1200V 40mohm Silicon Carbide Power MOSFET
AKCK2M040WAM

Features:

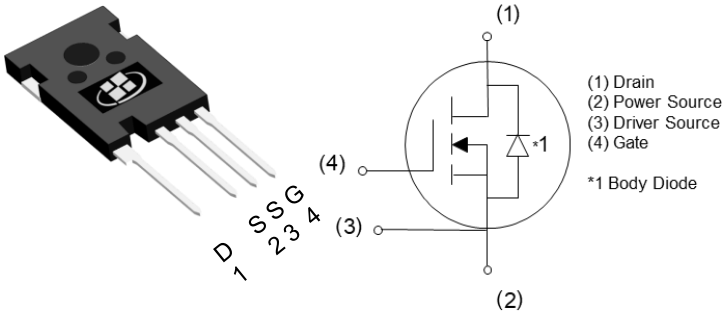
- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free，RoHS compliant (Note 1)

Applications:

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

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	1200	V
$R_{DSON,\ TYP}$ @V_{GS} = 15 V	40	mΩ
$R_{DSON,\ TYP}$ @V_{GS} = 18 V	34	mΩ
I_D	65	A
P_D	375	W



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKCK2M040WAM	TO-247-4L	CK2M040WAM	Tube	300 per box

Notes:

1. Contact ALKAIDSEMI sales for detail information

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous (T_C = 25°C) (Note 1)	65	A
	Drain Current - Continuous (T_C = 100°C) (Note 1)	48	A
I_{DM}	Drain Current - Pulsed (Note 2)	162	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°C)	375	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	°C

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady-State	40	°C/W

Notes:

1. The max drain current limited by maximum junction temperature
2. Pulse width is limited by safe operating area

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 100 μA	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200 V, V_{GS} = 0 V		5	50	μA
I_{GSS}	Gate Leakage Current	V_{GS} = + 15 V, V_{DS} = 0 V			100	nA
		V_{GS} = - 4 V, V_{DS} = 0 V			- 100	nA
$V_{GS(TH)}$	Gate Threshold voltage	V_{DS} = V_{GS}, I_D = 9.5 mA	2	2.8	4	V
		V_{DS} = V_{GS}, I_D = 9.5 mA, T_J = 175 °C		1.9		V
$R_{DS(ON)}$	Drain-Source on-state resistance	V_{GS} = 15 V, I_D = 33.3 A		40	54	mΩ
		V_{GS} = 15 V, I_D = 33.3 A, T_J = 175 °C		64		mΩ
		V_{GS} = 18 V, I_D = 33.3 A		34	40	mΩ
		V_{GS} = 18 V, I_D = 33.3 A, T_J = 175 °C		60		mΩ
G_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 33.3 A		16		S
		V_{DS} = 20 V, I_D = 33.3 A, T_J = 175 °C		17		S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 800 V, V_{GS} = 0 V, F = 100 kHz, V_{AC} = 25 mV		2540		pF
C_{OSS}	Output Capacitance			105		pF
C_{RSS}	Reverse Transfer Capacitance			11		pF
E_{OSS}	C_{OSS} Stored Energy			45		μJ
R_G	Gate Resistance	F = 1 MHz, V_{AC} = 25 mV		1.6		Ω
Q_{GS}	Gate-Source Charge	V_{DS} = 800 V , I_D = 33.3 A, V_{GS} = -4/+15 V		34		nC
Q_{GD}	Gate-Drain Charge			52		nC
Q_G	Total Gate Charge			138		nC

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 800 V , I_D = 33.3 A, V_{GS} = -4/+15 V, $R_{G,EXT}$ = 2.5 Ω L = 99 μH Diode： Body Diode at V_{GS} = -5 V		36		ns
T_R	Rise Time			16		ns
$T_{D(OFF)}$	Turn Off Delay Time			11.5		ns
T_F	Fall Time			11.5		ns
E_{ON}	Turn On Energy			563		μJ
E_{OFF}	Turn Off Energy			83.3		μJ
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 800 V , I_D = 33.3 A, V_{GS} = -4/+15 V, $R_{G,EXT}$ = 2.5 Ω L = 99 μH Diode： SIC Diode at V_{GS} = -5 V		36.5		ns
T_R	Rise Time			15		ns
$T_{D(OFF)}$	Turn Off Delay Time			11.5		ns
T_F	Fall Time			10.5		ns
E_{ON}	Turn On Energy			470		μJ
E_{OFF}	Turn Off Energy			90		μJ

Drain-Source Diode Characteristics (T_J = 25 °C unless otherwise noted)

I_S	Maximum Continuous Drain-Source Diode Forward Current				65	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				162	A
V_{SD}	Diode Forward Voltage	V_{GS} = -4 V , I_{SD} = 20 A		4.1		V
		V_{GS} = -4 V , I_{SD} = 20 A, T_J = 175 °C		3.6		V
I_{RM}	Peak Reverse Recovery Current	V_{GS} = -4 V , I_{SD} = 33.3 A, V_R = 800 V, di/dt = 650 A/μS		6.5		A
T_{RR}	Reverse Recovery Time			22.5		ns
Q_{RR}	Reverse Recovery Charge			79		nC

