

40V 5.8mohm N-channel SGT MOSFET
AKG4N058QM-A

Description:

This device is designed for automotive applications and manufactured in IATF16949 certified facilities. Qualified AEC-Q101, PPAP capable.

Features:

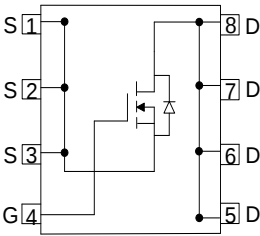
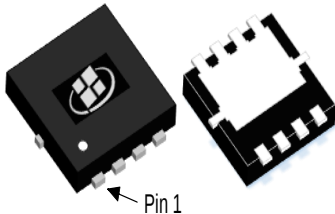
- Low $R_{DS(ON)}$
- 100% UIS Tested
- RoHS compliant ^(Note 1)
- Halogen-free ^(Note 1)
- AEC-Q101 qualified and PPAP capable

Applications:

- Battery Management System
- Motor Drivers

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(ON)}$, max @ $V_{GS} = 10\text{ V}$	5.8	m Ω
I_D	50	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKG4N058QM-A	PDFN3.3X3.3	G4N058QM	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)	58	A
	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) ^(Note 2)	50	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	40	A
I_{DM}	Drain Current - Pulsed ^(Note 3)	200	A
V_{GS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ^(Note 4)	76	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	33	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	4.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State ^(Note 5)	58	$^\circ\text{C/W}$

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. $L = 0.5\text{ mH}$, $V_{DD} = 20\text{ V}$, $I_{AS} = 17.5\text{ A}$, $R_G = 25\ \Omega$, Starting $T_J = 25\ ^\circ\text{C}$
5. Mount on minimum PCB layout

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Static Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			100	μA
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		4.8	5.8	m Ω

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$		1220		pF
C_{OSS}	Output Capacitance			360		pF
C_{RSS}	Reverse Transfer Capacitance			12		pF
R_G	Gate Resistance	$F = 1\text{ MHz}$		3		Ω

