12V 5.5mohm N-channel Trench MOSFET
AKT1A055MAU

Description:

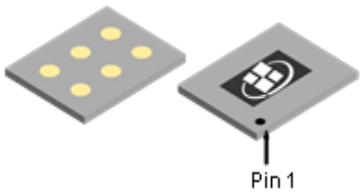
This N channel Trench MOSFET has been designed to Battery Protection.

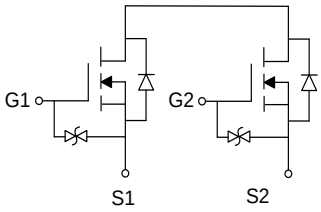
Features:

- Trench MOSFET technology
- Extremely Low $R_{SS(ON)}$
- ESD HBM Class 2
- Common Drain Design
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

Applications:

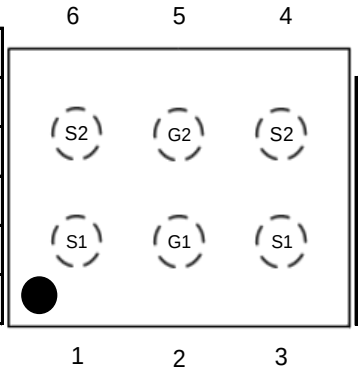
- Battery Protection





Key Performance Parameters:

Parameter	Value	Unit
V_{SS}	12	V
$R_{SSON,\ max}$ @V_{GS} = 4.5V	5.5	mΩ
$R_{SSON,\ max}$ @V_{GS} = 3.8V	6.2	mΩ
$R_{SSON,\ max}$ @V_{GS} = 3.1V	7.5	mΩ
$R_{SSON,\ max}$ @V_{GS} = 2.5V	12	mΩ



Device	Pin Name	Pin Number
MOSFET 1	Gate 1	2
	Source 1	1 3
MOSFET 2	Gate 2	5
	Source 2	4 6

Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKT1A055MAU	CSP-2.14X1.67-6L	AKT1A055MAU	Tape Reel	See the detail package information

Notes:

1. Contact ALKAIDSEMI sales for detail information

Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{SS}	Source-Source Voltage	12	V
I_S	Source Current - Continuous (T_C = 25°C) (Note 1)	7.5	A
	Source Current - Continuous (T_C = 100°C)	4.5	A
I_{SM}	Source Current - Pulsed (Note 2)	30	A
V_{GS}	Gate-Source Voltage	± 8	V
P_D	Power Dissipation (T_C = 25°C)	0.5	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady State (Note 3)	250	°C/W

Notes:

1. Continuous current based on $R_{\theta JA}$
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. Mount on 1 - inch^2 FR - 4, 2oz copper PCB board

Electrical Characteristics (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV_{SSS}	Source-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	12			V
I_{SSS}	Zero Gate Voltage Source Current	V_{SS} = 12 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate Leakage Current	V_{GS} = ± 8 V, V_{DS} = 0 V			± 10	μA
$V_{GS(TH)}$	Gate Threshold voltage	V_{SS} = V_{GS}, I_D = 1 mA	0.55	0.95	1.35	V
$R_{SS(ON)}$	Source-Source on-state resistance	V_{GS} = 4.5 V, I_D = 4 A		4.4	5.5	mΩ
		V_{GS} = 3.8 V, I_D = 4 A		4.9	6.2	mΩ
		V_{GS} = 3.1 V, I_D = 4 A		5.9	7.5	mΩ
		V_{GS} = 2.5 V, I_D = 4 A		8.7	12	mΩ
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{SS} = 10 V, V_{GS} = 0 V, F = 1 MHz		1715		pF
C_{OSS}	Output Capacitance			475		pF
C_{RSS}	Reverse Transfer Capacitance			312		pF
R_G	Gate Resistance	F = 1 MHz		501		Ω
Switching Characteristics						
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 6 V , R_L = 1.5 Ω, V_{GS} = 4.5 V, R_G = 3 Ω		3.9		ns
T_R	Rise Time			4.9		ns
$T_{D(OFF)}$	Turn Off Delay Time			12.2		ns
T_F	Fall Time			7.8		ns
Q_G	Total Gate Charge	V_{DD} = 6 V , I_S = 4 A, V_{GS} = 4.5 V		22		nC
Q_{GS}	Gate-Source Charge			5		nC
Q_{GD}	Gate-Drain Charge			8		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Body-Diode Forward Current				7.5	A
I_{SM}	Maximum Pulsed Body-Diode Forward Current				30	A
V_{SS}	Diode Forward Voltage	V_{GS} = 0 V, I_S = 4 A		0.73	1.2	V

