

1700V 1000mohm Silicon Carbide Power MOSFET
AKCK7M1K0WMH

Features:

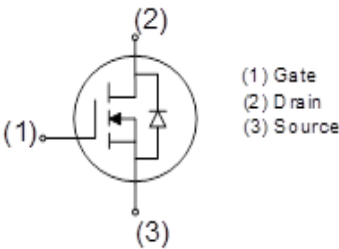
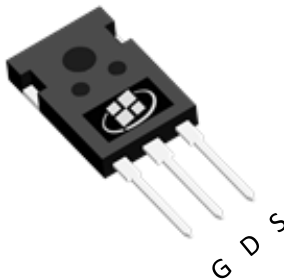
- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free, RoHS compliant ^(Note 1)

Applications:

- Motor drives
- DC/DC converters
- Switched mode power supplies
- Solar inverters

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	1700	V
$R_{DS(on), TYP} @V_{GS} = 18\text{ V}$	1000	m Ω
I_D	5.5	A
P_D	100	W



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKCK7M1K0WMH	TO-247-3L	CK7M1K0WMH	Tube	300 per box

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	1700	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) ^(Note 1)	5.5	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$) ^(Note 1)	4	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	11	A
V_{GS}	Gate-Source Voltage (dynamic)	-10/+22	V
V_{GS}	Gate-Source Voltage (static)	-6/+18	V
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	100	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	1.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady-State	40	$^\circ\text{C/W}$

Notes:

1. The max drain current limited by maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature

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	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1700			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}$		5	50	μA
I_{GSS}	Gate Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$			100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 0.7\text{ mA}$	1.8	3.2	4	V
		$V_{DS} = V_{GS}, I_D = 0.7\text{ mA}, T_J = 175^\circ\text{C}$		2		V
$R_{DS(on)}$	Drain-Source on-state resistance	$V_{GS} = 18\text{ V}, I_D = 2\text{ A}$		1000	1500	m Ω
		$V_{GS} = 18\text{ V}, I_D = 2\text{ A}, T_J = 175^\circ\text{C}$		2100		m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 2\text{ A}$		2.2		S
		$V_{DS} = 20\text{ V}, I_D = 2\text{ A}, T_J = 175^\circ\text{C}$		0.75		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V}, F = 100\text{ kHz}, V_{AC} = 25\text{ mV}$		184		pF
C_{oss}	Output Capacitance			12		pF
C_{rss}	Reverse Transfer Capacitance			3		pF
E_{oss}	C_{OSS} Stored Energy			7		μJ
R_g	Gate Resistance	$F = 1\text{ MHz}, V_{AC} = 25\text{ mV}$		8.7		Ω
Q_{gs}	Gate-Source Charge	$V_{DS} = 1200\text{ V}, I_D = 1\text{ A}, V_{GS} = -6/+18\text{ V}$		2.5		nC
Q_{gd}	Gate-Drain Charge			12		nC
Q_g	Total Gate Charge			16.5		nC

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn On Delay Time	$V_{DD} = 1200\text{ V}$, $I_D = 2\text{ A}$, $V_{GS} = -6/+18\text{ V}$, $R_{G,EXT} = 2.5\ \Omega$ $L = 1000\ \mu\text{H}$ Diode: Body Diode at $V_{GS} = -4\text{V}$ $T_J = 25\text{ }^\circ\text{C}$		5		ns
t_r	Rise Time			8		ns
$t_{d(off)}$	Turn Off Delay Time			6		ns
t_f	Fall Time			41		ns
E_{on}	Turn On Energy			45		μJ
E_{off}	Turn Off Energy			21		μJ
$t_{d(on)}$	Turn On Delay Time	$V_{DD} = 1200\text{ V}$, $I_D = 2\text{ A}$, $V_{GS} = -6/+18\text{ V}$, $R_{G,EXT} = 2.5\ \Omega$ $L = 1000\ \mu\text{H}$ Diode: Body Diode at $V_{GS} = -4\text{V}$ $T_J = 175\text{ }^\circ\text{C}$		6		ns
t_r	Rise Time			10		ns
$t_{d(off)}$	Turn Off Delay Time			7		ns
t_f	Fall Time			48		ns
E_{on}	Turn On Energy			58		μJ
E_{off}	Turn Off Energy			7		μJ

Drain-Source Diode Characteristics ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)

I_S	Maximum Continuous Drain-Source Diode Forward Current			5.5	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current			11	A
V_{SD}	Diode Forward Voltage	$V_{GS} = -4\text{ V}$, $I_{SD} = 1\text{ A}$		3.8	V
		$V_{GS} = -4\text{ V}$, $I_{SD} = 1\text{ A}$, $T_J = 175\text{ }^\circ\text{C}$		3.5	V
I_{rrm}	Peak Reverse Recovery Current	$V_{GS} = -4\text{ V}$, $I_{SD} = 2\text{ A}$, $V_R = 1200\text{ V}$, $di/dt = 2350\text{ A}/\mu\text{S}$ $T_J = 175\text{ }^\circ\text{C}$		5	A
t_{rr}	Reverse Recovery Time			15	ns
Q_{rr}	Reverse Recovery Charge			68	nC

