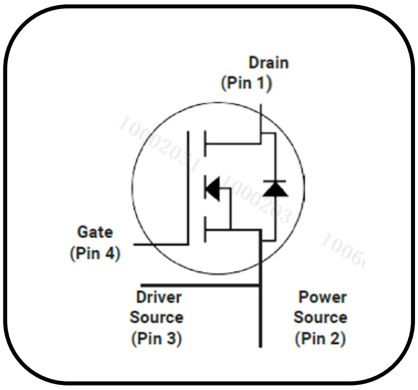
1200V/16mohm Silicon Carbide Power MOSFET

Features

- AEC-Q101 Qualified
- Revolutionary semiconductor material - Silicon Carbide (SiC)
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency



Die Size(mm)
5.00*6.00 mm^2

Potential Applications

- Solar Inverters
- High Voltage DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- Pulsed Power applications

AEC-Q101 RoHS HF

Description

The AMS1200016B SiC power MOSFET has been developed using Sanan's advanced SiC MOSFET technology with the highest performance and reliability. It registers higher efficiency, higher operation temperature and lower loss and can be operated at higher frequency than Si-based solutions. As to the MOSFET structure, it shows great input impedance ability and allows a low leakage current with source-drain voltage up to 1200V. It can contribute to system miniaturization and achieve lightweight system design. Using RoHS compliant components, it is qualified for use in electric vehicle power system application.

Product Specifications

Device	$V_{BR(DSS)}$	I_D(25℃)	$R_{(DS)on}$	Q_{rr}
AMS1200016B	**1200V**	**132A**	**16 mΩ**	**580nC**

CONTENTS

Table 1. Maximum Ratings

(Tc = 25℃, unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain-Source Voltage	1200	V	V_{GS} = 0V, I_D = 1mA, T_C = 25℃
V_{GSop}	Gate-Source Voltage	-4/+18	V	Recommended operational values
V_{GSmax}	Gate-source voltage, max. static voltage	-8/+22	V	Tc = 25℃
V_{GSmax}	Gate-source voltage, max. transient voltage	-10/+25	V	t_p ≤ 0.5us, D < 1%, Tc = 25℃
I_D[1]	Continuous Drain Current, tp limited by Tvjmax, V_{GS} = 18V, assumes Rth(j-c) <0.23℃/W	132	A	T_C = 25℃
		95	A	T_C = 100℃
$I_{D(pulse)}$[1,2]	Pulsed Drain Current	396	A	tp limited by Tvjmax
E_{AS}	Single Pulse Drain−to−Source Avalanche Energy	3.4	J	I_{AS}=83A,V_{DD} = 50 V,L=1mH
T_J ,T_{stg}	Operating Junction and Storage temperature	-55~175	℃	

1. Specified by design, not tested in production 2. Pulse width is limited by safe operating area

Table 2. Electrical Characteristics

(T_J = 25℃, unless otherwise specified)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{BR(DSS)}$	1200	/	/	V	V_{GS} = 0V, I_D =1mA
Gate Threshold Voltage	$V_{GS(th)}$	/	2.8	/	V	V_{DS} = V_{GS}, I_D = 20mA, T_J =25℃
		/	2.0	/		V_{DS} = V_{GS}, I_D = 20mA, T_J =175℃

Zero Gate Voltage Drain Current	I_{DSS}	/	/	10	μA	V_{DS} = 1200V, V_{GS} = 0V
Gate-body leakage current	I_{GSS}	/	/	±100	nA	V_{DS} = 0V, V_{GS} = -8 to 20V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	16	22	mΩ	V_{GS} = 18V, I_D = 60A,
		/	27	/	mΩ	V_{GS} = 18V, I_D = 60A, T_J =175℃
Gate input resistance	R_g	/	0.9	/	Ω	f = 1MHz
Input Capacitance	C_{iss}	/	4672	/	pF	V_{GS} = 0V,V_{DS} = 800V f = 100kHz
Output Capacitance	C_{oss}	/	275	/		
Reverse Transfer Capacitance	C_{rss}	/	15.6	/		
Total Gate Charge	Q_G	/	204	/	nC	V_{DS} = 800 V, I_D = 75A, V_{GS} = -3 V to 18 V
Gate−to−Source Charge	Q_{GS}	/	61	/		
Gate−to−Drain Charge	Q_{GD}	/	65	/		