Electrical Characteristics Diagrams

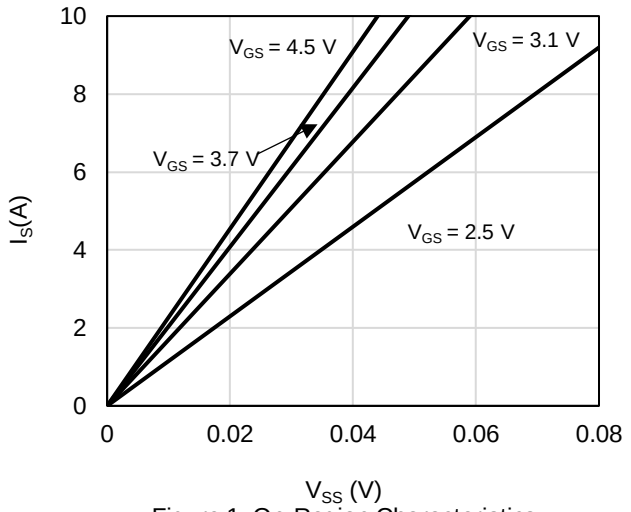


Figure 1: On-Region Characteristics

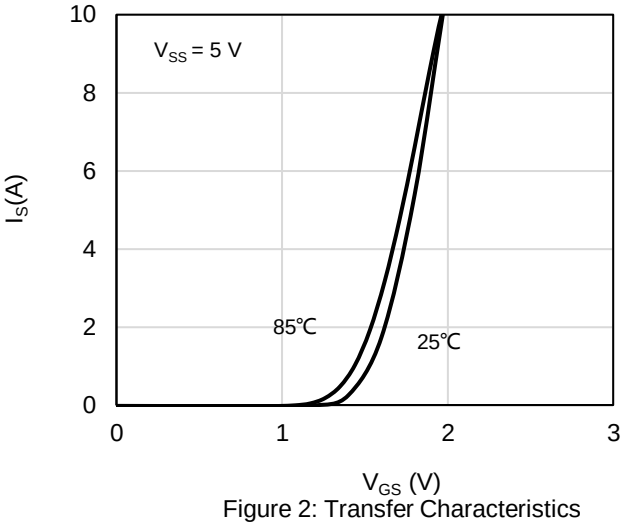


Figure 2: Transfer Characteristics

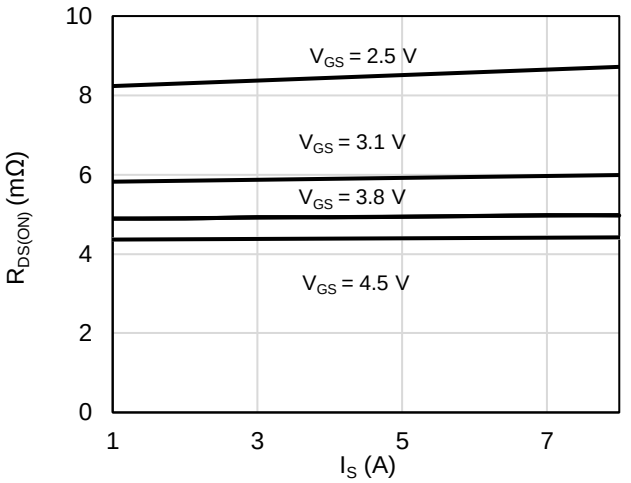


Figure 3: On-Resistance vs. Source Current and Gate Voltage

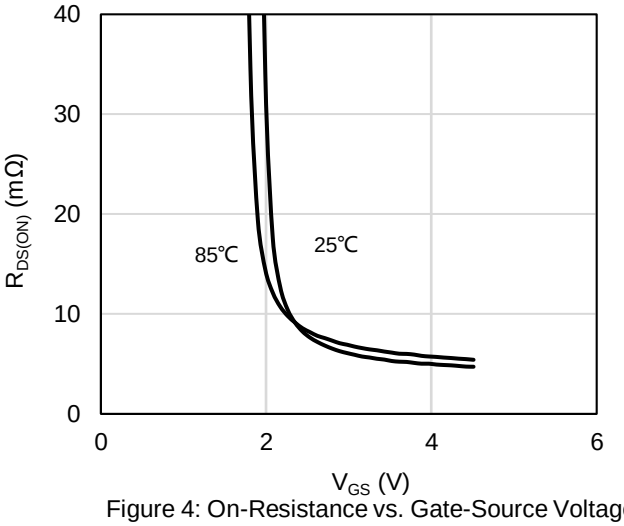