Electrical Characteristics Diagrams

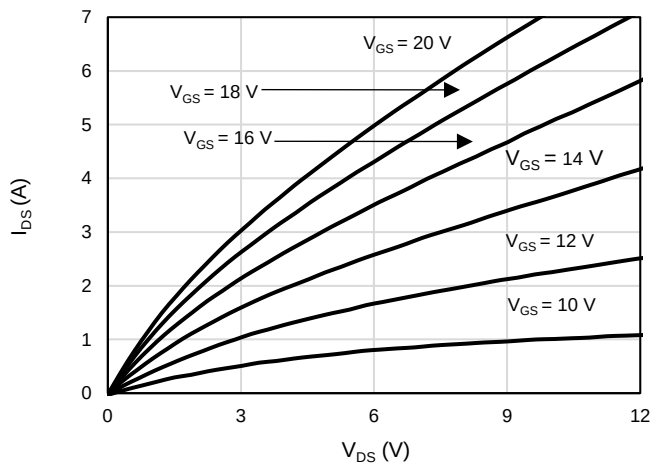
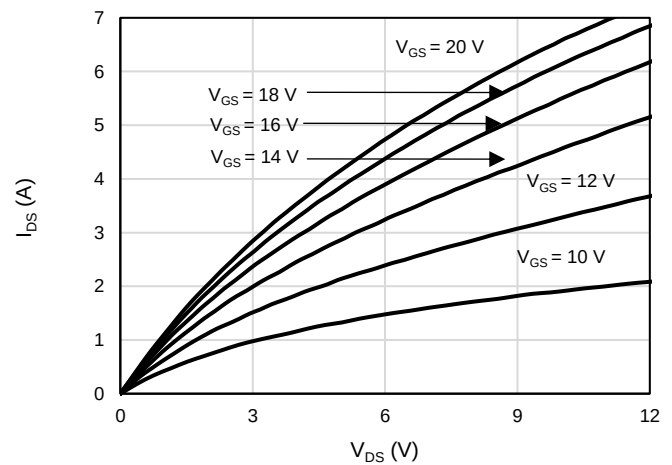
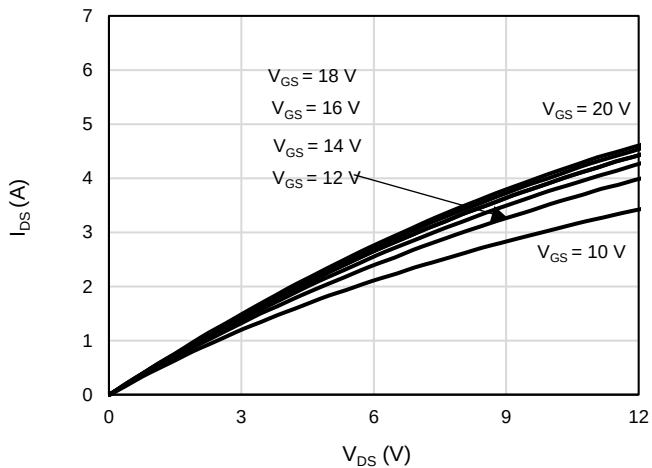
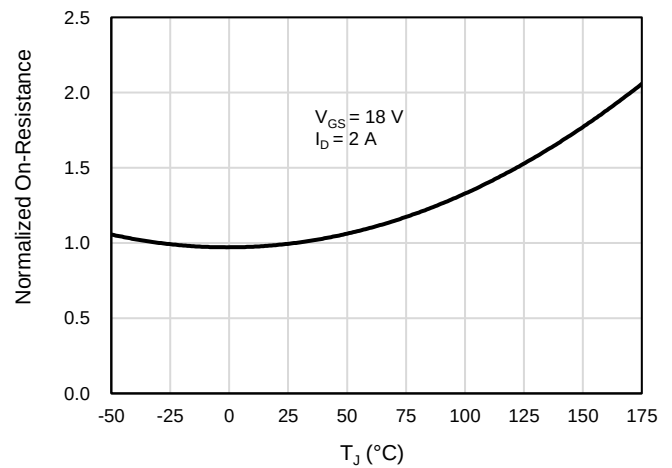
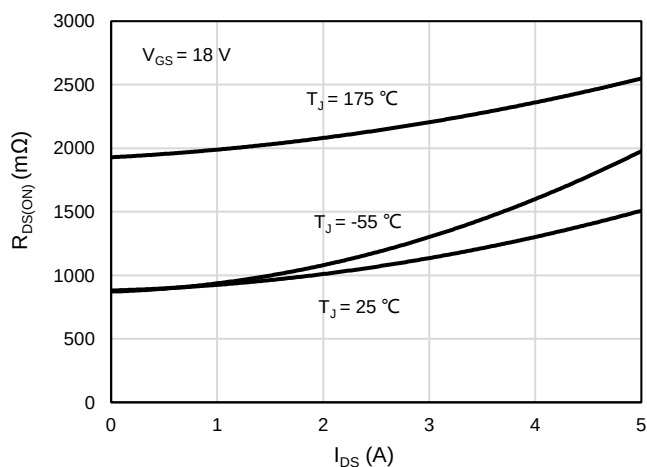
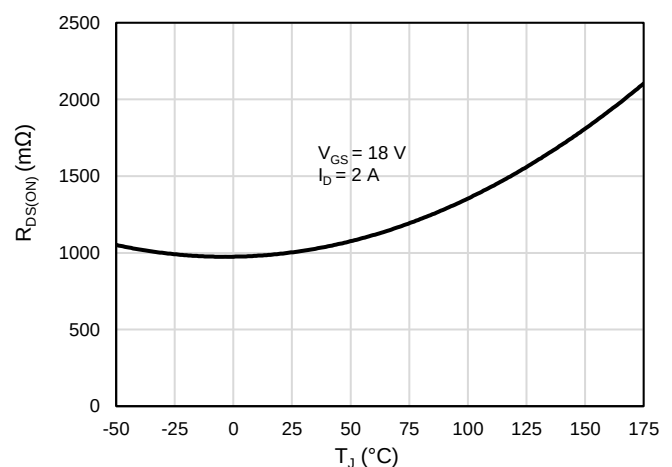
Figure 1: Output Characteristics $T_J = -40^{\circ}\text{C}$ Figure 2: Output Characteristics $T_J = 25^{\circ}\text{C}$ Figure 3: Output Characteristics $T_J = 175^{\circ}\text{C}$ 

