

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:

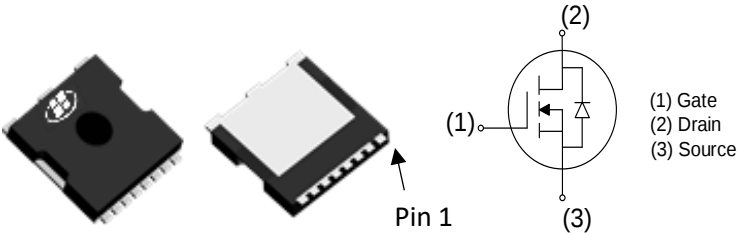
- Ultra Low $R_{DS(ON)}$
- RoHS compliant (Note 1)
- Halogen-free (Note 1)
- 100% UIS tested

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	mΩ
I_D	160	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG4N012TM	TOLL	G4N012TM	Tape Reel	See the detail package information

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 ($T_C = 25^{\circ}\text{C}$) ^(Note 1)	380	A
	Drain Current - Continuous ($T_C = 25^{\circ}\text{C}$) ^(Note 2)	160	A
	Drain Current - Continuous ($T_C = 100^{\circ}\text{C}$)	160	A
I_{DM}	Drain Current - Pulsed ^(Note 3)	530	A
V_{GS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ^(Note 4)	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 ^(Note 5)	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. $L = 0.5\text{ mH}$, $V_{DD} = 40\text{ V}$, $I_{AS} = 58\text{ A}$, $R_G = 25\text{ }\Omega$, Starting $T_J = 25\text{ }^{\circ}\text{C}$
- 5. Mount on minimum PCB layout

Symbo l	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV _{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	2	3	4	V
R _{DS(ON)}	Drain-Source on-state resistance	V _{GS} = 10 V, I _D = 50 A		1	1.2	mΩ
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, F = 1 MHz		7020		pF
C _{OSS}	Output Capacitance			2000		pF
C _{RSS}	Reverse Transfer Capacitance			10		pF
R _G	Gate Resistance	F = 1 MHz		6.5		Ω
Switching Characteristics						
T _{D(ON)}	Turn On Delay Time	V _{DD} = 20 V , R _L = 0.4 Ω, V _{GS} = 10 V, R _G = 4 Ω		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 V , I _D = 50 A, V _{GS} = 10 V		80		nC
Q _{GS}	Gate-Source Charge			36		nC
Q _{GD}	Gate-Drain Charge			8		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Body-Diode Forward Current				160	A
I _{SM}	Maximum Pulsed Body-Diode Forward Current				530	A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 40 A		0.8	1.2	V
T _{RR}	Reverse recovery time	V _{DD} = 20 V, I _D = 40 A, di/dt = 100 A/μs		98		ns
Q _{RR}	Reverse recovery charge			229		nC
I _{RRM}	Peak Reverse Recovery Current			4		A