Electrical Characteristics Diagrams

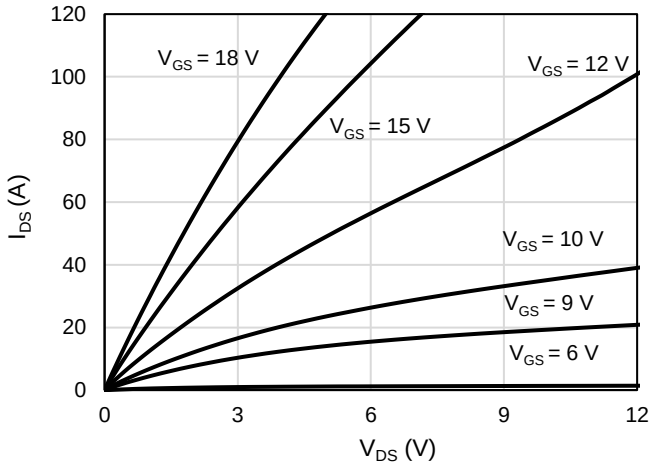


Figure 1: Output Characteristics T_J = -40℃

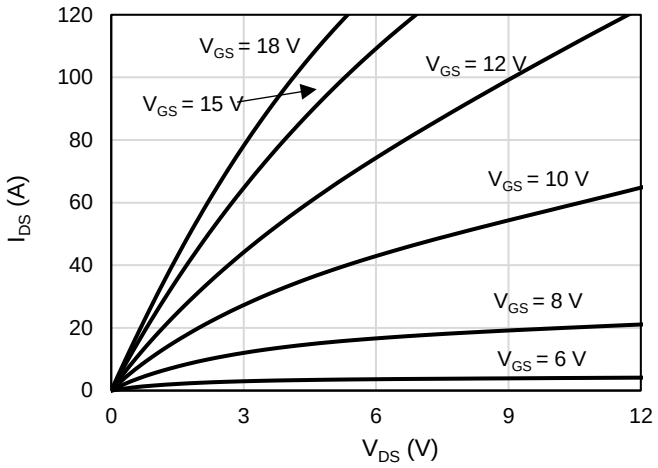


Figure 2: Output Characteristics T_J = 25℃

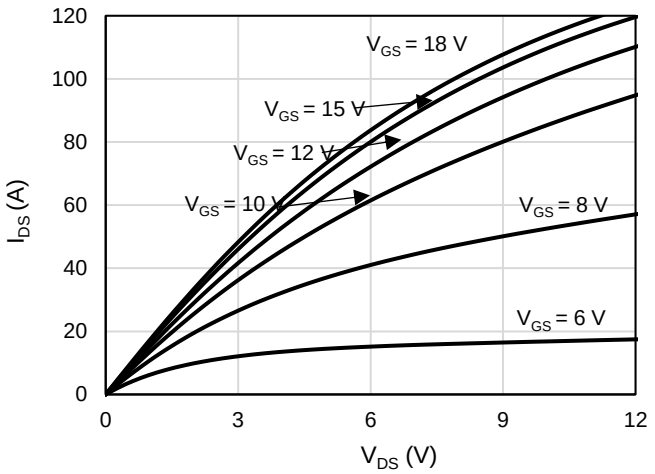


Figure 3: Output Characteristics T_J = 175℃

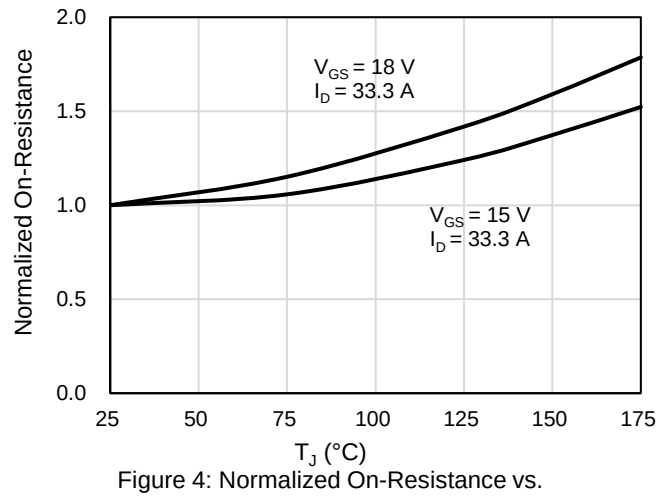


Figure 4: Normalized On-Resistance vs. Temperature

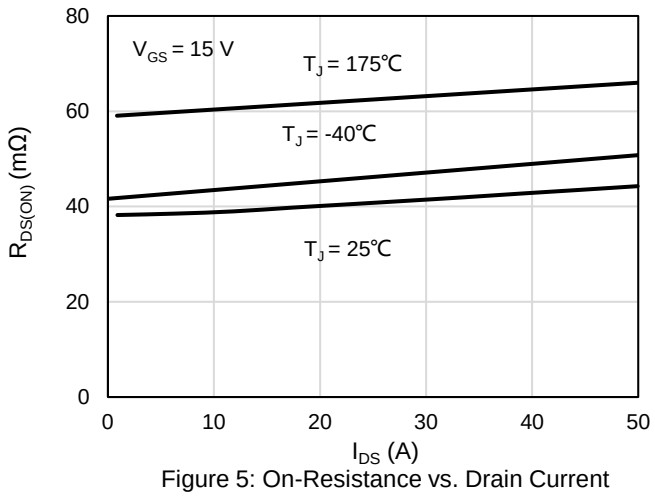