Figure 4: Normalized On-Resistance vs. Temperature

Figure 5: On-Resistance vs. Drain Current
For Various TemperaturesFigure 6: On-Resistance vs. Temperature
For Various Gate Voltage

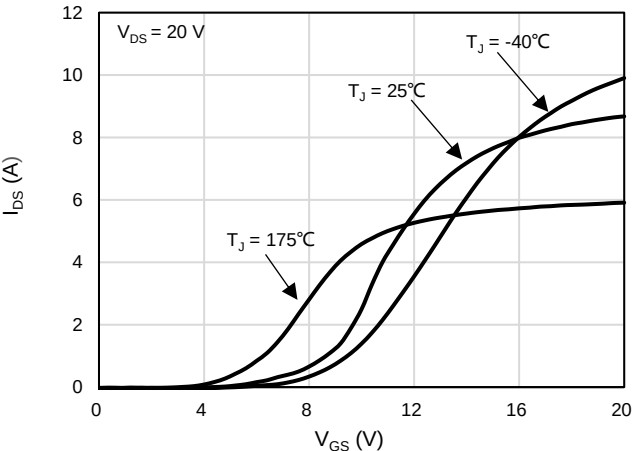


Figure 7: Transfer Characteristics For Various Junction Temperature

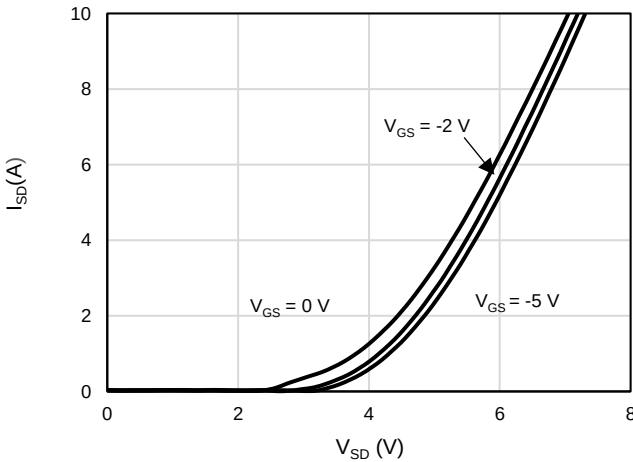


Figure 8: Body Diode Characteristics at -55°C

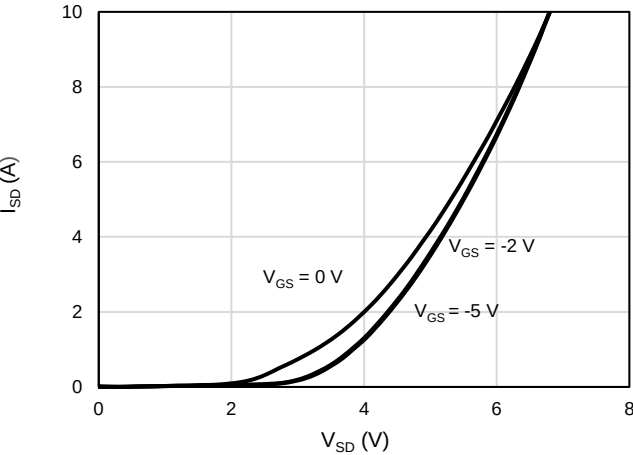