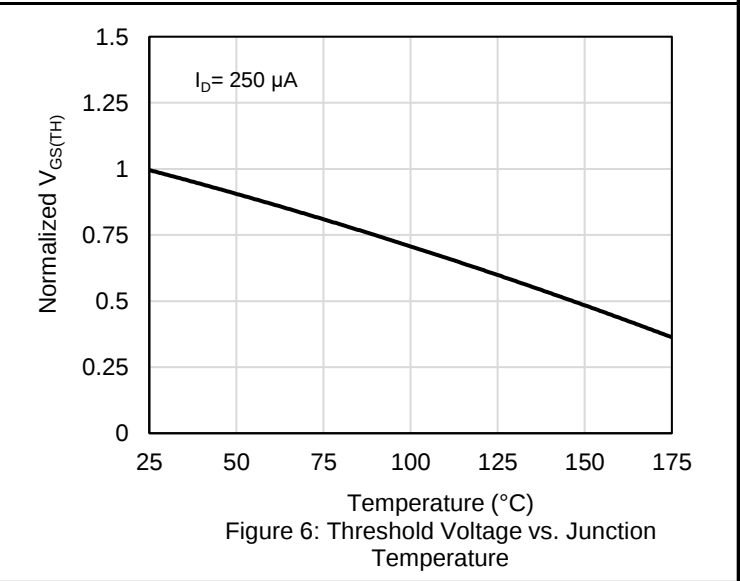
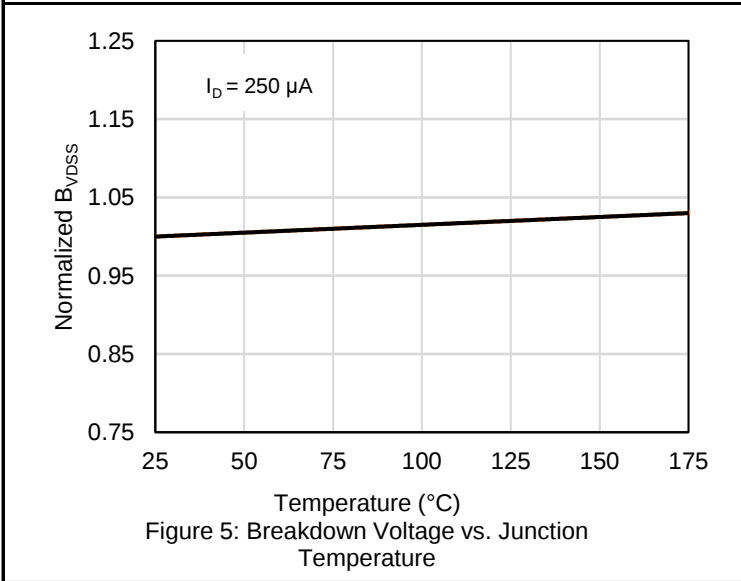
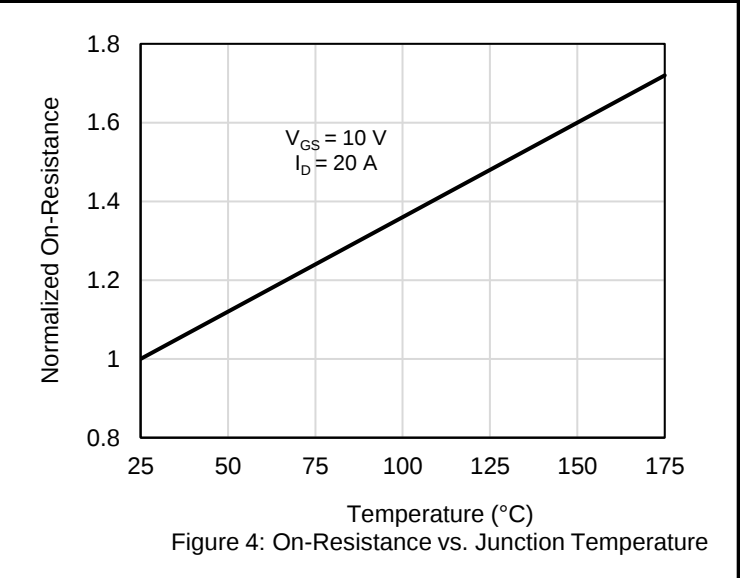
