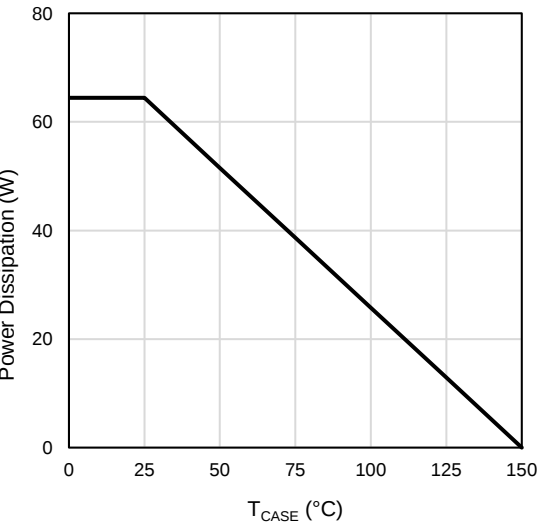


Figure 11: Power De-rating

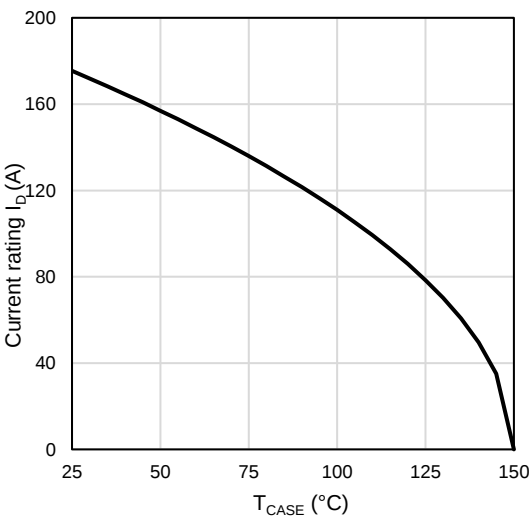


Figure 12: Current De-rating

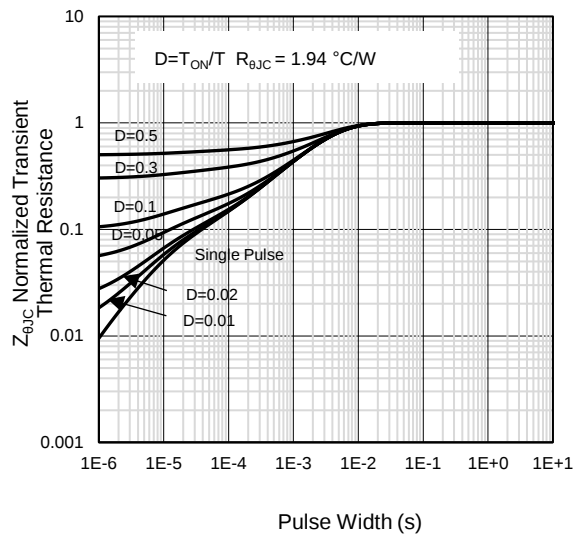


Figure 13: Normalized Maximum Transient Thermal Impedance

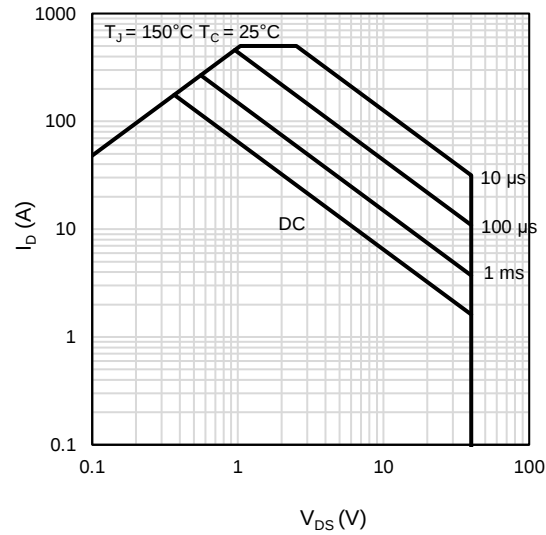
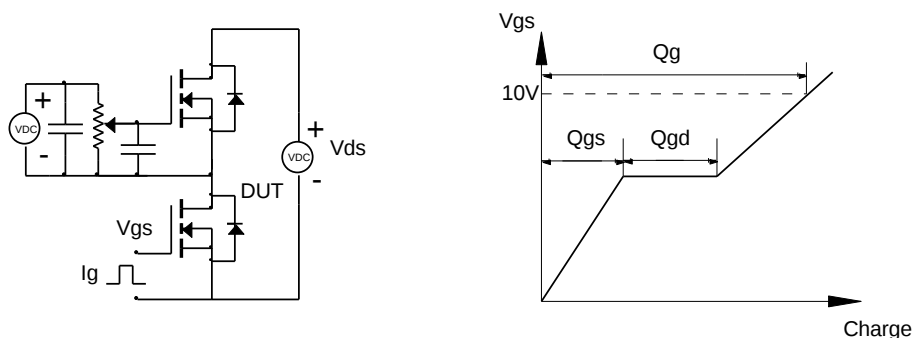