Figure 9: Body Diode Characteristics at 25°C

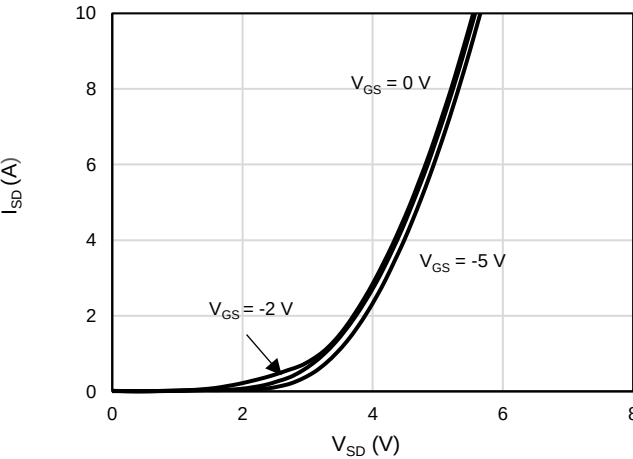


Figure 10: Body Diode Characteristics at 175°C

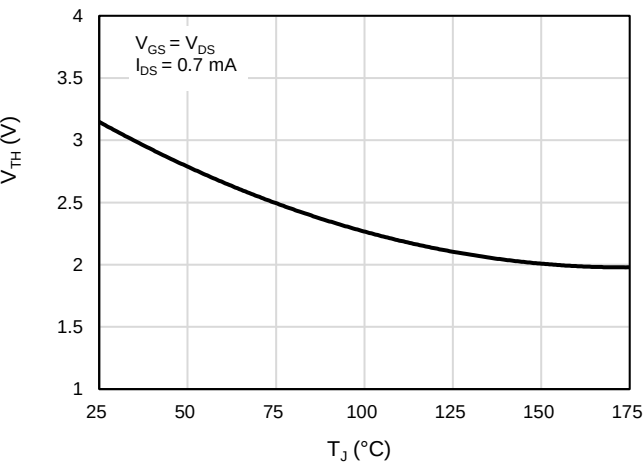


Figure 11: Threshold Voltage vs. Temperature

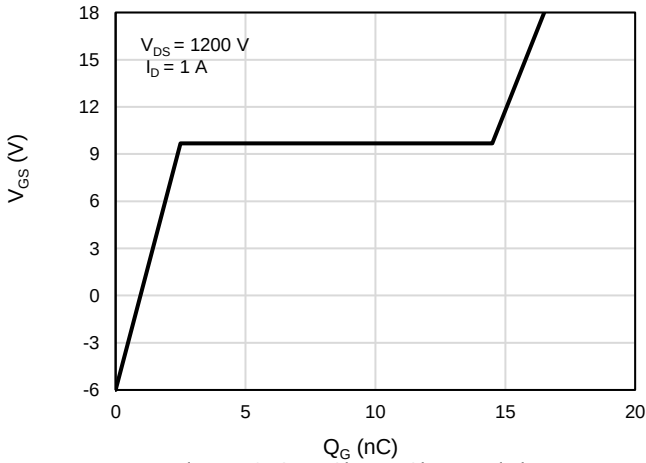


Figure 12: Gate-Charge Characteristics

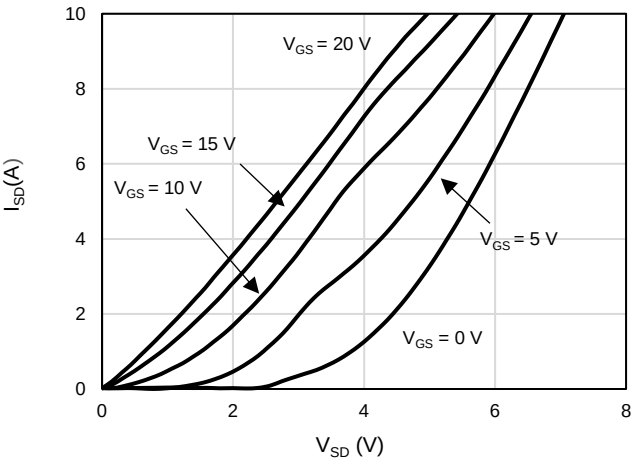


Figure 13: 3rd Quadrant Characteristics at -55°C

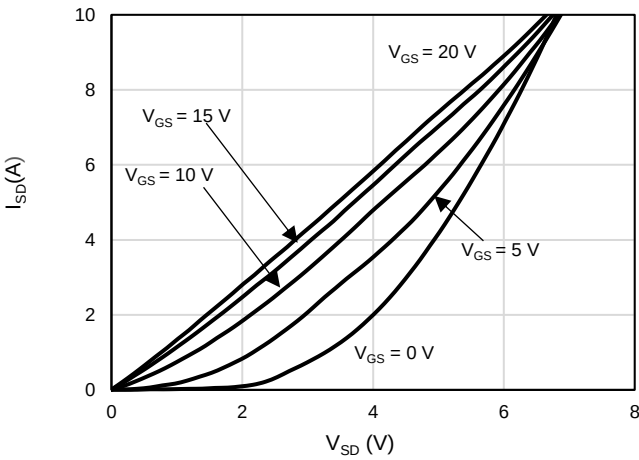