Electrical Characteristics Diagrams

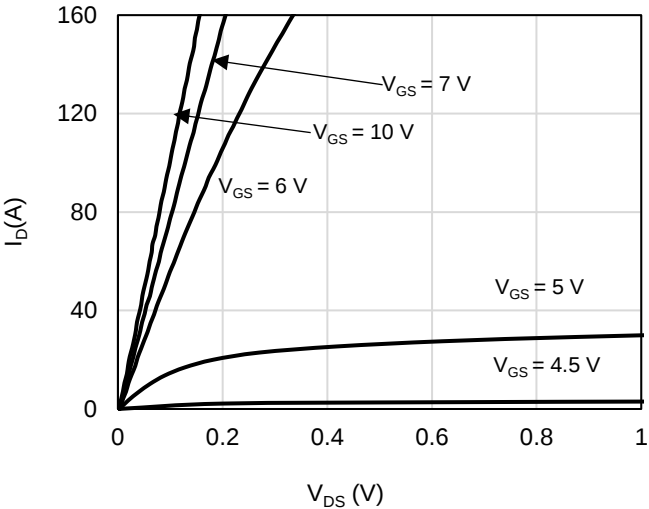


Figure 1: On-Region Characteristics

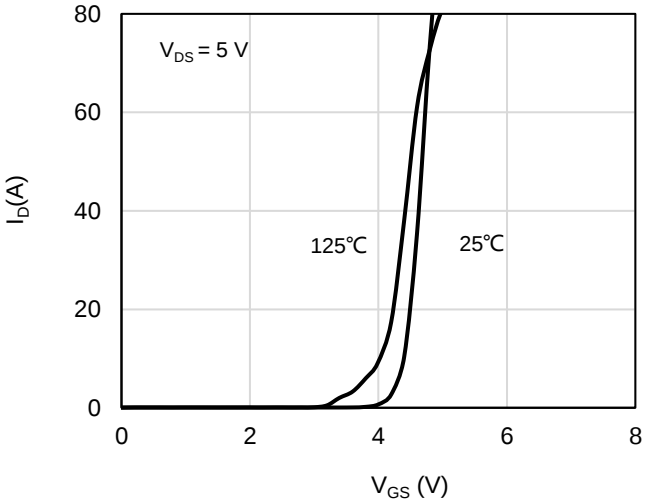


Figure 2: Transfer Characteristics

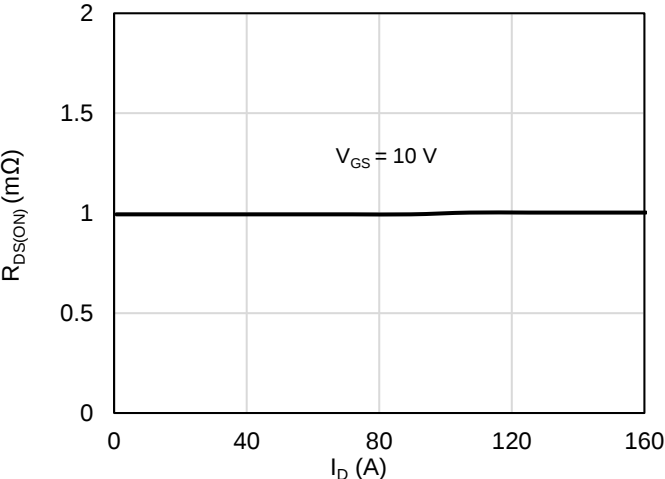