Figure 4: On-Resistance vs. Gate-Source Voltage

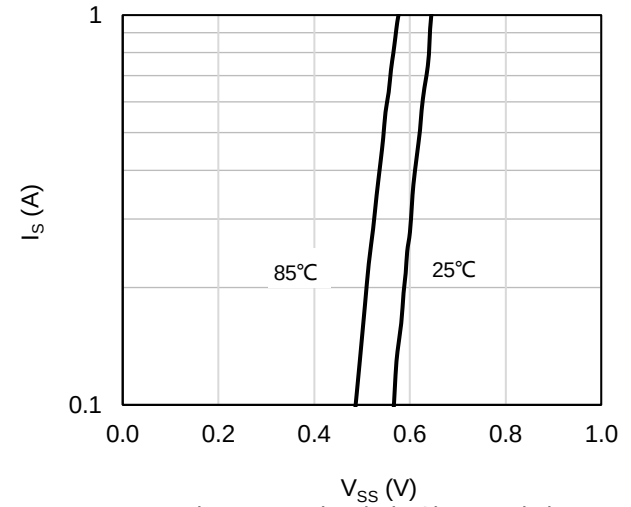


Figure 5: Body-Diode Characteristics

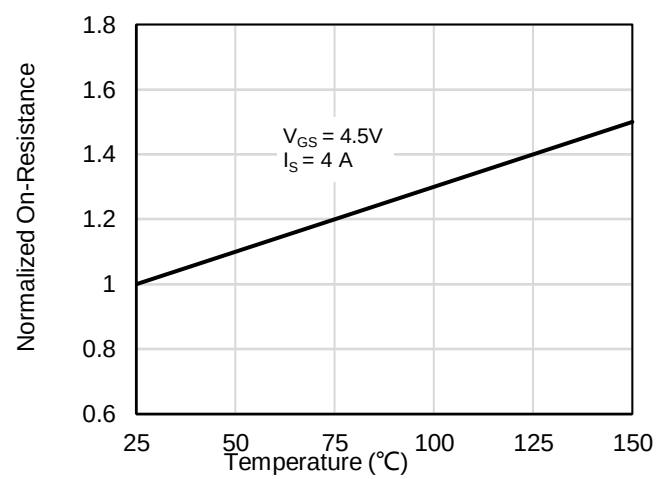


Figure 6: On-Resistance vs. Junction Temperature

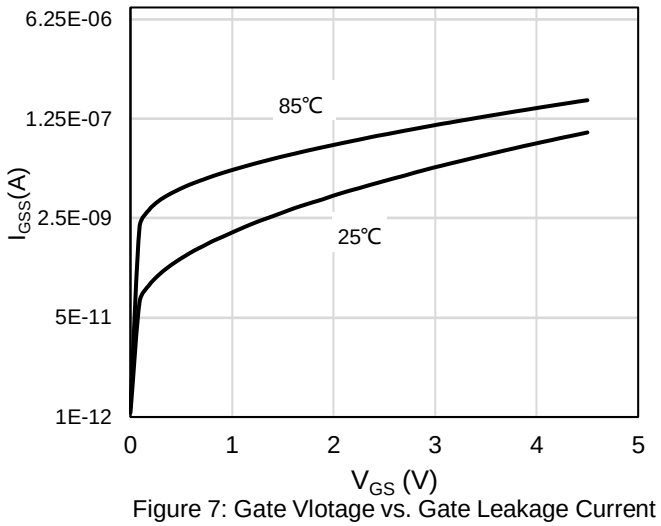


Figure 7: Gate Vlotage vs. Gate Leakage Current

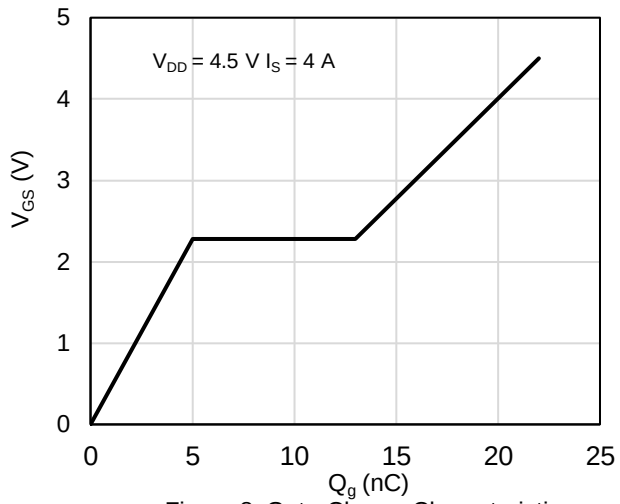