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

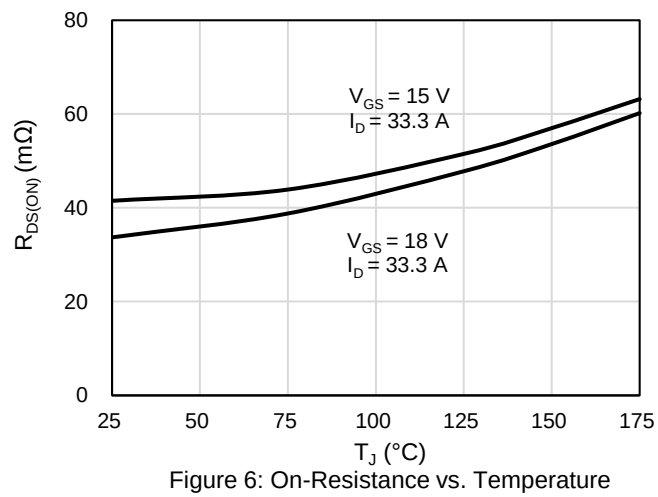


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

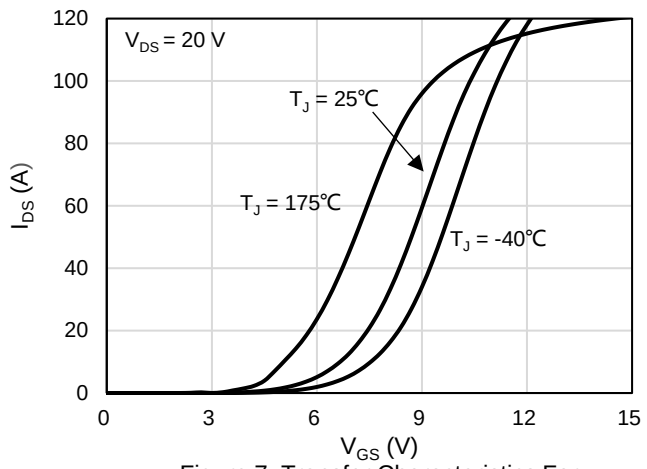


Figure 7: Transfer Characteristics For Various Junction Temparature

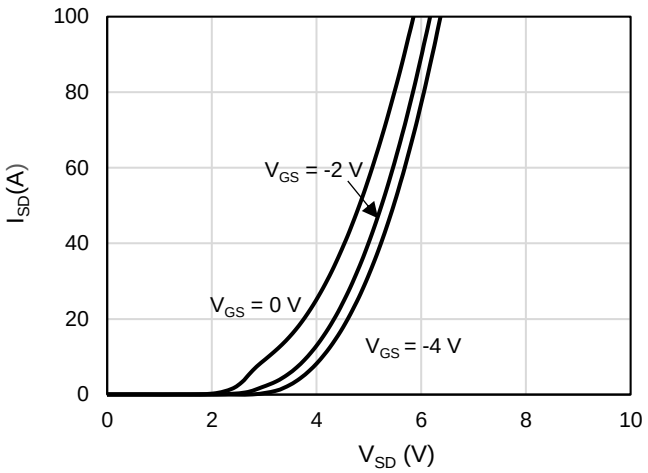


Figure 8: Body Diode Characteristics at -40℃

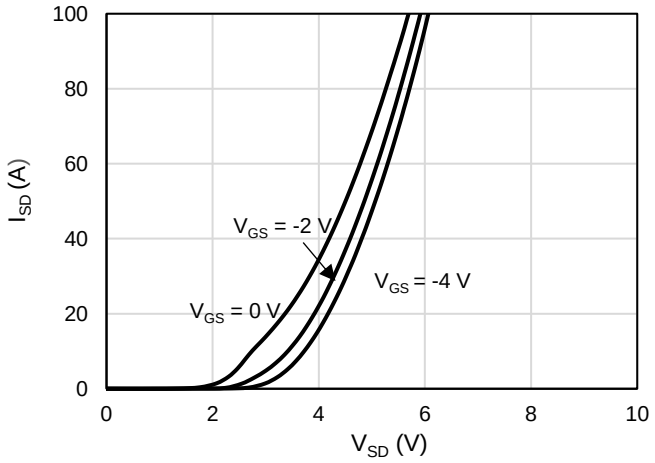