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

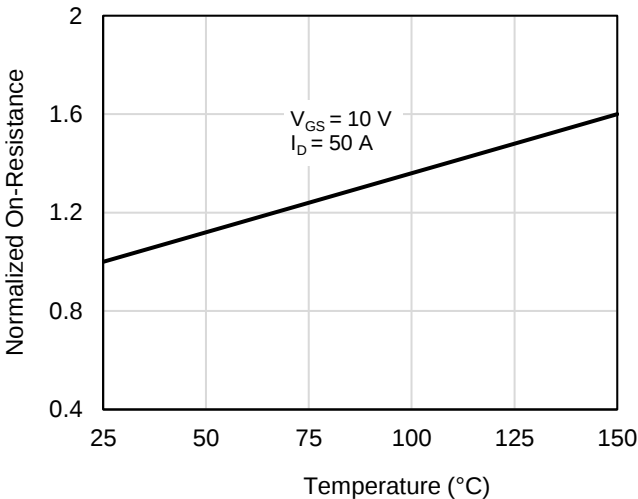


Figure 4: On-Resistance vs. Junction Temperature

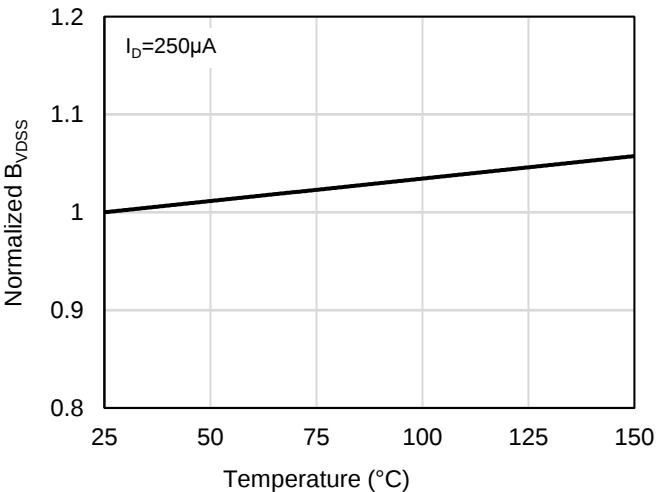


Figure 5: Breakdown Voltage vs. Junction Temperature

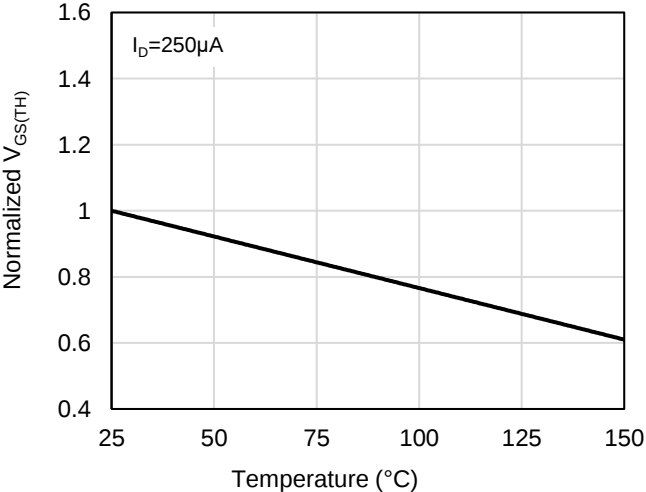
