

1200V N-Channel SiC Power MOSFET & SiC SBD

Description

The AKM4CM016N120P is a high blocking voltage N-Channel SiC power MOSFET.

This device provides excellent performance for high voltage power supplies or pulse circuits.

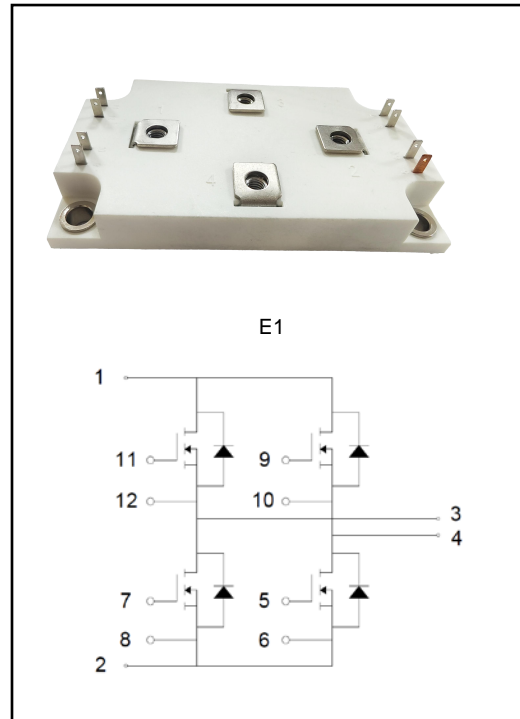
These SiC MOS Module series are ideally suited for Solar and UPS Inverters, High Voltage DC/DC Converters, Motor Drivers, Switch Mode Power Supplies where switching losses are significant portion of the total losses.

Features

- Typical on-Resistance: $R_{DS(on)}=16m\Omega$ @ $V_G=18V$
- High Blocking Voltage
- High Speed Switching with Low Capacitance
- Good Stability and Uniformity with High E_{AS}

Applications

- Solar and UPS Inverters
- High Voltage DC/DC Converters
- Motor Drivers
- Switch Mode Power Supplies
- Battery Chargers



Absolute Maximum Ratings @ $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain to Source Voltage	1200	V
V_{GSS}	Gate to Source Voltage	-8/+22	V
V_{GSop}	Recommended operation Values of Gate-Source Voltage	-5/+20	V
I_D	Drain Current	$V_{GS}=18V, T_C=25^\circ C$	120
		$V_{GS}=18V, T_C=100^\circ C$	90
I_{DM}	Pulsed Drain Current (Note 1)	250	A
P_D	Maximum Power Dissipation $T_C=25^\circ C$	600	W
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1450	mJ
T_J	Operating Junction Temperature Range	-55~+175	$^\circ C$
T_{STG}	Storage Temperature Range	-40~+150	$^\circ C$

Static Electrical Characteristics @ $T_c=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	1200	-	-	V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=23.5mA$	2.0	2.6	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=18V, I_D=75A$	-	16	23	m Ω
		$V_{GS}=18V, I_D=75A$ $T_c=175\text{ }^\circ\text{C}$	-	28	-	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=V_{DSS}, V_{GS}=0V$	-	-	100	μA
I_{GSS+}	Gate to Source Leakage Current	$V_{GS}=20V, V_{DS}=0V$	-	-	± 500	nA
I_{GSS-}	Gate to Source Leakage Current	$V_{GS}=-5V, V_{DS}=0V$	-	-	± 500	nA
g_{fs}	Transconductance	$V_{DS}=20V, I_D=75A$	-	41.4	-	S
		$V_{DS}=20V, I_D=75A$, $T_c=175\text{ }^\circ\text{C}$	-	36.5	-	

Switching Characteristics @ $T_c=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=1000V$, $f=1.0MHz$	-	4817	-	pF
C_{oss}	Output Capacitance		-	207	-	pF
C_{riss}	Reverse Transfer Capacitance		-	45	-	pF
Q_g	Total Gate Charge	$I_D=75A$, $V_{DD}=800V$ $V_{GS}=-4V/18V$ (Note 3)	-	66	-	nC
Q_{gs}	Gate to Source Charge		-	48	-	nC
Q_{gd}	Gate to Drain Charge		-	269	-	nC
$t_{d(on)}$	Turn-on Delay Time	$I_D=75A$, $V_{DD}=800V$, $R_t=2.5\Omega$ $V_{GS}=-5/20V$, (Note 3)	-	16	-	ns
t_r	Turn-on Rise Time		-	16.2	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	33	-	ns
t_f	Turn-off Fall Time		-	7.8	-	ns

Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. $V_{DD}=100V, L=5mH, V_{clamp}=1200V, V_G=15V, I_D=25.0A$
3. Essentially independent of operating temperature typical characteristics