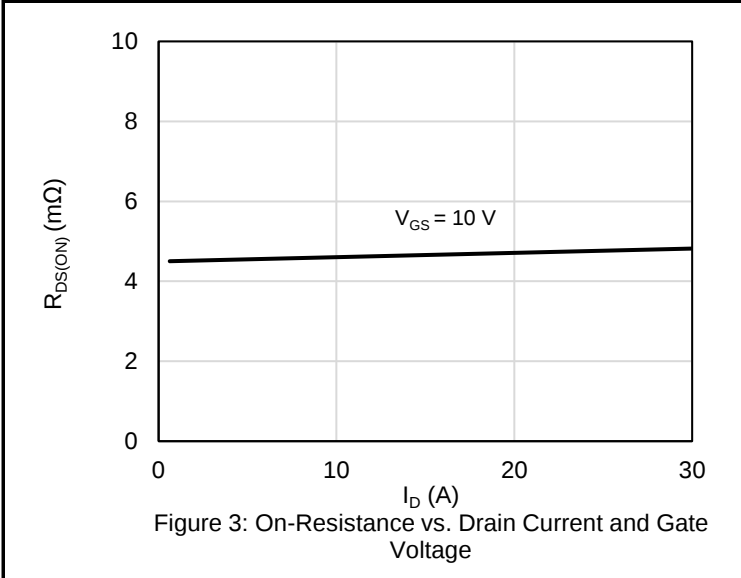
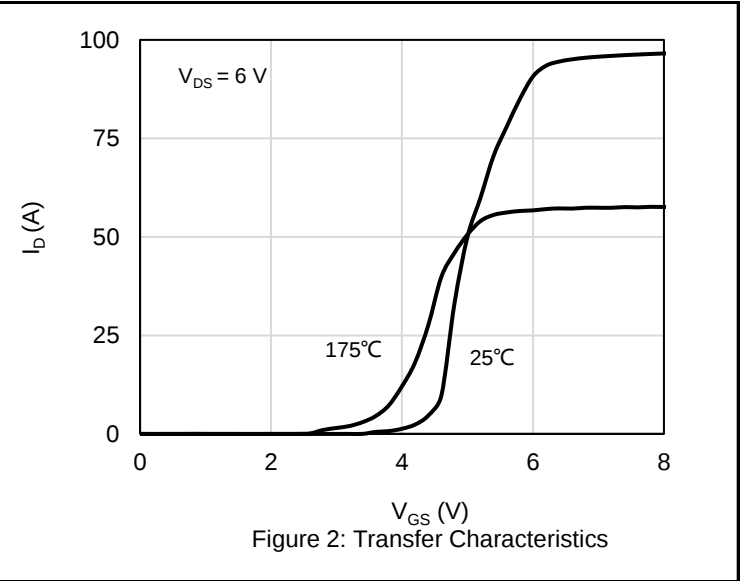
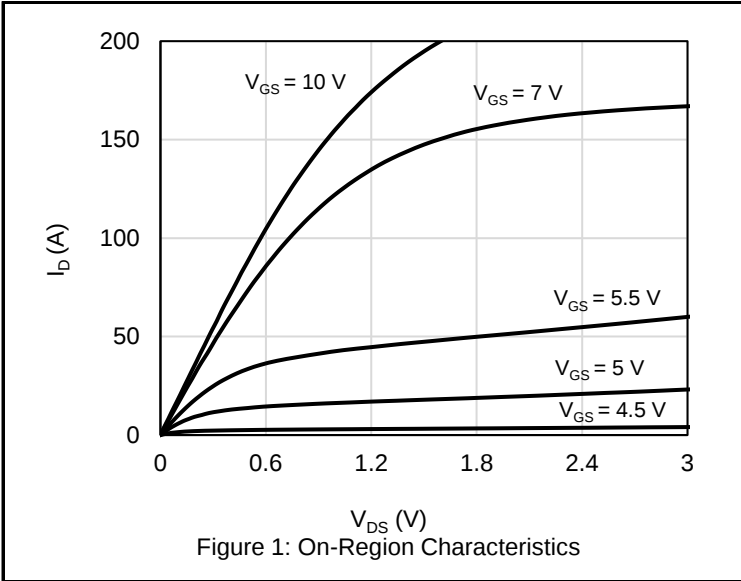
Switching Characteristics