Figure 8: Gate-Charge Characteristics

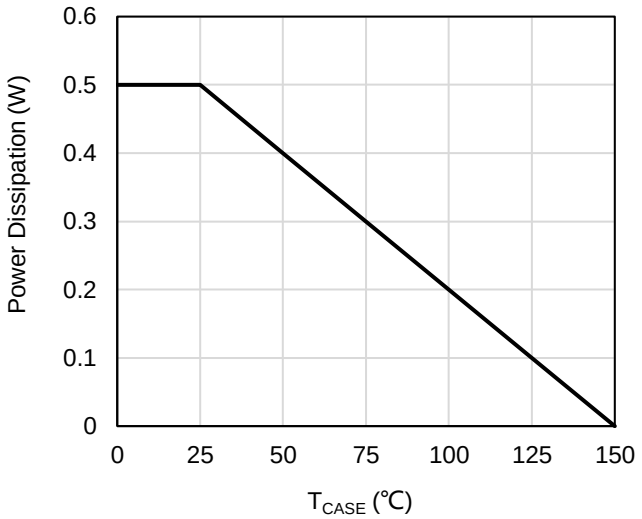


Figure 9: Power De-rating

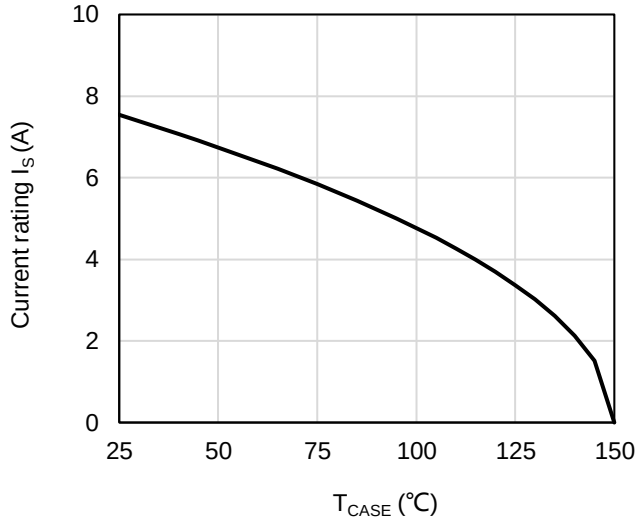


Figure 10: Current De-rating

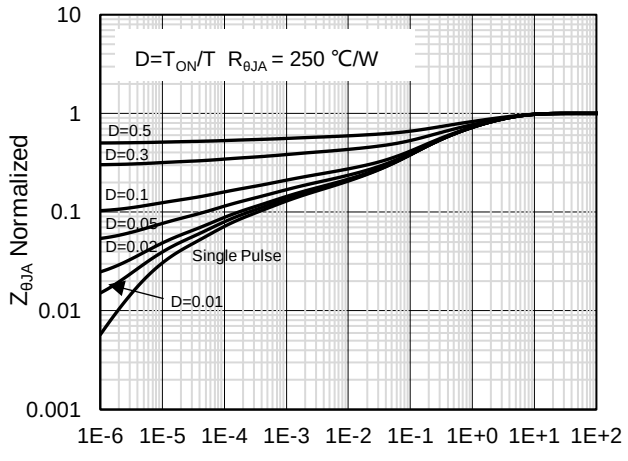


Figure 13: Normalized Maximum Transient Thermal Impedance

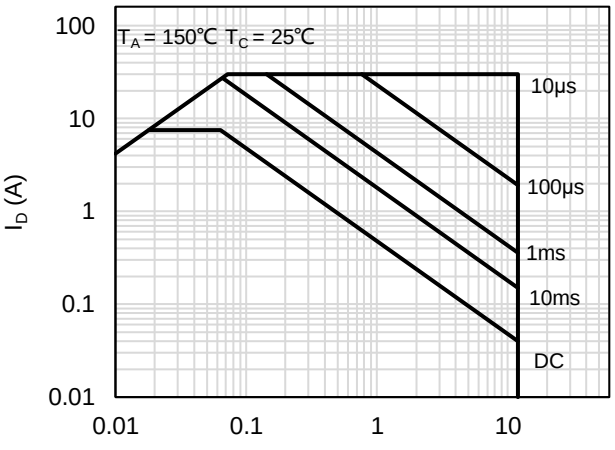
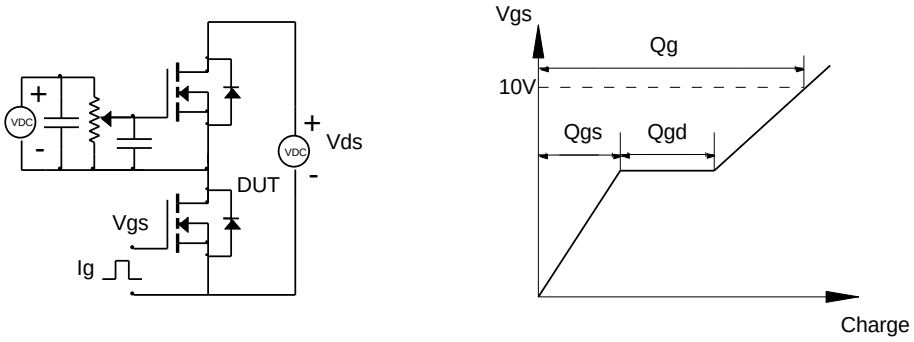