Figure 14: 3rd Quadrant Characteristics at 25°C

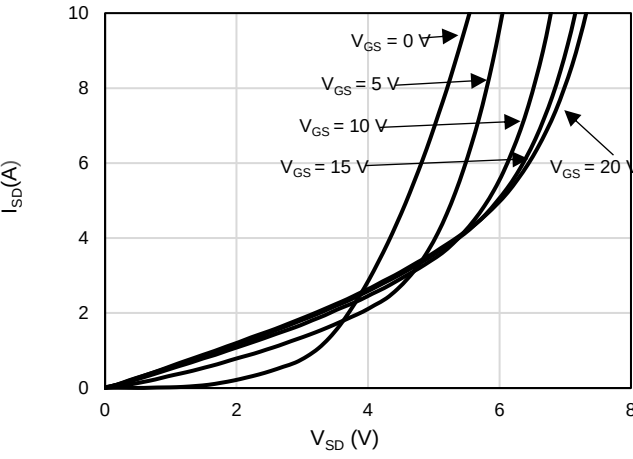


Figure 15: 3rd Quadrant Characteristics at 175°C

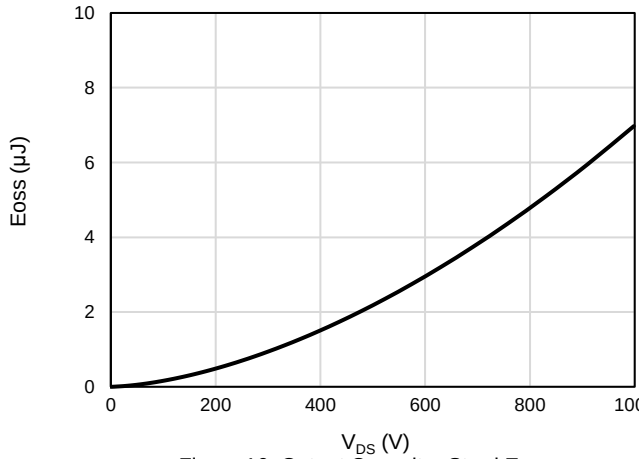


Figure 16: Output Capacitor Stord Energy

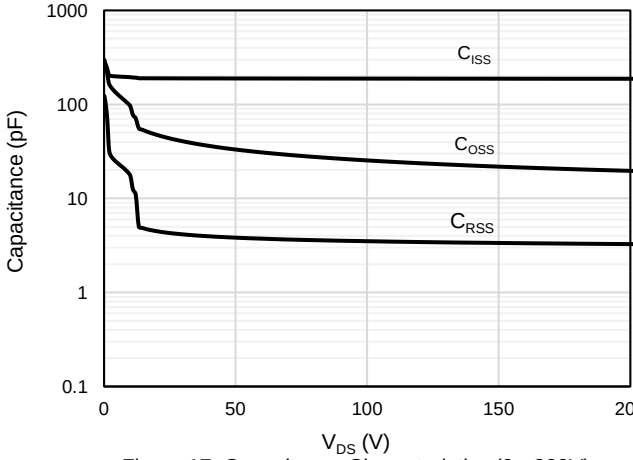


Figure 17: Capacitance Characteristics (0 - 200V)

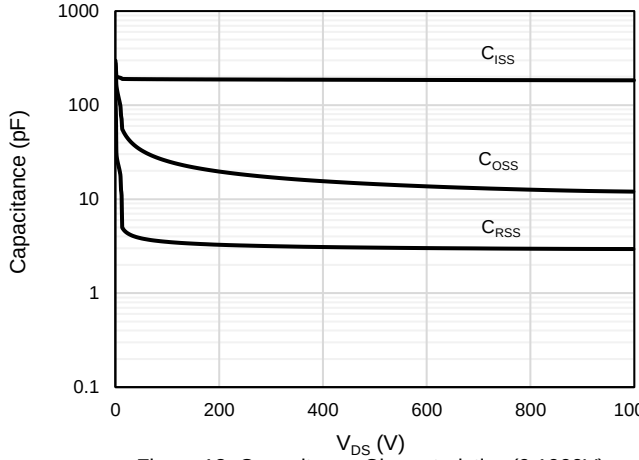


Figure 18: Capacitance Characteristics (0-1000V)