Diode Characteristics @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Drain-Source Diode Forward Voltage	$I_F=75\text{A}$	-	1.45	1.8	V
		$I_F=75\text{A}, T_C=175\text{ }^\circ\text{C}$	-	2.1	2.5	
I_R	Reverse Current	$V_R=1200\text{V}$	-	10	50	μA
C	Total Capacitance	$V_R=0\text{V}, f=1\text{MHz}$	-	2350	-	pF
Q_C	Reverse Recovery Charge	$V_R=800\text{V}, I_F=75\text{A}$ $di/dt=1000\text{A}/\mu\text{s}$	-	184	-	nC
T_{rr}	Reverse Recovery Time	$V_R=800\text{V}, I_F=75\text{A}$ $di/dt=1000\text{A}/\mu\text{s}$	-	24	-	ns

Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C), MOSFET}$	Thermal Resistance, Junction to case, MOSFET	0.25	$^\circ\text{C}/\text{W}$
$R_{th(J-C), Diode}$	Thermal Resistance, Junction to case, Diode	0.4	$^\circ\text{C}/\text{W}$
$R_{th(C-S)}$	Thermal Resistance, Case to Sink	0.05	$^\circ\text{C}/\text{W}$

Typical Performance Characteristics

Fig. 1. Typical Output Characteristics @ $25\text{ }^\circ\text{C}$

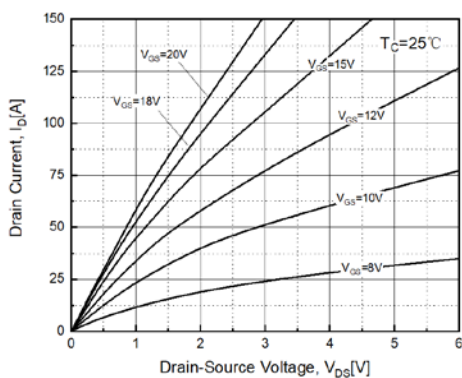
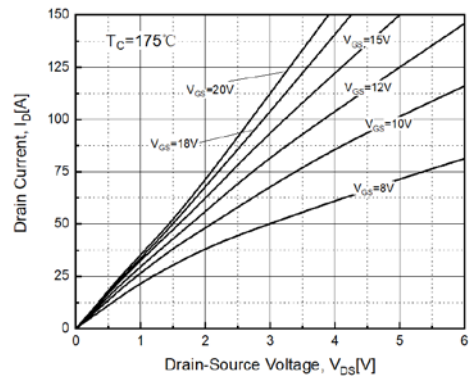