$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega,$ $V_{GS} = 10\text{ V}, R_G = 3.5\text{ }\Omega$		9		ns
T_R	Rise Time			49		ns
$T_{D(OFF)}$	Turn Off Delay Time			16		ns
T_F	Fall Time			7		ns
Q_G	Total Gate Charge	$V_{DD} = 20\text{ V}, I_D = 20\text{ A},$ $V_{GS} = 10\text{ V}$		15		nC
Q_{GS}	Gate-Source Charge			5		nC
Q_{GD}	Gate-Drain Charge			4		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Body-Diode Forward Current			50		A
I_{SM}	Maximum Pulsed Body-Diode Forward Current ^(NOTE 1)			200		A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}$		0.85	1.2	V
T_{RR}	Reverse recovery time	$V_{DD} = 20\text{ V}, I_D = 20\text{ A},$ $di/dt = 100\text{ A}/\mu\text{S}$		33		ns
Q_{RR}	Reverse recovery charge			32		nC
I_{RRM}	Peak Reverse Recovery Current			1.6		A

Electrical Characteristics Diagrams



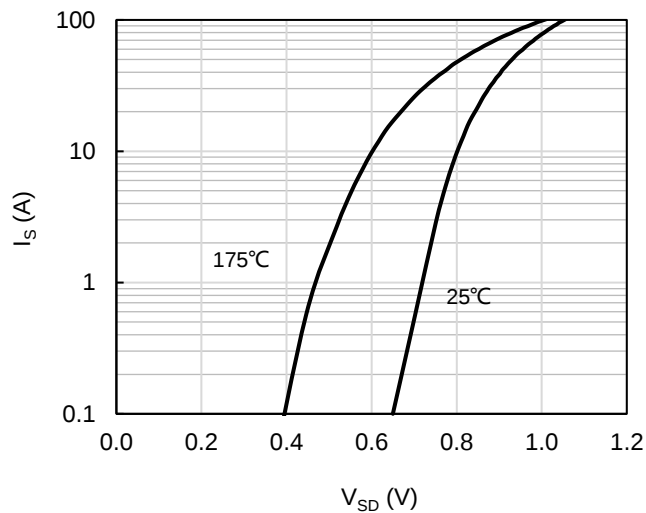


Figure 7: Body-Diode Characteristics

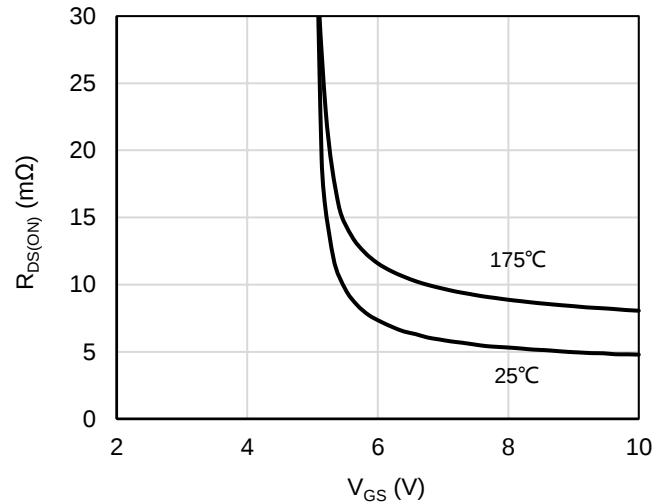


Figure 8: On-Resistance vs. Gate-Source Voltage

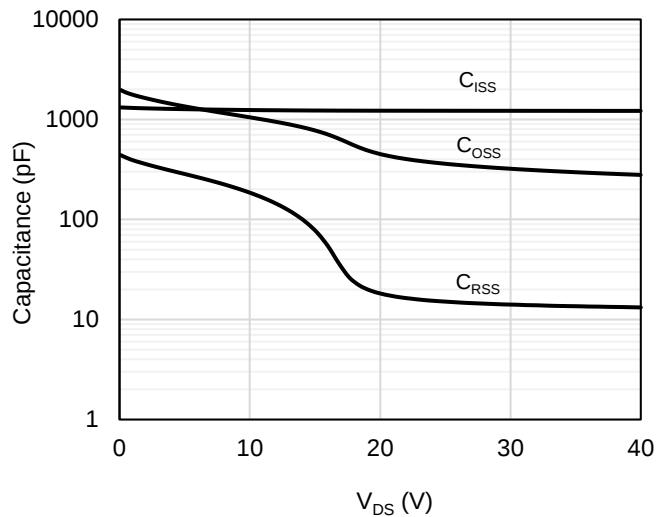


Figure 9: Capacitance Characteristics

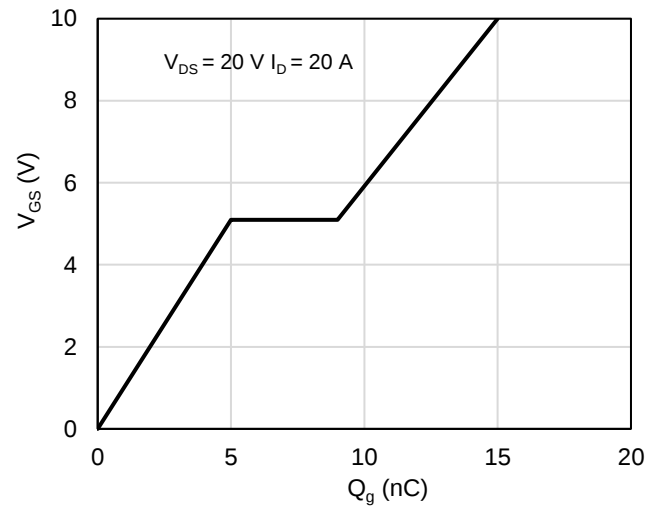


Figure 10: Gate-Charge Characteristics

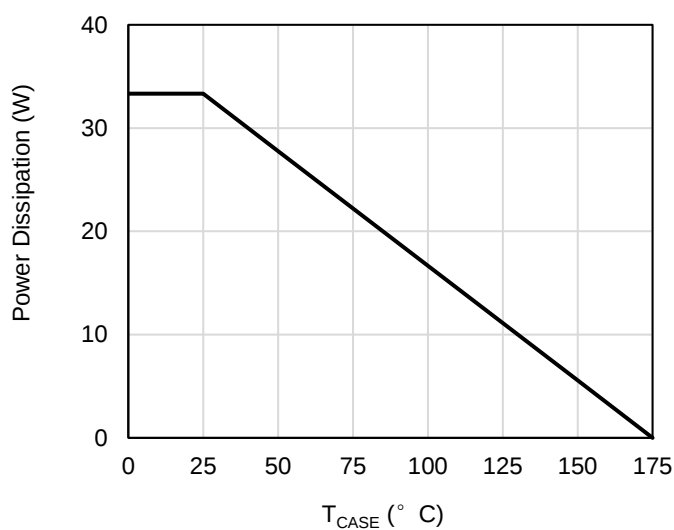


Figure 11: Power De-rating

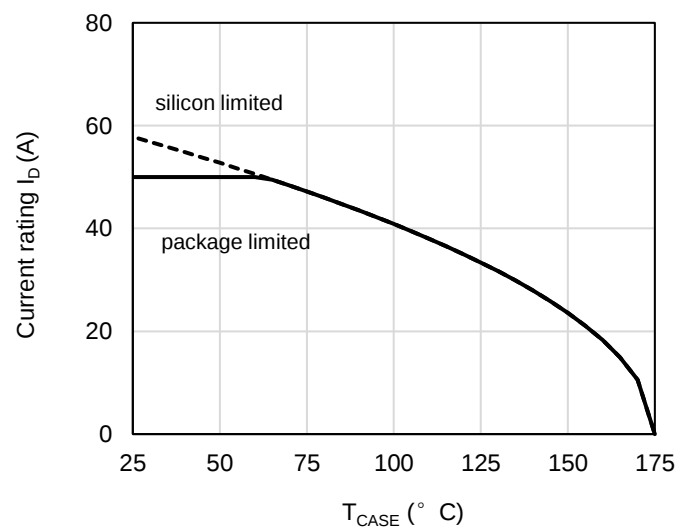
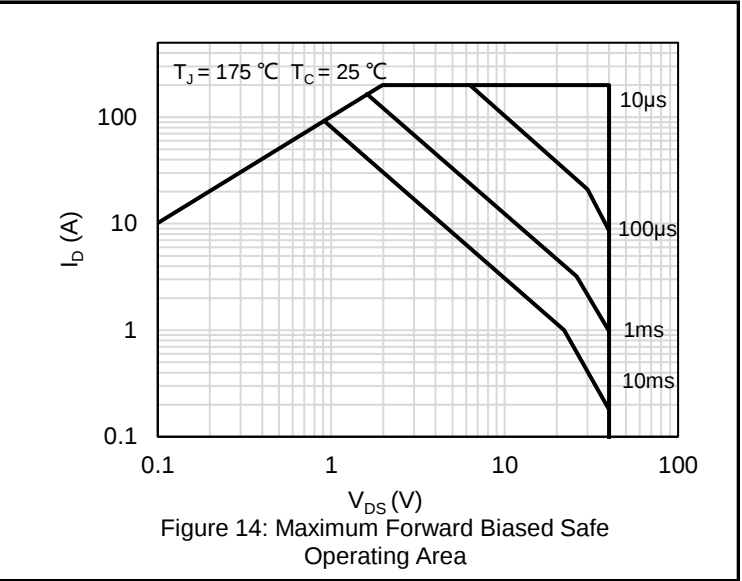
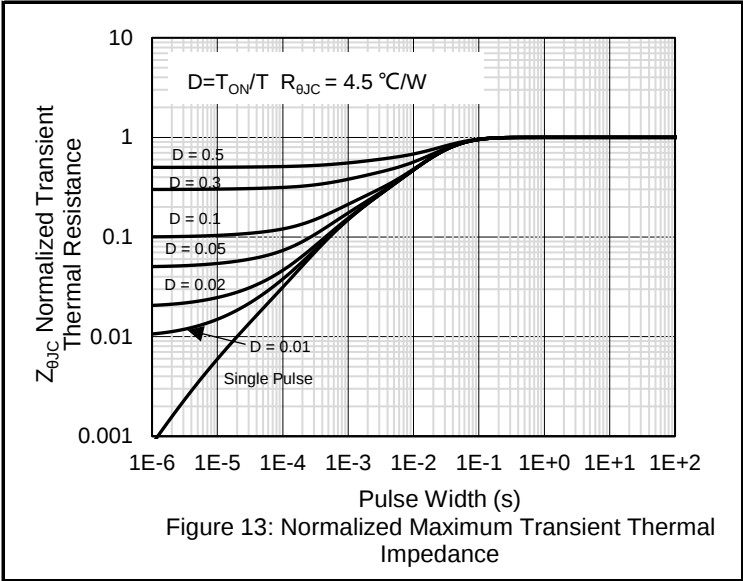
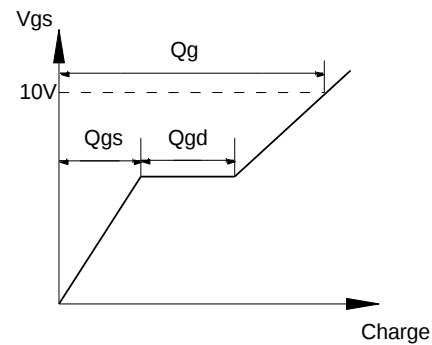
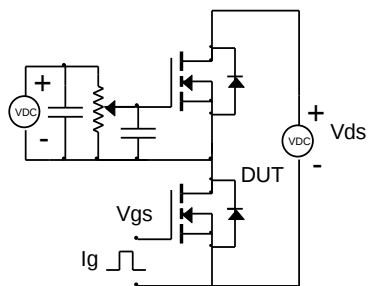