Figure 9: Body Diode Characteristics at 25℃

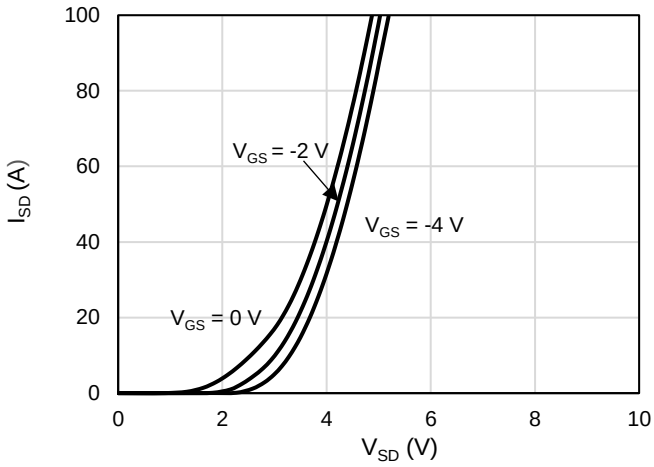


Figure 10: Body Diode Characteristics at 175℃

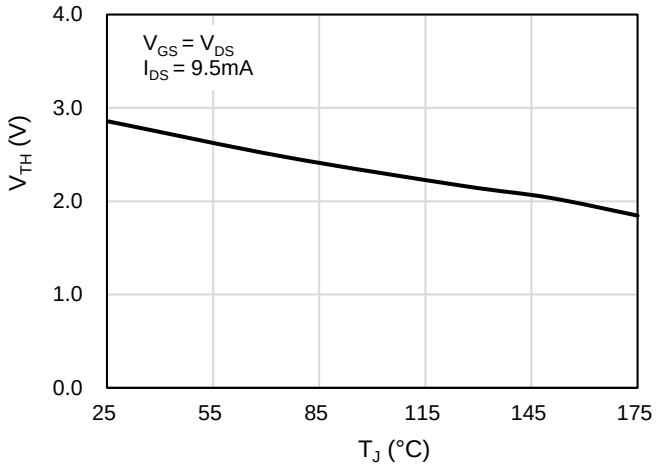


Figure 11: Threshold Voltage vs. Temperature

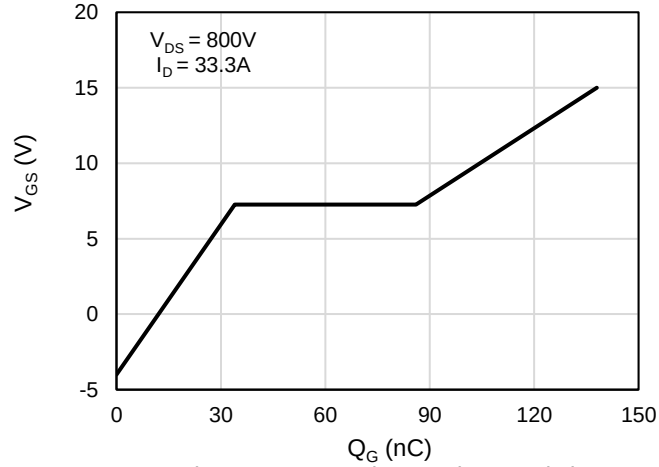


Figure 12: Gate-Charge Characteristics

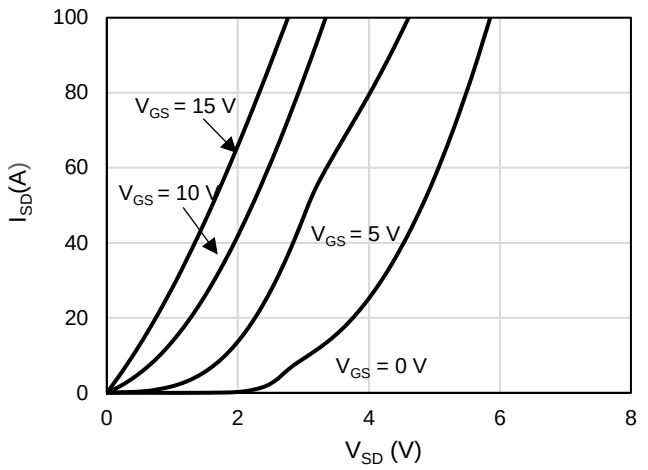


Figure 13: 3rd Quadrant Characteristics at -40℃

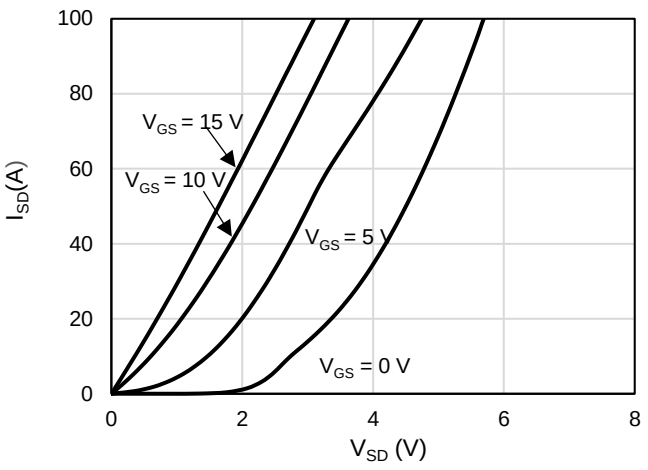