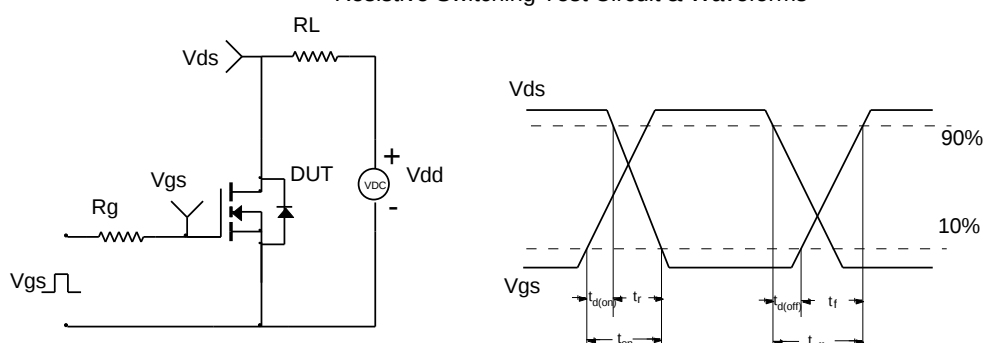
Figure 14: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

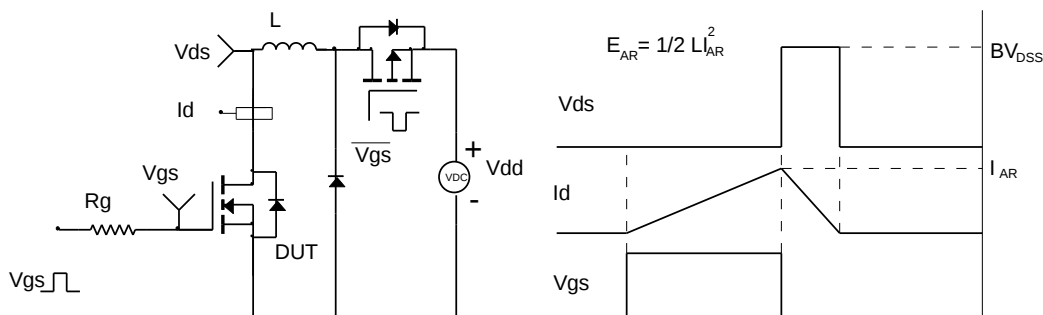
Gate Charge Test Circuit & Waveform



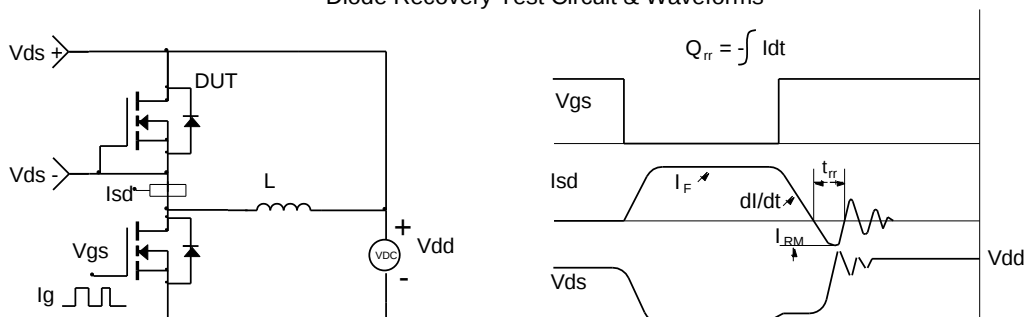
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Released	Remark
Rev.1.2	2023	

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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