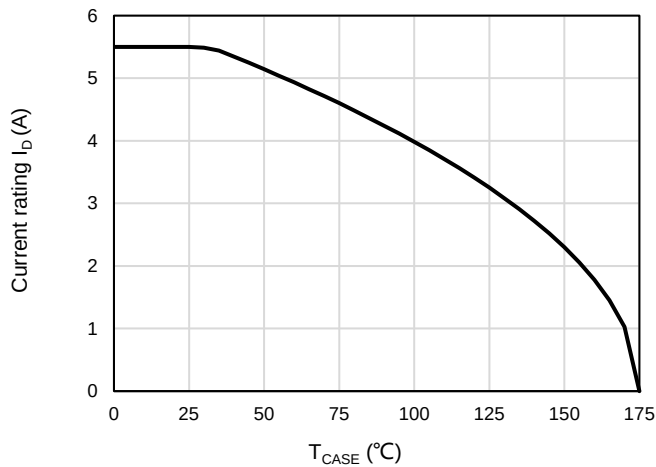


Figure 19: Current De-rating

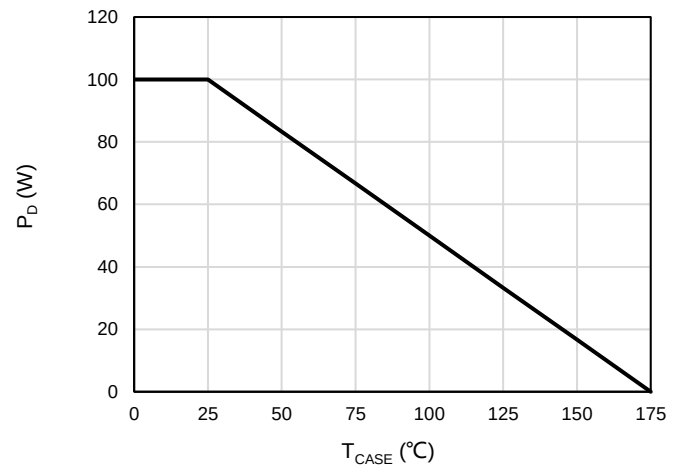


Figure 20: Maximum Power Dissipation Derating vs Case Temperature

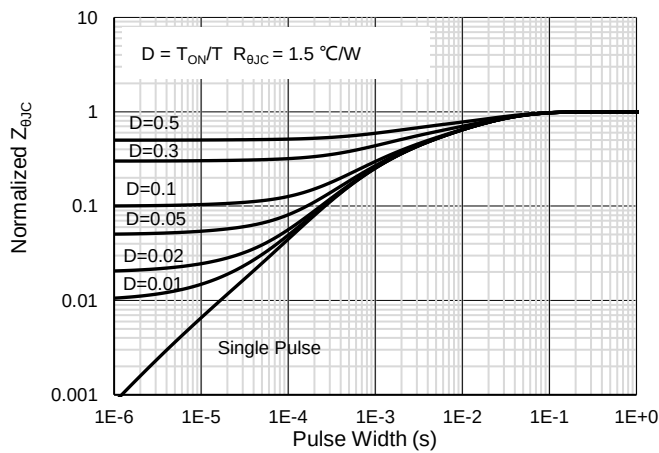


Figure 21: Normalized Maximum Transient Thermal Impedance

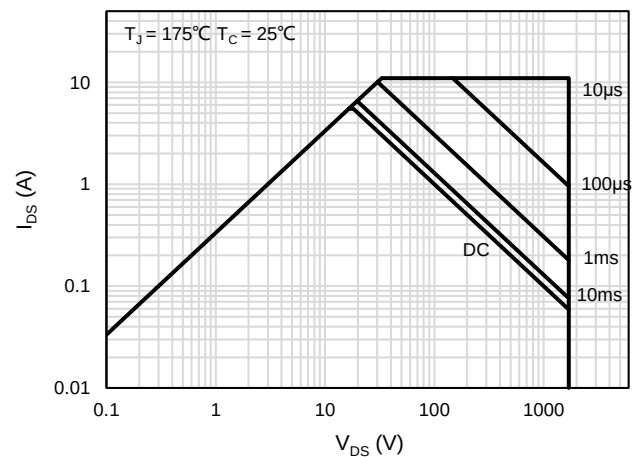
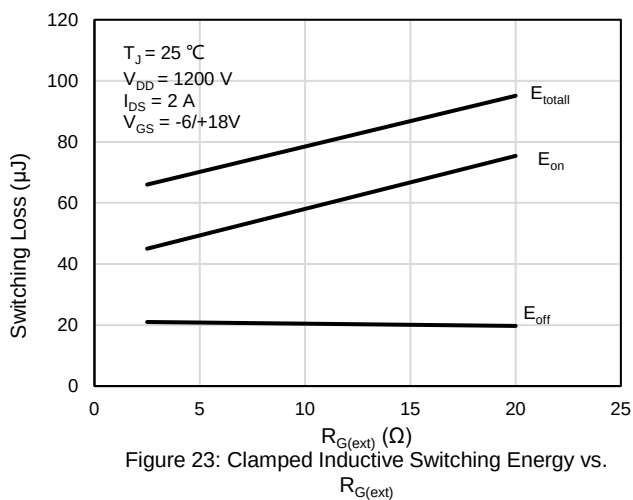
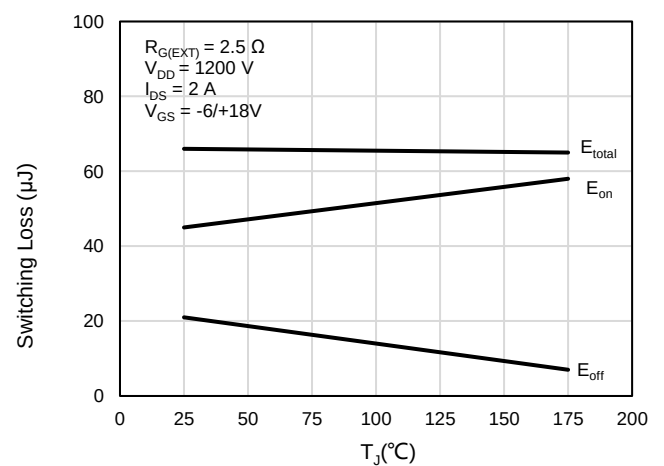


Figure 22: Maximum Forward Biased Safe Operating Area

Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$ Figure 24: Clamped Inductive Switching Energy vs. T_J

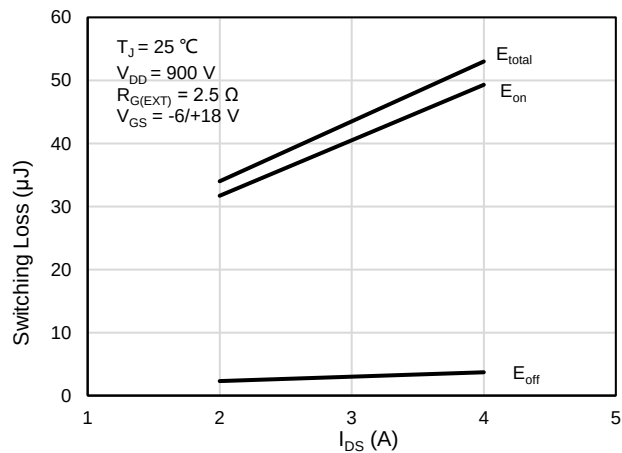


Figure 25: Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600\text{ V}$)