Figure 14: 3rd Quadrant Characteristics at 25℃

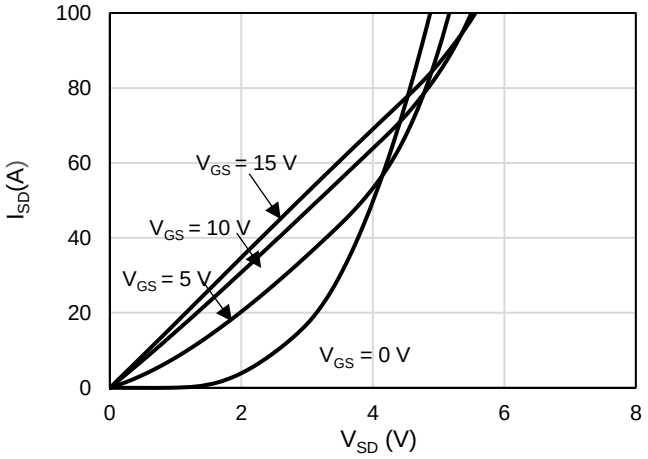


Figure 15: 3rd Quadrant Characteristics at 175℃

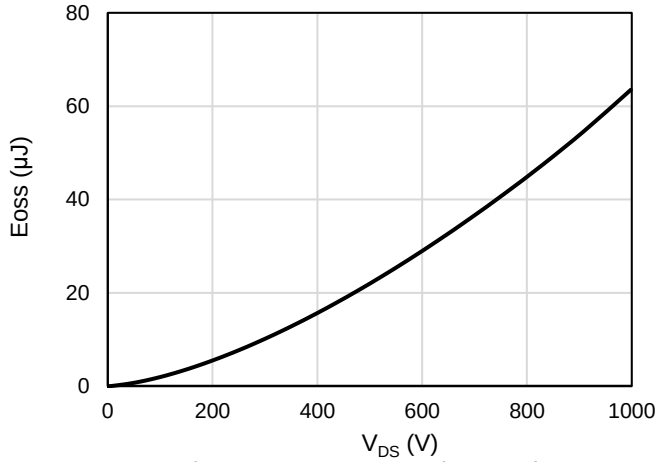


Figure 16: Output Capacitor Stord Energy

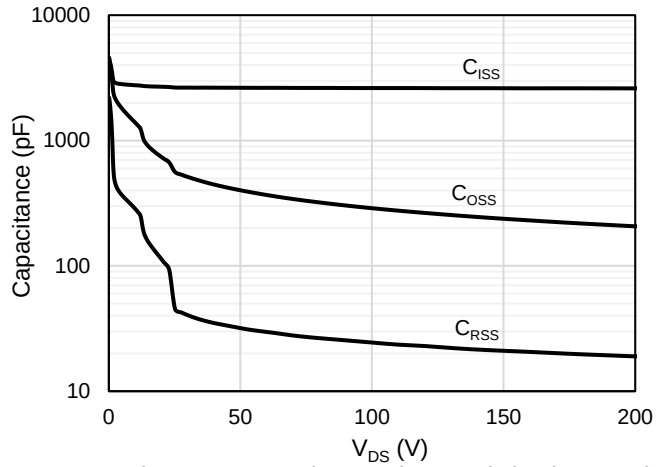


Figure 17: Capacitance Characteristics (0 - 200V)

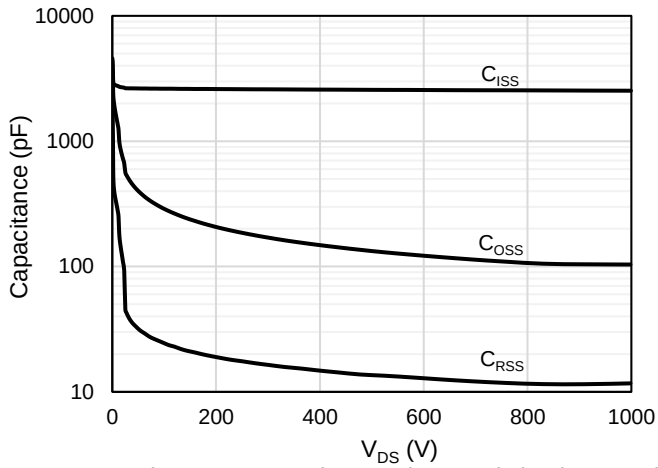


Figure 18: Capacitance Characteristics (0-1000V)

