

1700V 1Ω N-Channel SiC Power MOSFET

Description

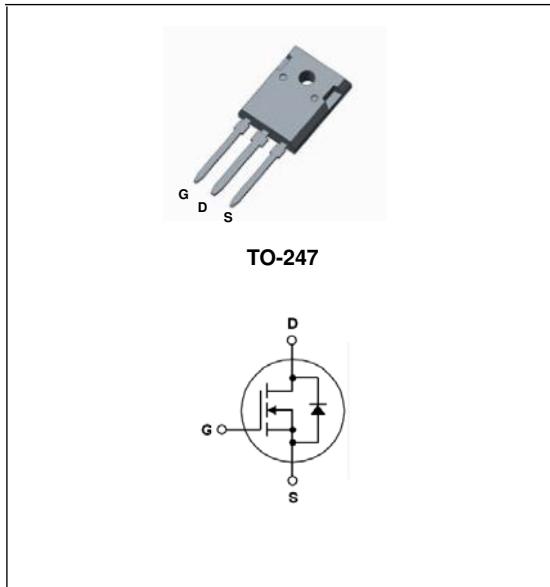
The AKCT1000N170H is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

Features

- Typical on-Resistance: $R_{DS(on)}=1\Omega(\text{typ.})$
- High Blocking Voltage
- 100% Avalanche Test
- Good Stability and Uniformity with High E_{AS}

Applications

- Solar Inverters
- High Voltage DC/DC Converters
- Motor Drivers
- Switch Mode Power Supplies



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

Symbol	Parameter		Ratings	Unit
V_{DSS}	Drain to Source Voltage		1700	V
V_{GSS}	Gate to Source Voltage		-10/+25	V
V_{GSop}	Recommended operation Values of Gate -Source Voltage		-5/+20	V
I_D	Drain Current	$T_C=25^\circ\text{C}$	5.0	A
		$T_C=100^\circ\text{C}$	3.0	A
I_{DM}	Pulsed Drain Current	(Note1)	20.0	A
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	62	W
	Derate above 25°C		0.5	W/°C
T_J	Operating Junction Temperature Range		-55~+150	°C
T_{STG}	Storage Temperature Range		-55~+150	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$	Thermal Resistance, Junction to case	2.02	°C/W
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	40	°C/W

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	$V_{GS}=0\text{V}, I_D=100\mu\text{A}$	1700	-	-	V
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=1\text{mA}$	2.0	2.6	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=20\text{V}, I_D=2\text{A}$	-	1	1.3	Ω
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}$	-	-	100	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}$	-	-	± 250	nA

D-S Diode Characteristics and Maximum Rating @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS}=-5\text{V}, I_S=1\text{A}$	-	4.2	-	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0\text{V}, I_S=2\text{A},$ $dI/dt=-290\text{A}/\mu\text{s}$	-	25	-	ns
Q_{rr}	Reverse Recovery Charge		-	15	-	nC

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$I_D=30\text{A},$ $V_{DD}=1200\text{V},$ $R_G=2.5\Omega$ $V_{GS} = -5/20\text{V},$ (Note 3)	-	5	-	ns
t_r	Turn-on Rise Time		-	9.2	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	13.8	-	ns
t_f	Turn-off Fall Time		-	22.8	-	ns
E_{ON}	Turn-On Switching Energy	$V_{DS}=1200\text{V}, V_{GS}=-5\text{V}/20\text{V}$	-	5.1	-	μJ
E_{Off}	Turn-Off Switching Energy	$ID=2\text{A}, RG(\text{ext})=2.5\Omega,$ $L=1500\mu\text{H}$	-	9.2	-	μJ
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=1000\text{V},$ $f=1.0\text{MHz}$	-	194	-	pF
C_{oss}	Output Capacitance		-	13	-	pF
C_{rss}	Reverse Transfer Capacitance		-	1.8	-	pF
Q_g	Total Gate Charge	$I_D=2\text{A},$ $V_{DD}=1200\text{V}$ $V_{GS}=-5\text{V}/20\text{V}$ (Note 3)	-	23	-	nC
Q_{gs}	Gate to Source Charge		-	5.4	-	nC
Q_{gd}	Gate to Drain Charge		-	7.6	-	nC

Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. $V_{DD}=100\text{V}, L=1\text{mH}, V_G=10\text{V}, I_D=2.0\text{A}$
3. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Fig. 1. Typical on-Resistance Characteristics

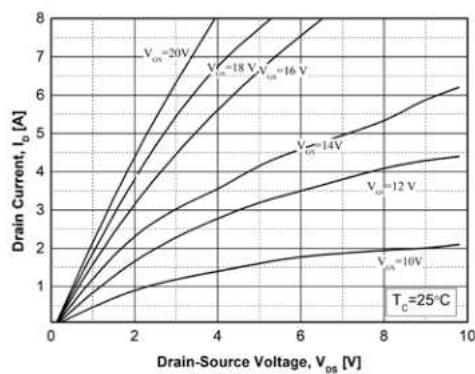


Fig. 3 Normalized On-Resistance vs. Drain Current and Gate Voltage

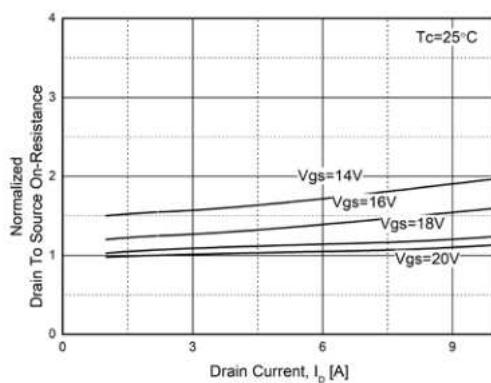


Fig. 5. On-Resistance vs. Drain Current

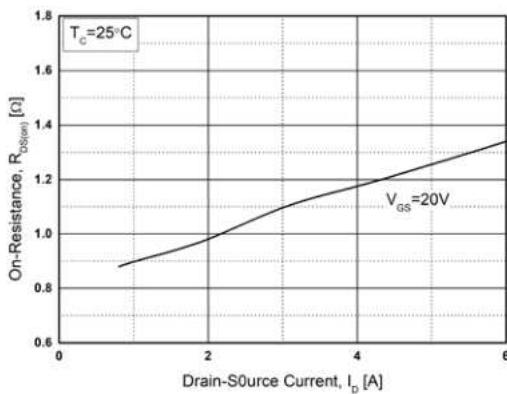


Fig. 2. Typical on-Resistance Characteristics

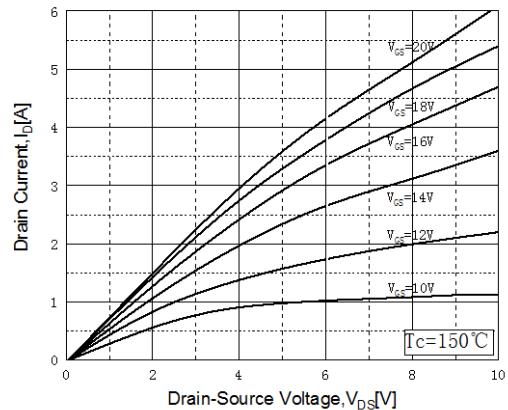


Fig. 4. Normalized On-Resistance vs. Junction Temperature