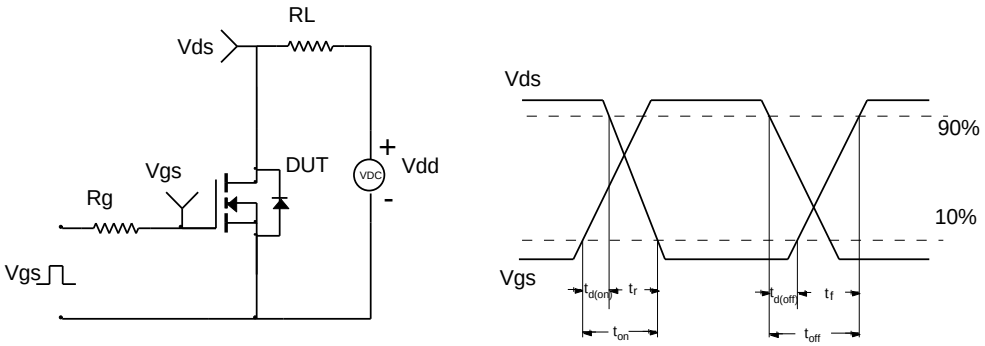
Figure 14: Maximum Forward Biased Safe Operating Area

Test Circuit and Waveform

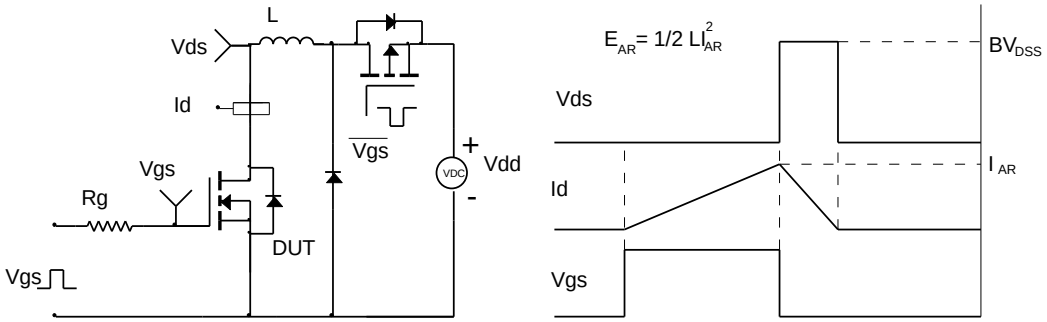
Gate Charge Test Circuit & Waveform



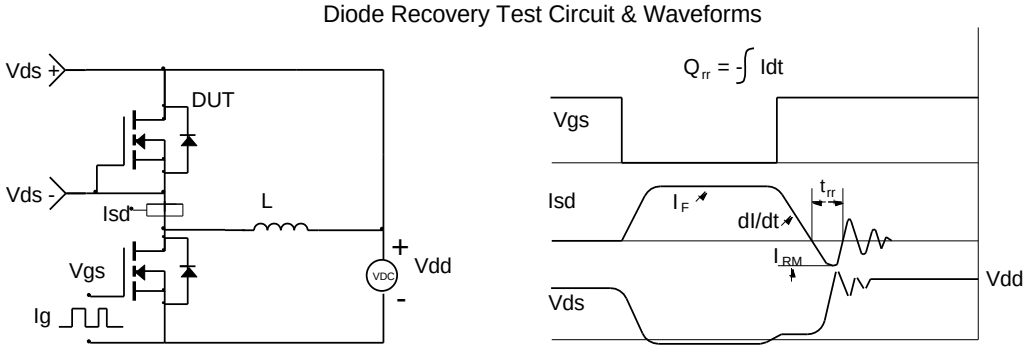
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Release Date	Remark
Rev.1.1	2022/12/1	

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.