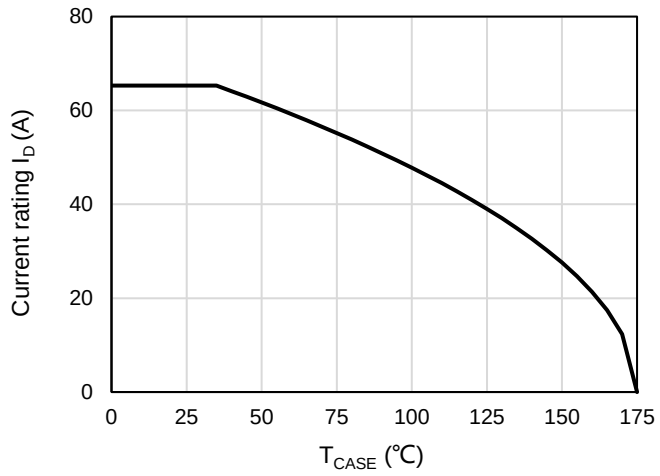


Figure 19: Current De-rating

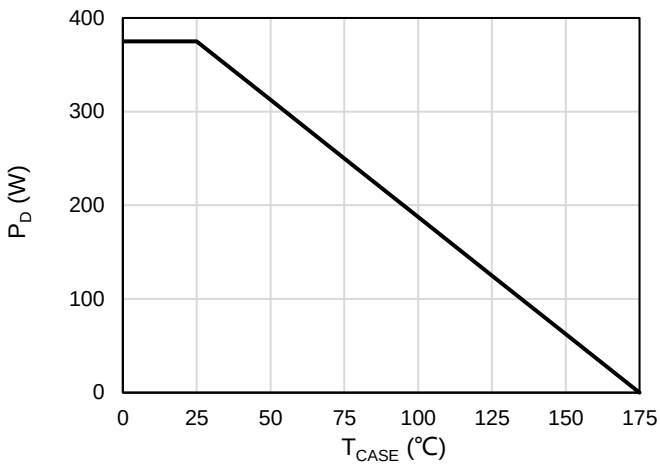


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

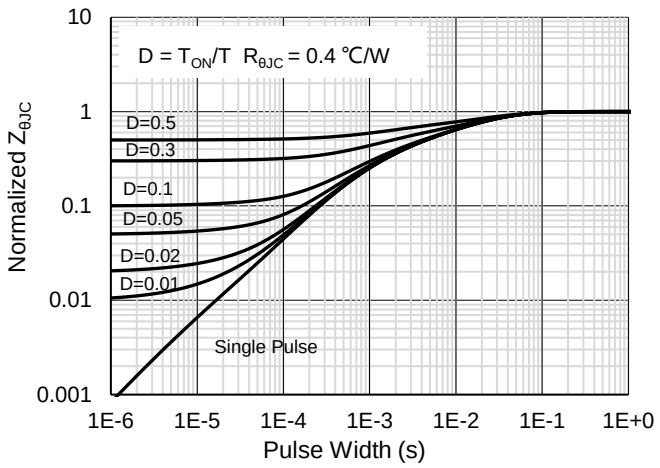


Figure 21: Normalized Maximum Transient Thermal Impedance

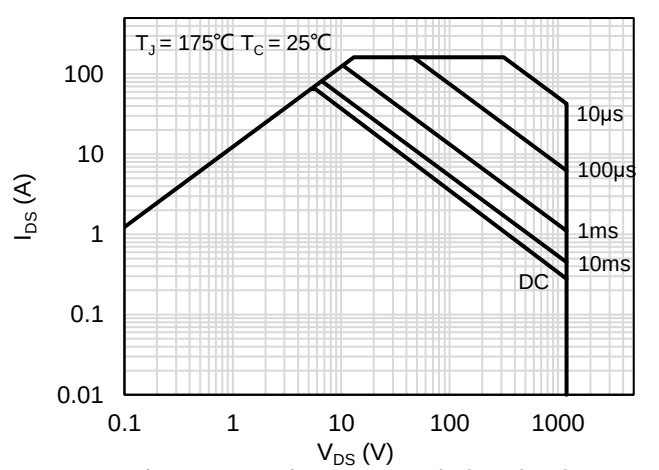


Figure 22: Maximum Forward Biased Safe Operating Area

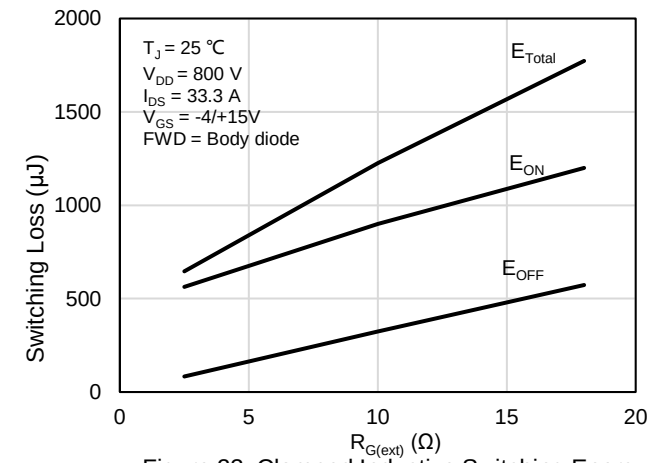


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