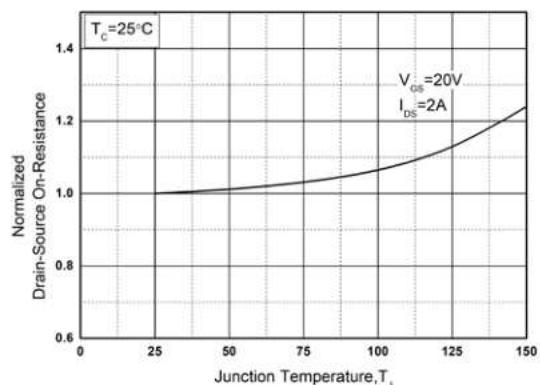
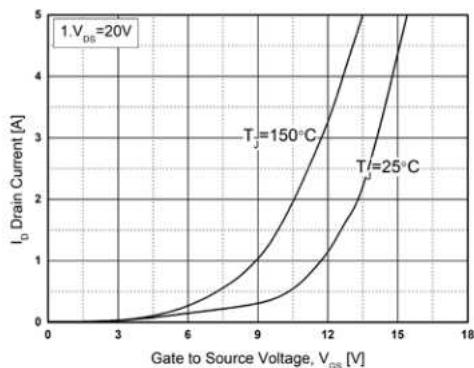


Fig. 6. Transfer Characteristics



Typical Performance Characteristics

Fig. 7. Source-to-Drain Diode Forward Voltage vs. Source Current

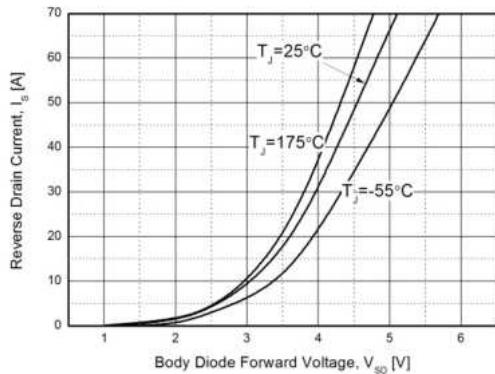


Fig. 8. Gate Charge Characteristics

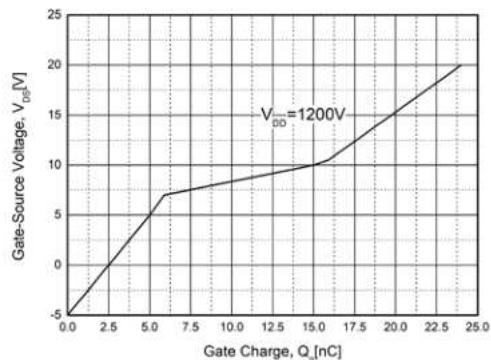


Fig. 9. Characteristics vs. Drain-to-Source Voltage

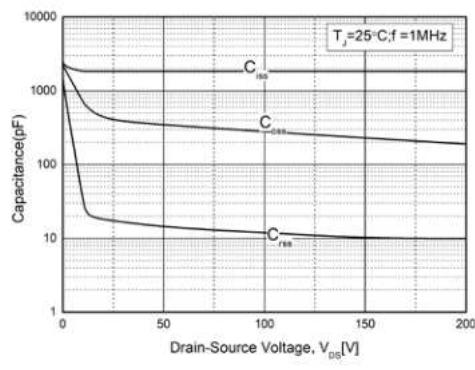
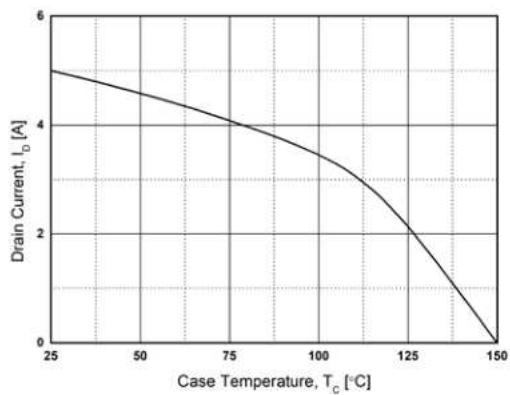


Fig.10. Maximum Drain Current vs. Temperature



Package Dimensions**TO-247**

(Dimensions in Millimeters)