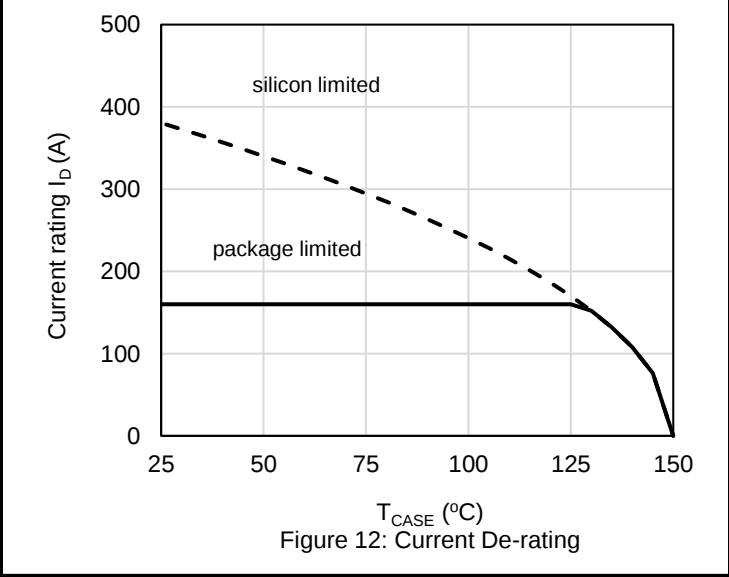
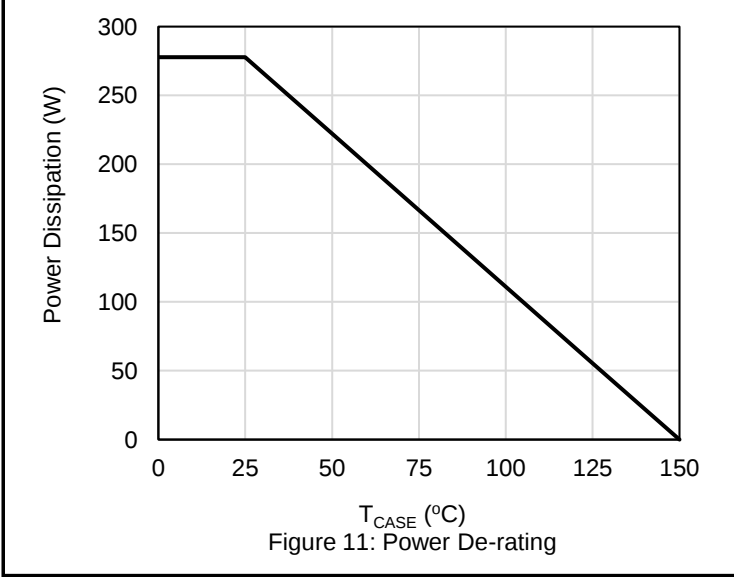
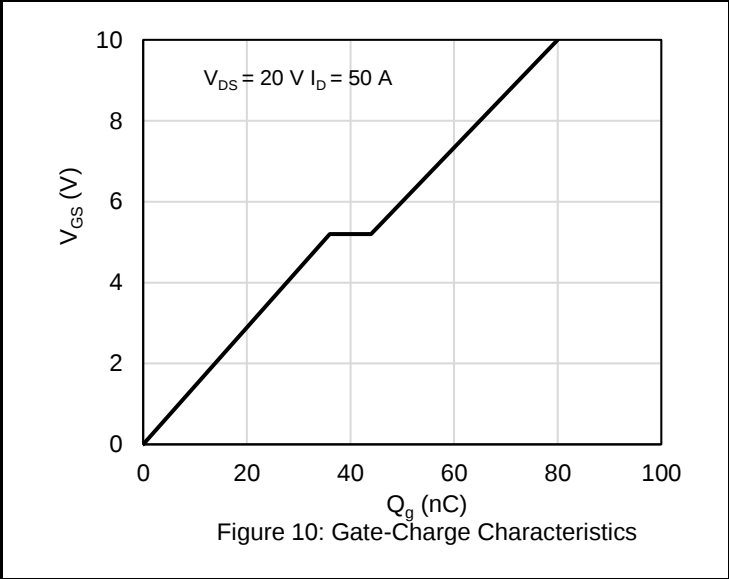
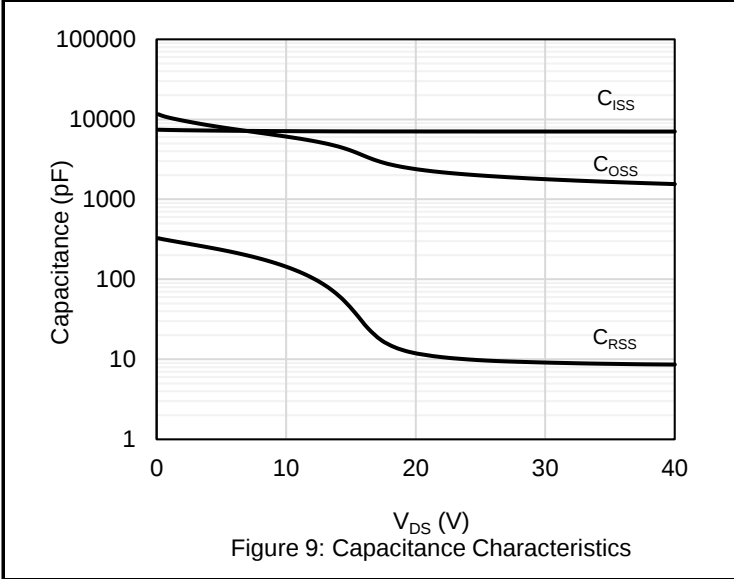
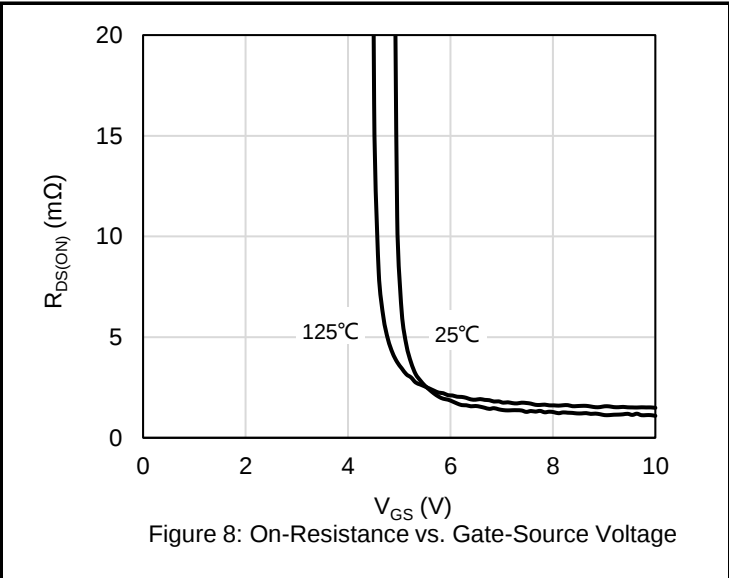
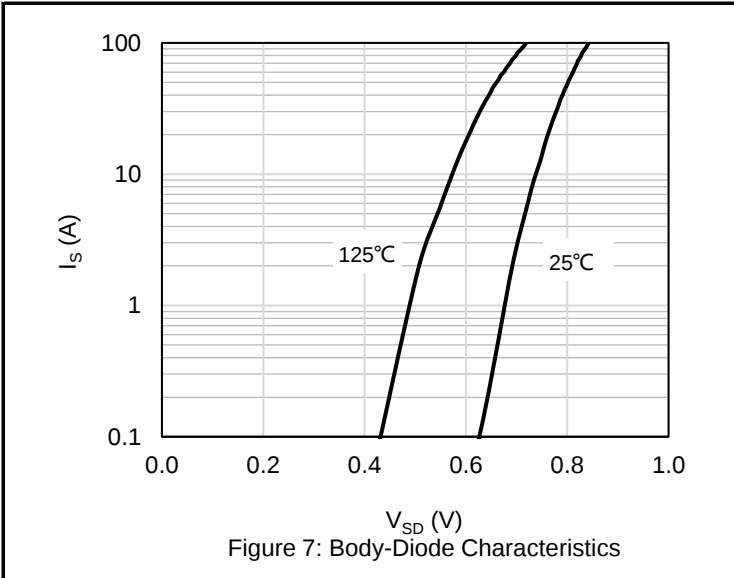