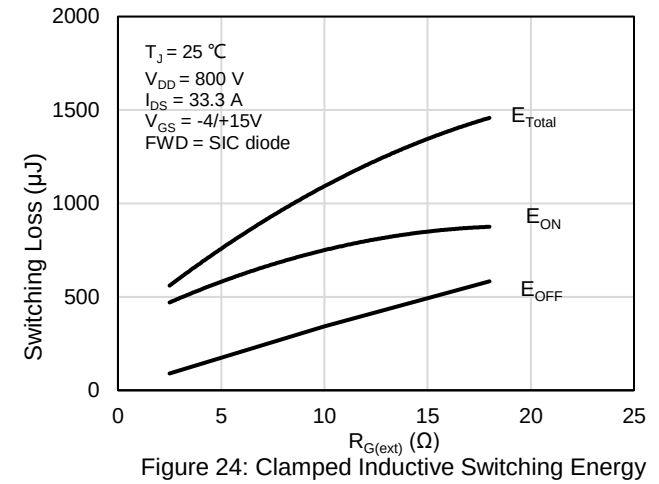


Figure 24: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

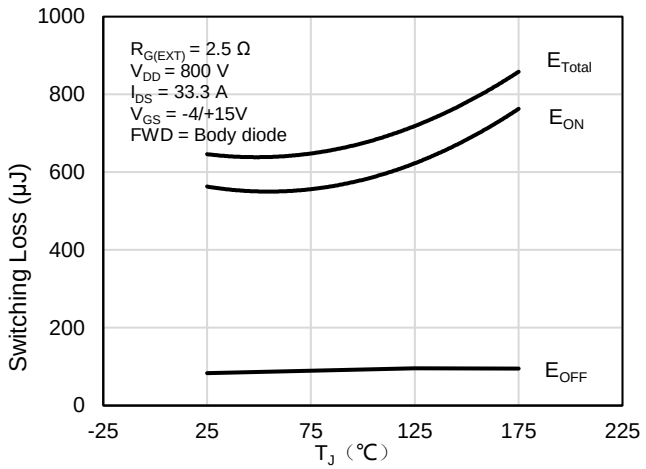


Figure 25: Clamped Inductive Switching Energy vs. T_J

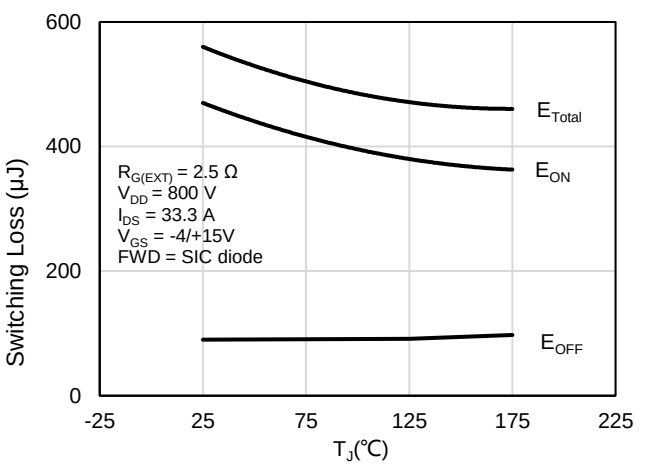


Figure 26: Clamped Inductive Switching Energy vs. T_J

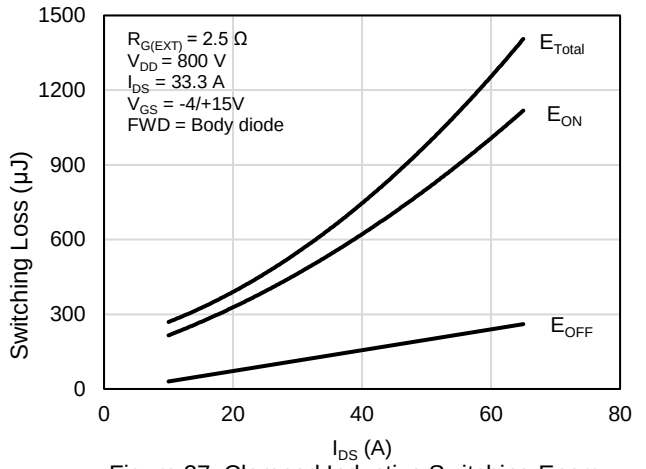
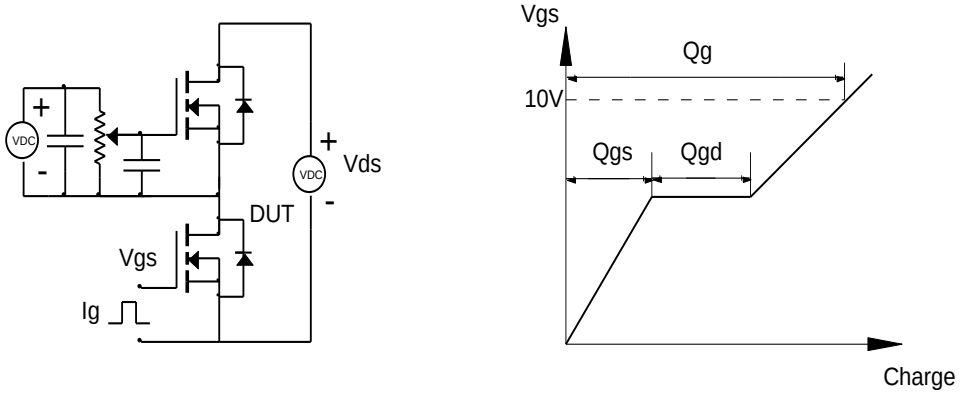


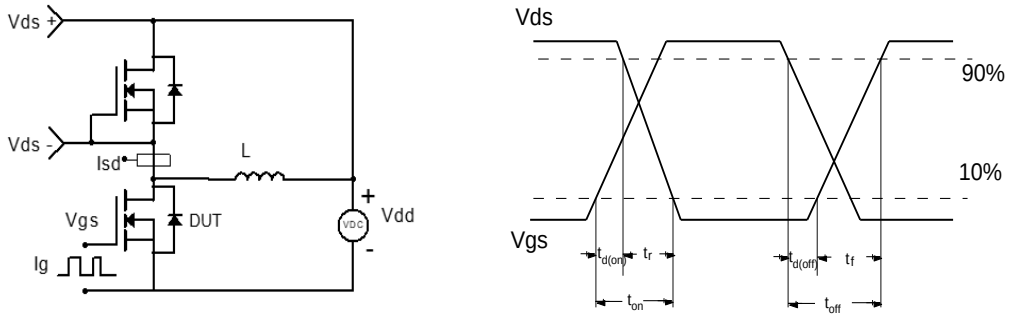
Figure 27: Clamped Inductive Switching Energy vs. I_{DS}