Fig. 2. Typical Output Characteristics @ $175\text{ }^\circ\text{C}$



Typical Performance Characteristics

Fig. 3. Normalized On-Resistance vs. Junction Temperature

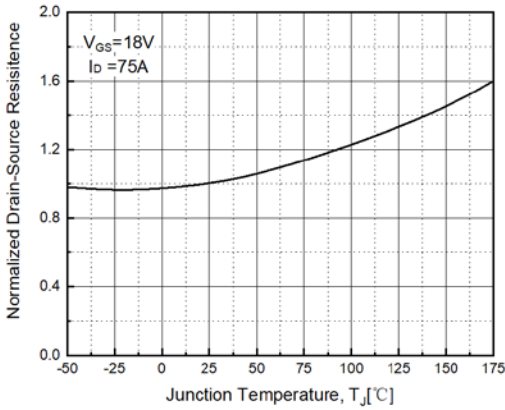


Fig. 4. On-Resistance vs. Drain Current for Various Temperatures

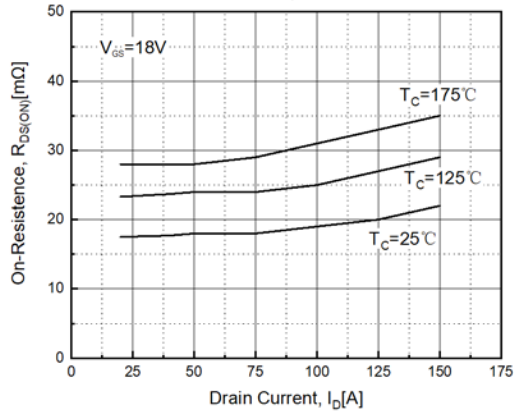


Fig. 5. On-Resistance vs. Drain Current for Various Gate Voltage

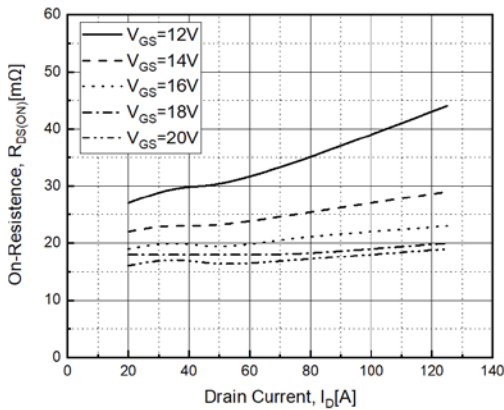


Fig. 6. On-Resistance vs. Gate Voltage for Various Temperatures

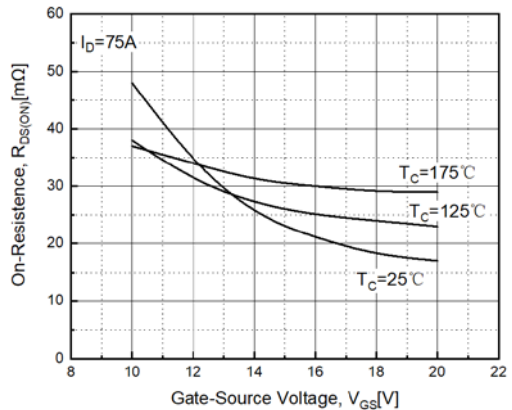


Fig. 7. Transfer Characteristics

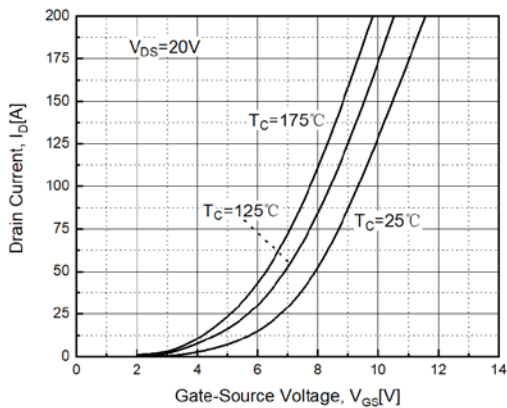
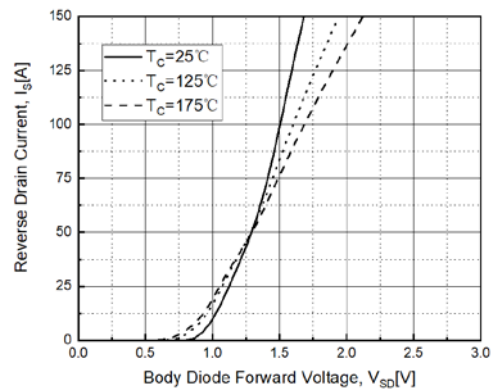


Fig. 8. Diode Forward Characteristics



Typical Performance Characteristics

Fig. 9. Gate Charge Characteristics

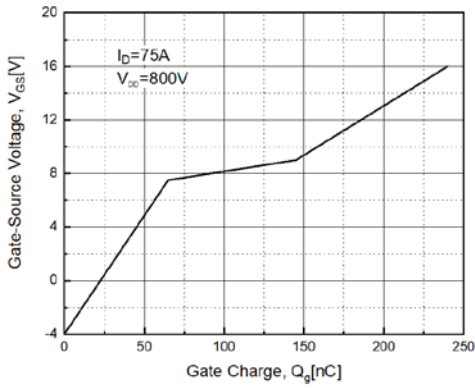


Fig. 10. Capacitance vs. Drain-to-Source Voltage

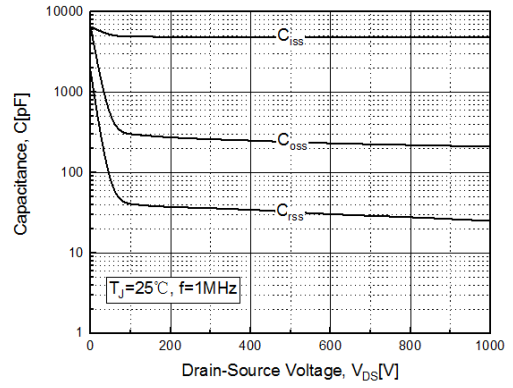
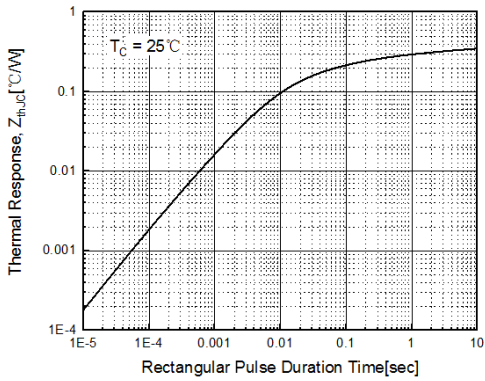


Fig. 11. Transient Thermal Impedance



Package Dimensions

E1



(Dimensions in Millimeters)