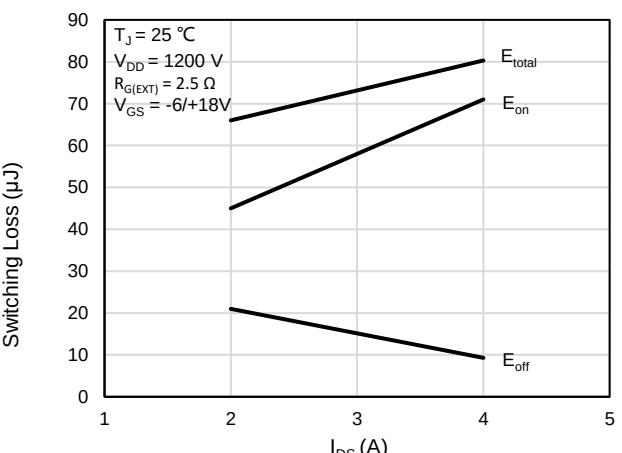


Figure 26: Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 1200\text{ V}$)

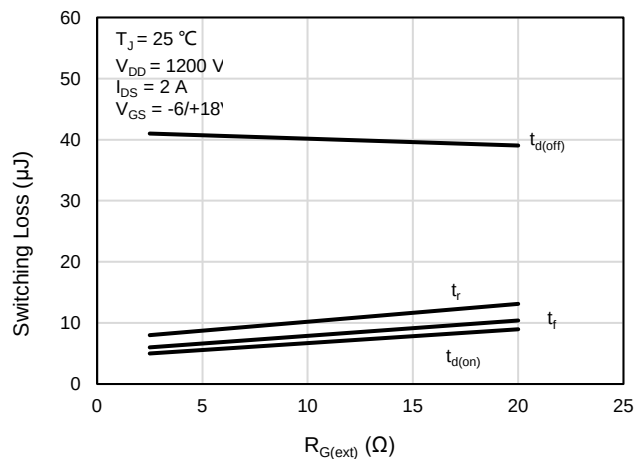
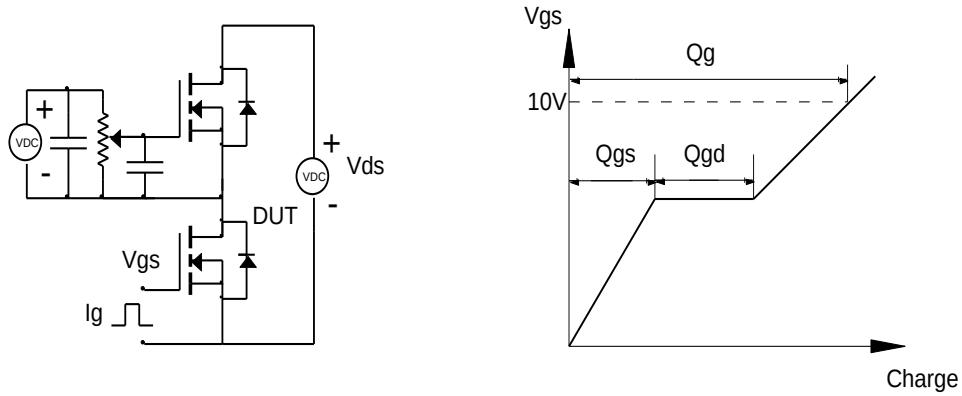


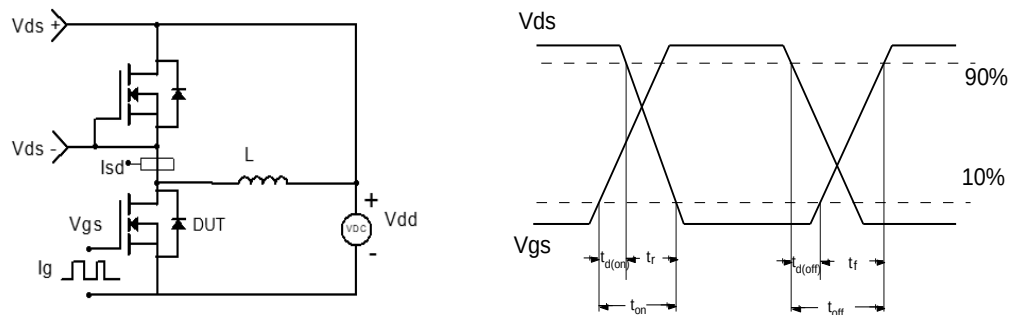
Figure 27: Switching Time vs. $R_{G(EXT)}$