Table 3. Switching Characteristic

(T_J = 25℃, unless otherwise specified)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Turn-on switching energy	E_{on}	/	1203	/	μJ	V_{DD} = 800 V, I_D =75A, Rg = 4.0 Ω,V_{GS} = -4 V to 18 V
Turn−On Delay Time	$T_{d(on)}$	/	21	/	ns	
Rise Time	T_r	/	34	/	ns	
Turn-off switching energy	E_{off}	/	346	/	μJ	
Turn−Off Delay Time	$T_{d(off)}$	/	47	/	ns	
Fall Time	T_f	/	11	/	ns	

Table 4. Reverse Diode Characteristic

(T_J = 25℃, unless otherwise specified)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Diode Forward Voltage	V_{SD}	/	4.3	/	V	V_{GS} = -5V, I_{SD} = 60A, T_J=25℃
		/	4.1	/	V	V_{GS} = -5V, I_{SD} = 60A, T_J=175℃
Reverse recovery time	T_{rr}	/	17	/	ns	V_{DD} = 800 V, I_D =75 A, di/dt = 4740A/μs
Reverse recovery charge	Q_{rr}	/	580	/	nC	
Reverse recovery current	I_{RRM}	/	53	/	A	

Electrical Characteristic Diagrams: All the graphs are based on the TO-247-4L (which has higher thermal resistance than most packages used with topside sinter/solder)