Figure 6: Threshold Voltage vs. Junction Temperature



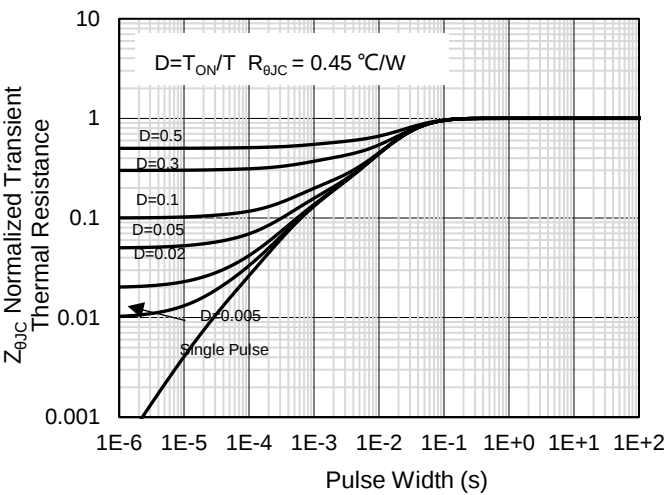


Figure 13: Normalized Maximum Transient Thermal Impedance

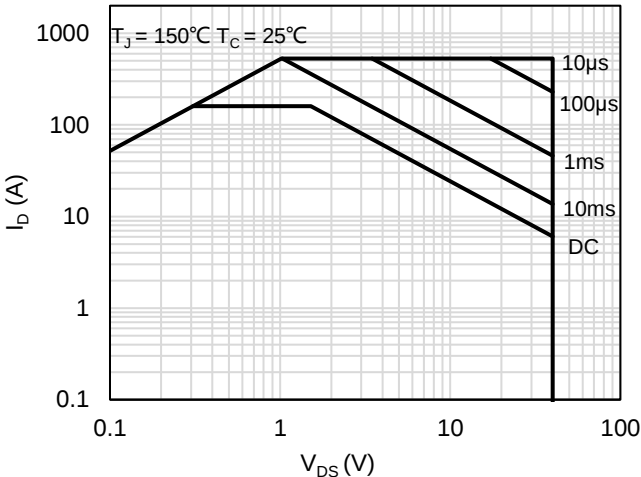
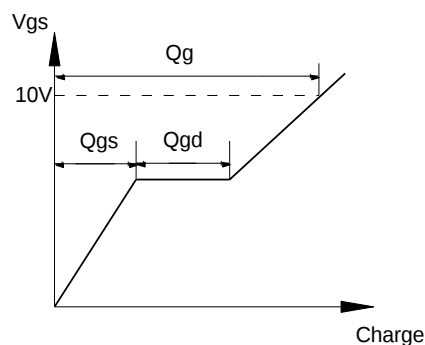
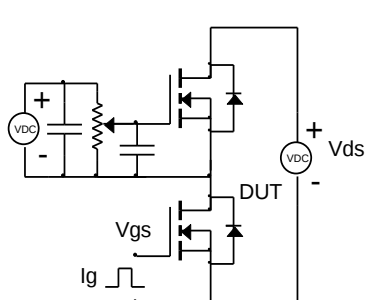