Test Circuit and Waveform

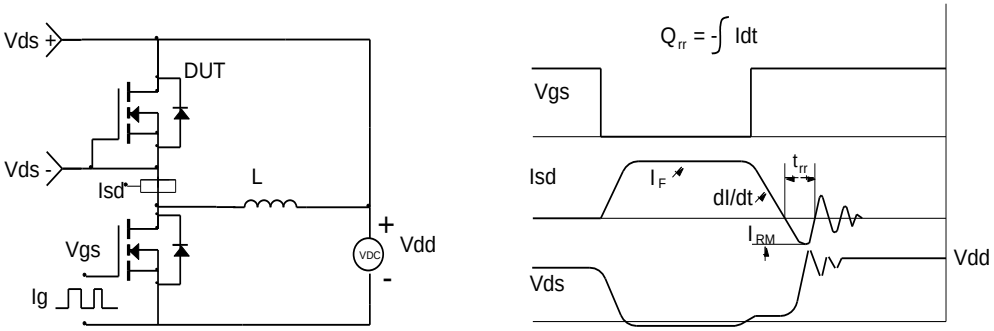
Gate Charge Test Circuit & Waveform



Clamped Inductive Switching Test Circuit & Waveforms

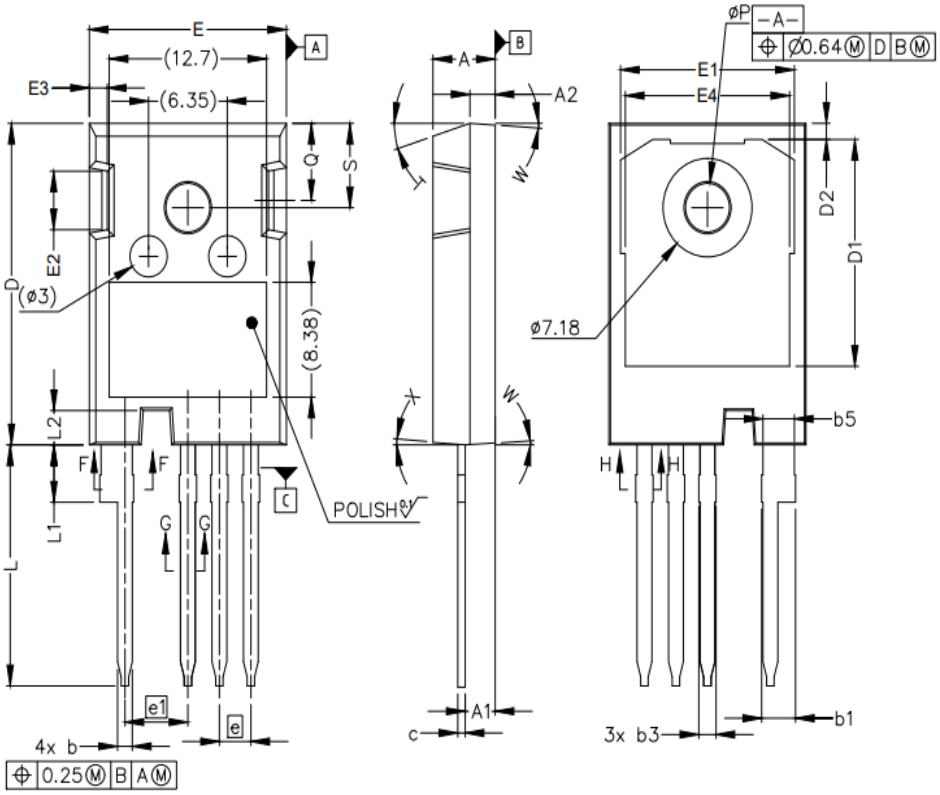


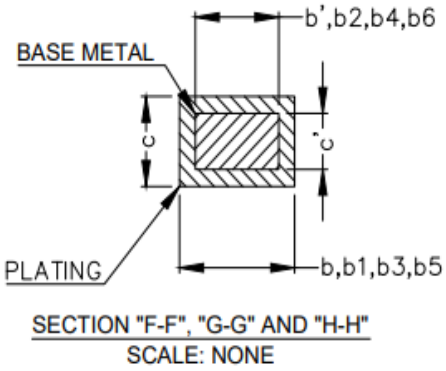
Diode Recovery Test Circuit & Waveforms



Package Outlines

TO-247-4L PKG Outlines

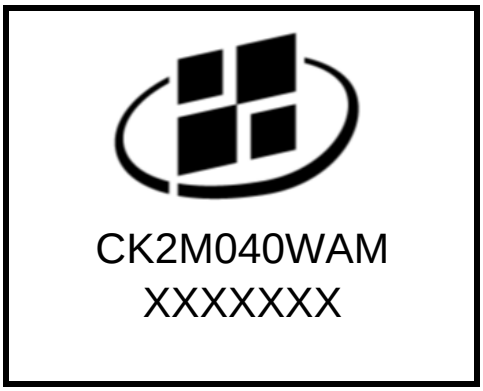




SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

SYMBOL	MILLIMETERS	
	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	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
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	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	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:

CK2M040WAM = Product Name Code

XXXXXXX = Date Code

Contact ALKAIDSEMI sales for detail information

Revision History		
Revision	Release Date	Remark
Rev.1.6	2023/12/8	

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.