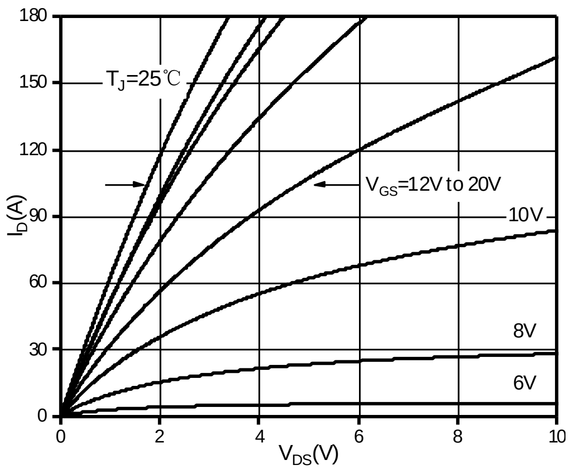


Figure 1. Output Characteristics T_J = 25 ºC

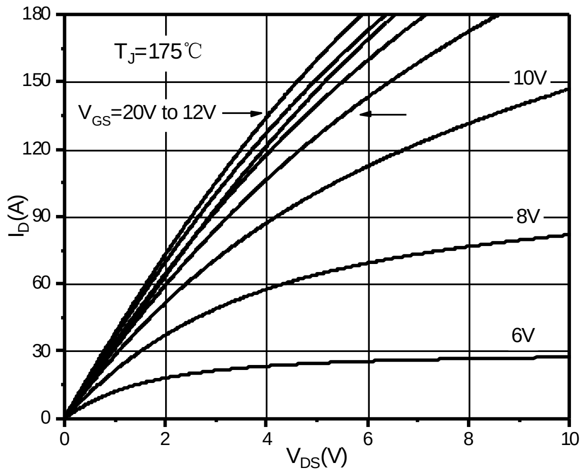


Figure 2. Output Characteristics T_J= 175 ºC

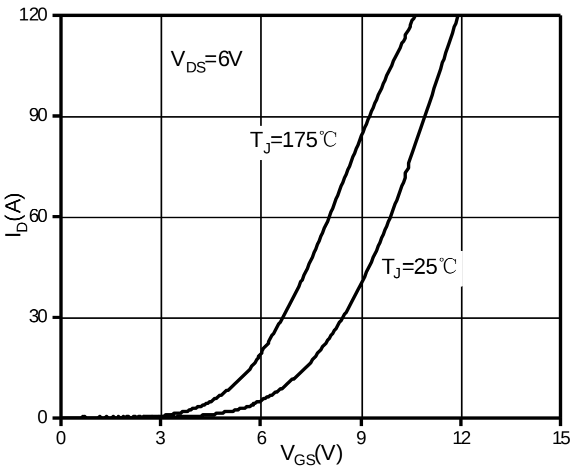


Figure 3. Transfer Characteristic

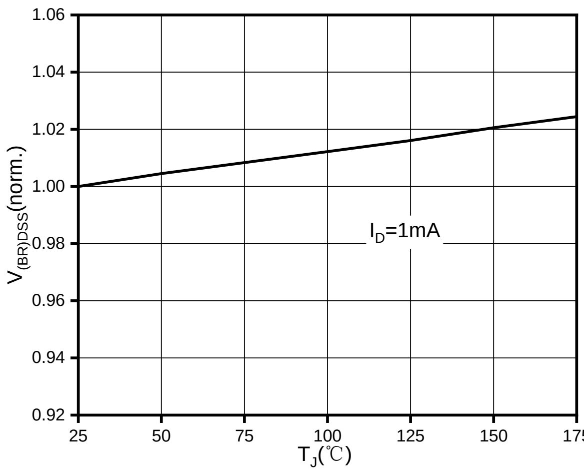


Figure 4.Normalized breakdown voltage vs. Temperature

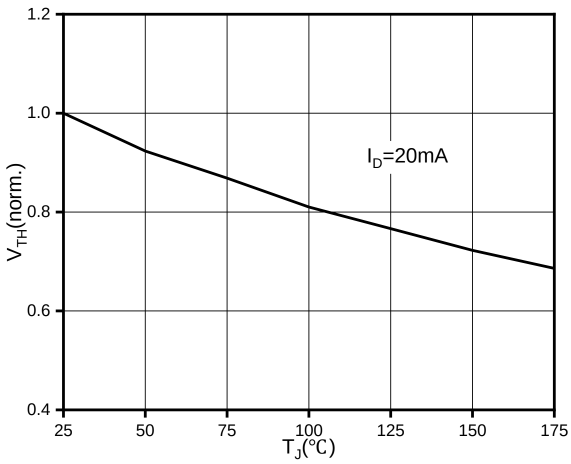


Figure 5. Normalized gate threshold vs. Temperature

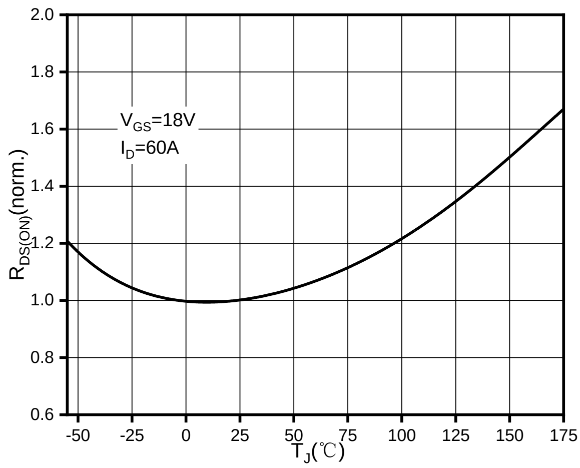


Figure 6. Normalized On-Resistance vs. Temperature

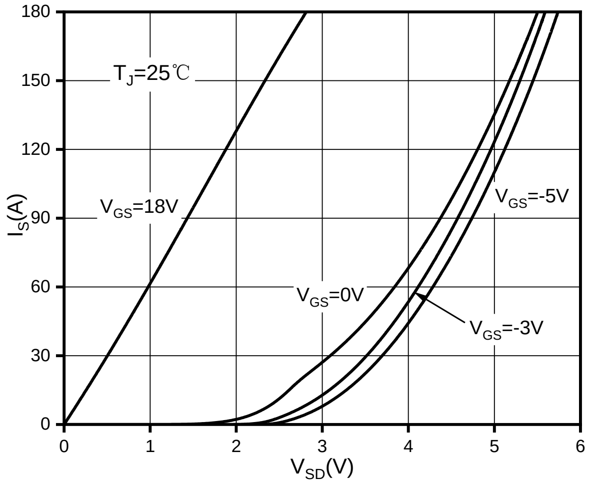