Test Circuit and Waveform

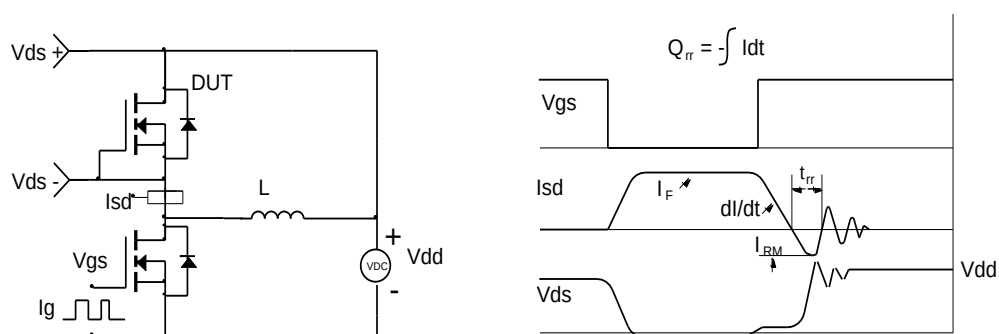
Gate Charge Test Circuit & Waveform



Clamped Inductive Switching Test Circuit & Waveforms

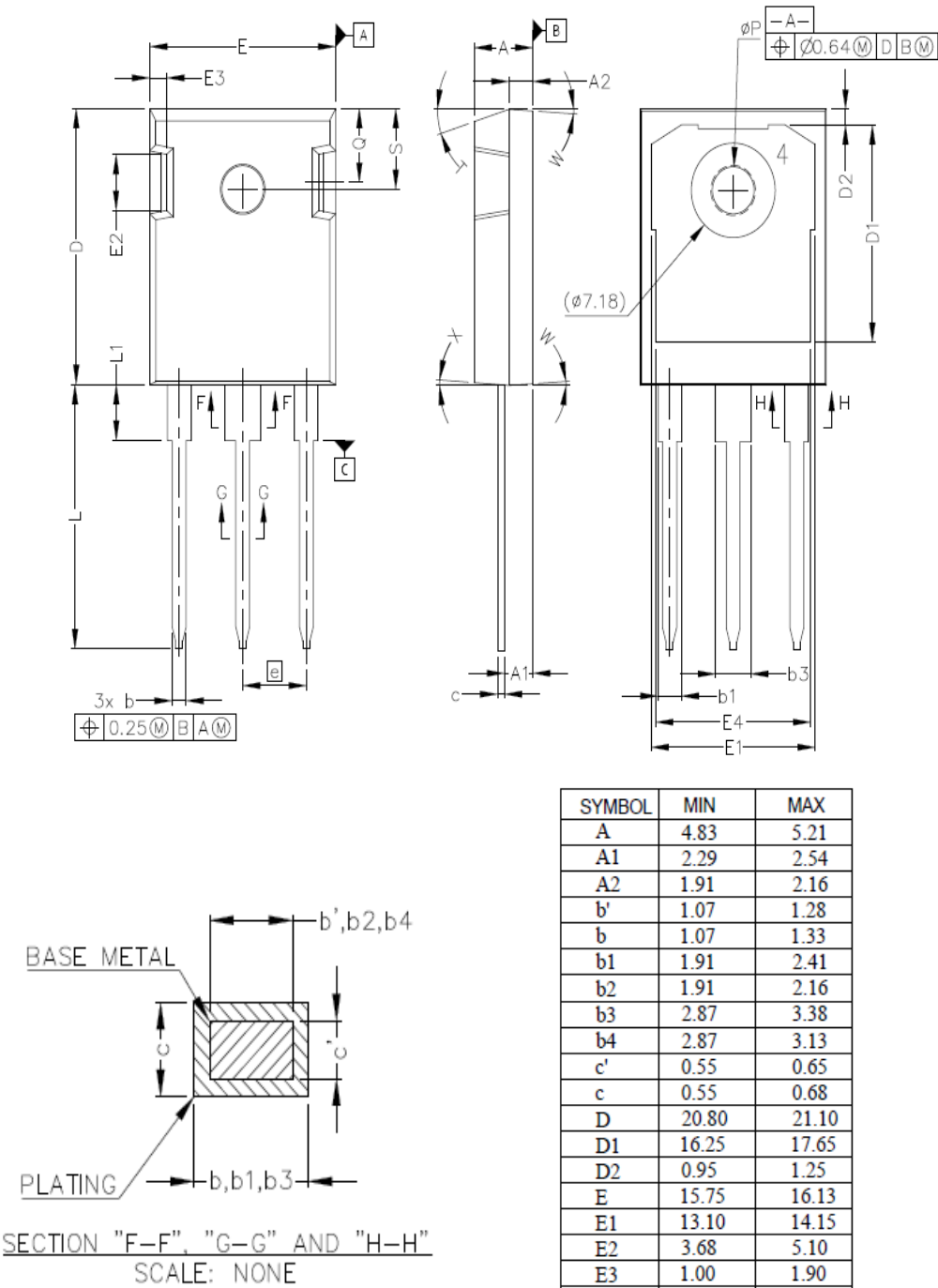


Diode Recovery Test Circuit & Waveforms



Package Outlines

TO-247-3L PKG Outlines



SYMBOL	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
ϕP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	



Marking Information



Note:
CK7M1K0WMH = Product Name Code
XXXXXXX = Date Code
Contact ALKAIDSEMI sales for detail information

Revision History		
Revision	Release Date	Remark
Rev.1.1	2023/7/4	

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.

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