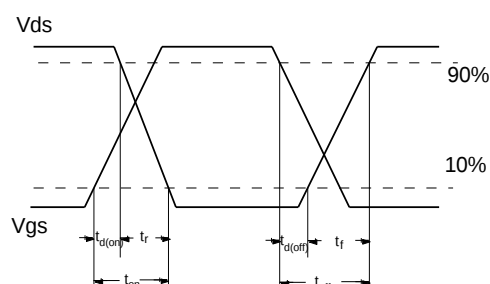
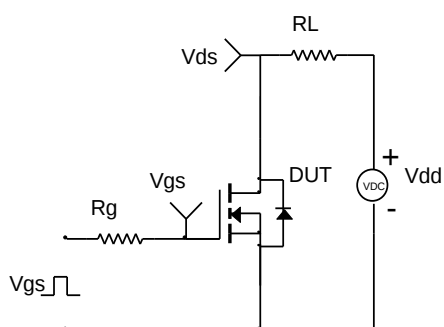
Figure 14: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

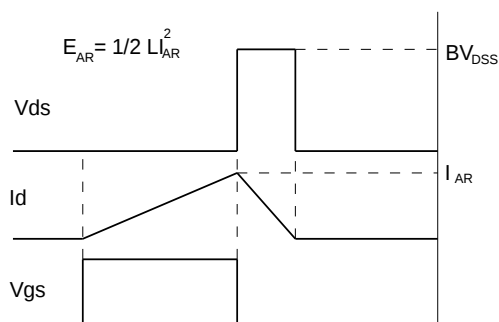
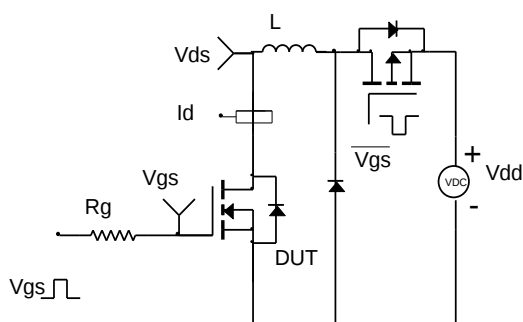
Gate Charge Test Circuit & Waveform



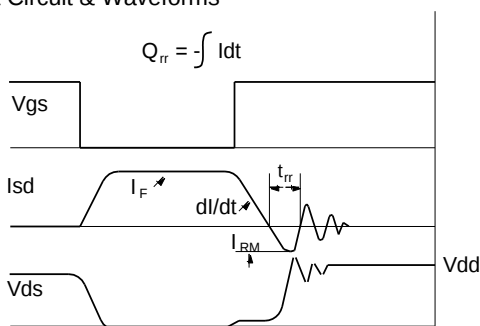
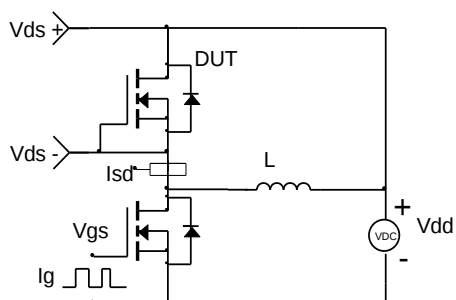
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Release Date	Remark
Rev.1.1	2024/1/4	

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.