Figure 12: Current De-rating

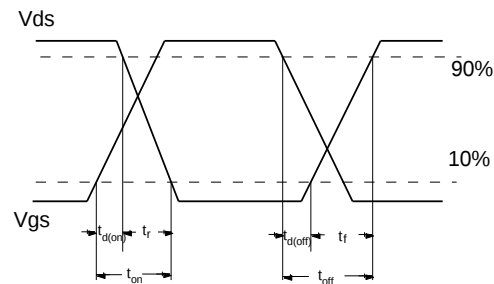
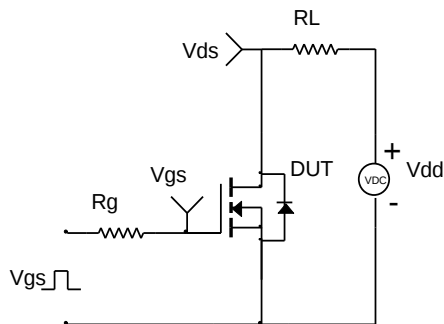


Test Circuit and Waveform

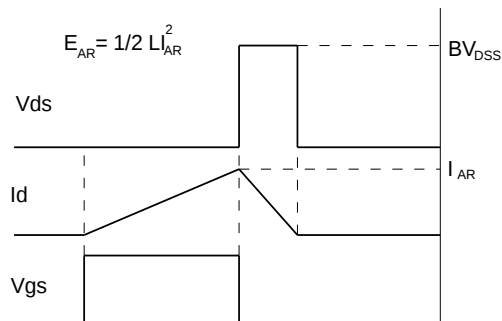
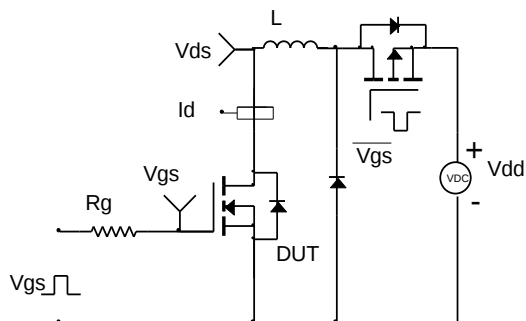
Gate Charge Test Circuit & Waveform



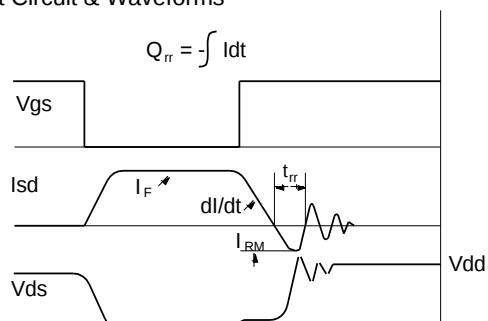
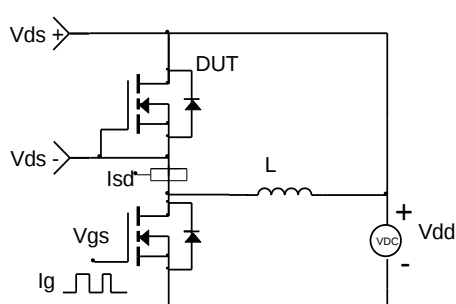
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Release Date	Remark
Rev.1.1	2023/7/13	

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.