Figure 7. Diode Forward Voltage vs. Current at 25ºC

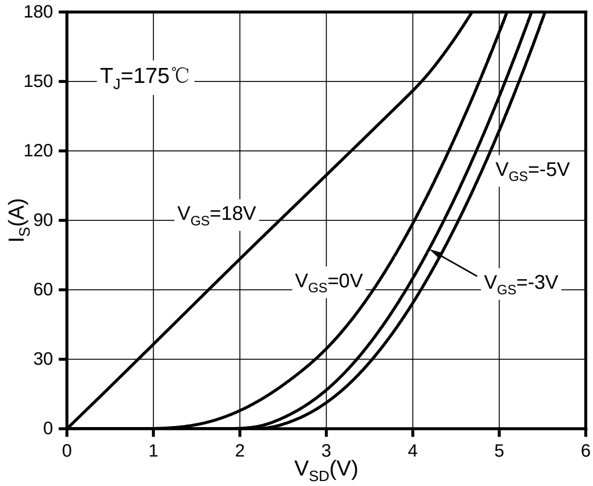


Figure 8. Diode Forward Voltage vs. Current at 175ºC

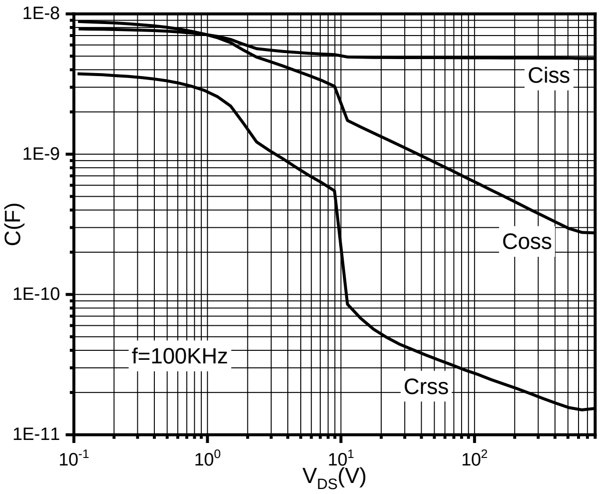


Figure 9. Capacitances vs. Drain-Source Voltage

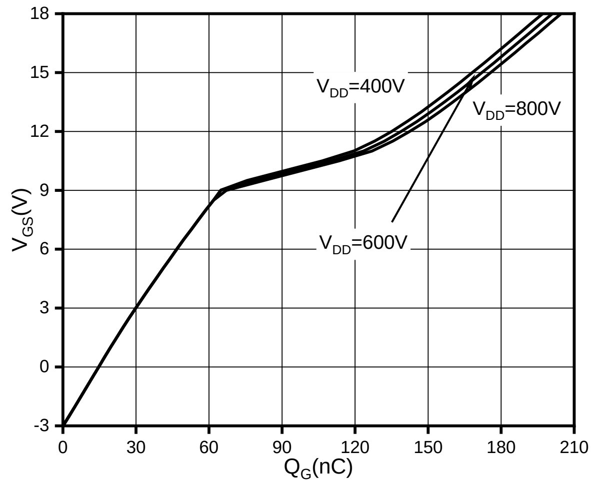


Figure 10. Gate−to−Source Voltage vs. Total charge

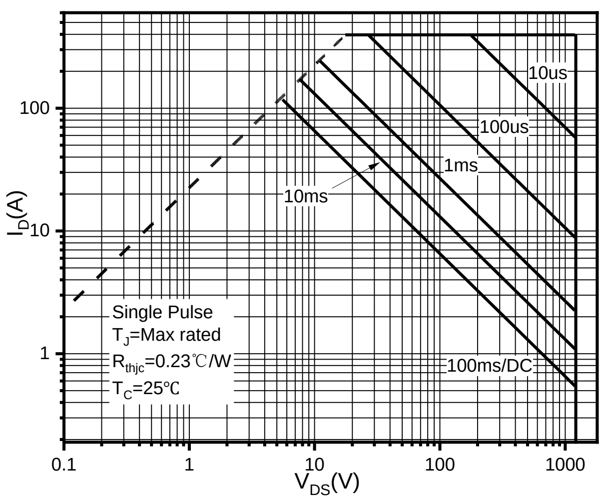


Figure 11. Safe Operating Area

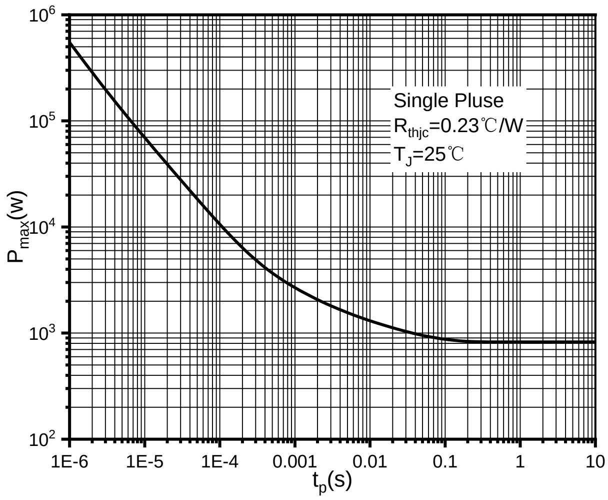


Figure 12. Single Pulse Maximum Power Dissipation

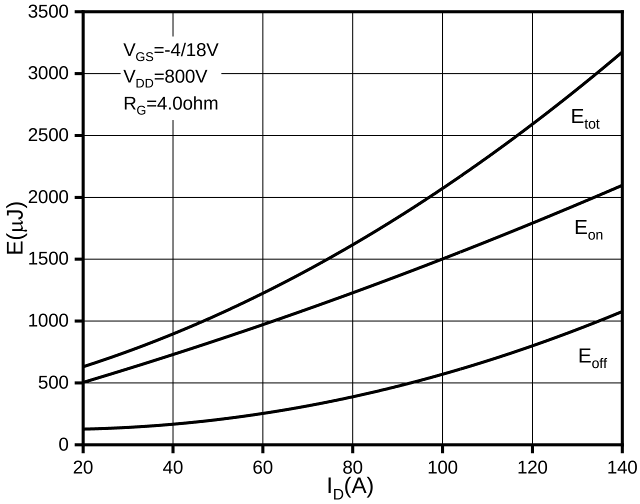


Figure 13. Switching Loss vs. Drain Current

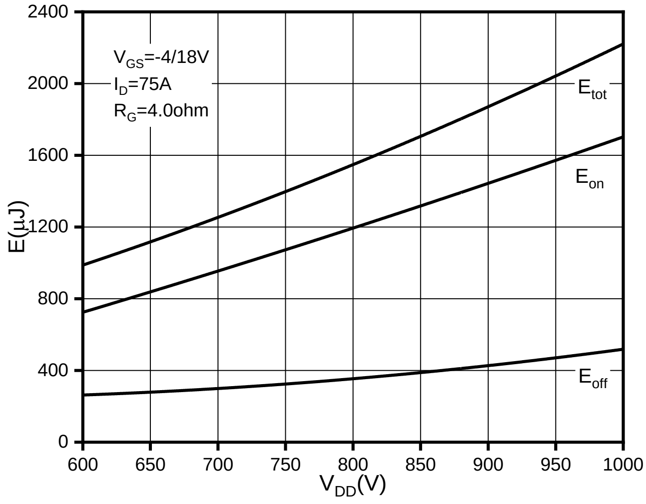


Figure 14. Switching Loss vs. Drain Voltage

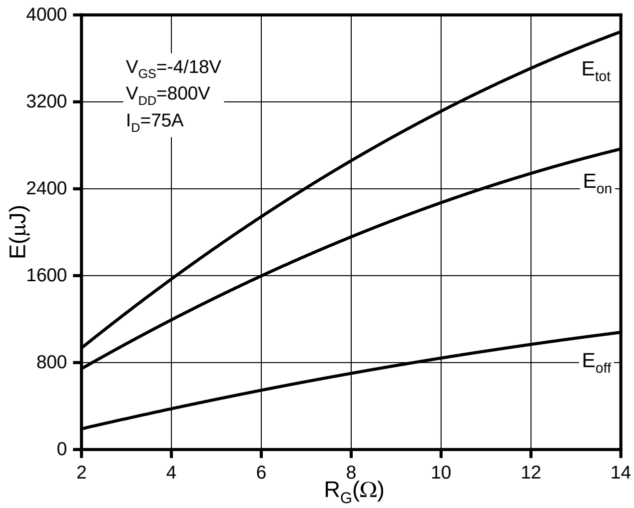


Figure 15. Switching Loss vs. Gate Resistance

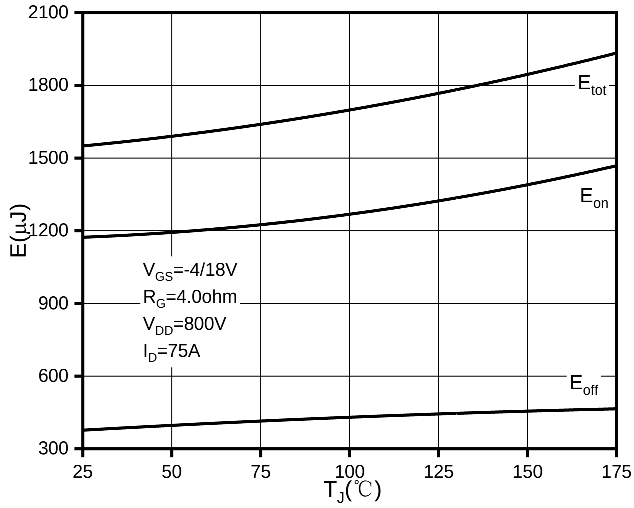


Figure 16. Switching Loss vs. Temperature

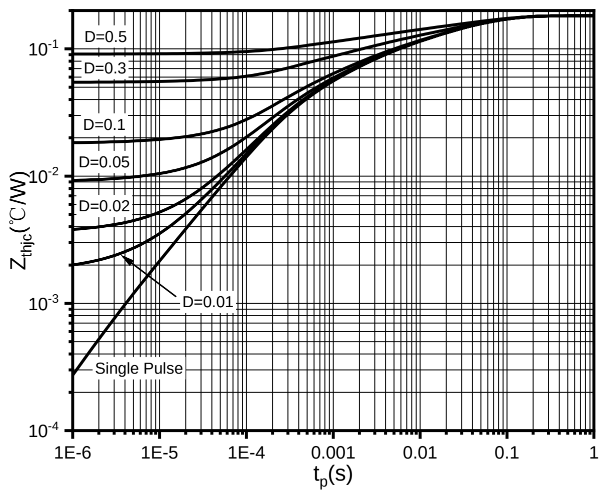
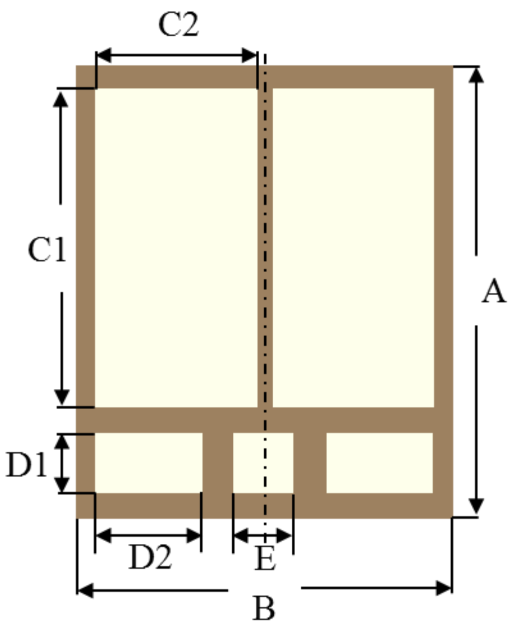


Figure 17. Junction−to−Case Transient Thermal Response

Chip Dimensions

Excluding scribe line of 80 μm



Symbol	Dimensions	
	mm	inch
A	5.92	0.233
B	4.92	0.194
C1	4.22	0.166
C2	2.14	0.084
D1	0.8	0.031
D2	1.41	0.056
E	0.8	0.031

Ordering Information

Part number	AMS1200016B
Package	Bare Die
Packing Method	Wafer
RoHS	Yes

Mechanical Parameters

Parameter	Typical Value	Unit
Die Dimensions (L*W)	5*6	mm
Exposed Source Pad Metal (L*W) Each (2 S pads total)	2.14*4.22	mm
Kelvin Pad Dimensions (L*W)	0.8*1.41	mm
Gate Pad Dimensions (L*W)	0.8*0.8	mm
Die Thickness	150	um
Top Side (Source) metallization (Ni:Pd:Au)	2/0.2/0.1	um
Top side (Gate) metallization (Ni:Pd:Au)	2/0.2/0.1	um
Bottom Drain metallization (Ti:Ni:Ag)	0.3/0.4/1.2	um

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