

## 1200V 40mΩ N-Channel SiC Power MOSFET

### Description

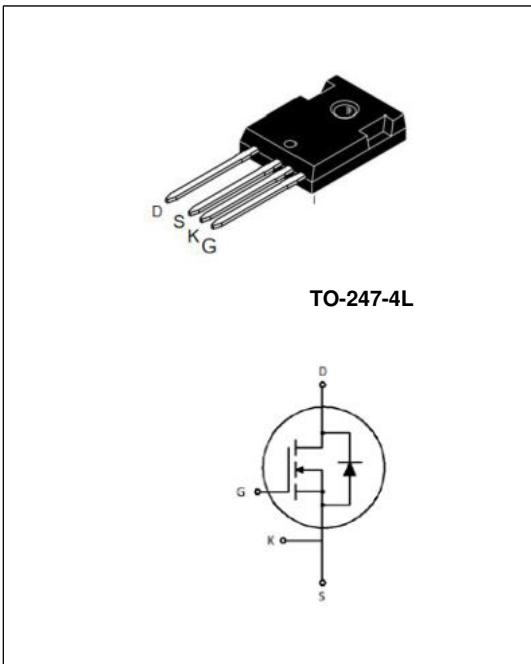
The AKCT40N120HB4L is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

### Features

- Typical on-Resistance:  $R_{DS(on)}=40\text{m}\Omega(\text{typ.})$
- 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		1200	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	$T_C=25^\circ\text{C}$	68	A
		$T_C=100^\circ\text{C}$	50	A
$I_{DM}$	Pulsed Drain Current	(Note1)	100	A
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	357	W
	Derate above 25°C		2.86	W/°C
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	1500	mJ
$T_J$	Operating Junction Temperature Range		-40~+175	°C
$T_{STG}$	Storage Temperature Range		-40~+150	°C

### Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$	Thermal Resistance, Junction to case	0.42	°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	$V_{GS}=0\text{V}, I_D=100\mu\text{A}$	1200	-	-	V
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=10\text{mA}$	2	2.5	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=20\text{V}, I_D=30\text{A}$	-	40	50	$\text{m}\Omega$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}$	-	-	$\pm 500$	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	$V_{GS}=0\text{V}, I_S=50\text{A}$	-	5.5	-	V
$t_{rr}$	Reverse Recovery Time	$V_{GS}=0\text{V}, I_S=33\text{A},$	-	38	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	110	-	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	$I_D=20\text{A}, V_{DD}=800\text{V}, R_G=2.5\Omega, V_{GS}=-5/20\text{V}, (\text{Note 3})$	-	30	-	ns
$t_r$	Turn-on Rise Time		-	22	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	50	-	ns
$t_f$	Turn-off Fall Time		-	28	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=1000\text{V}, f=1.0\text{MHz}$	-	2070	-	pF
$C_{oss}$	Output Capacitance		-	120	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	18	-	pF
$Q_g$	Total Gate Charge	$I_D=20\text{A}, V_{DD}=800\text{V}, V_{GS}=-5/20\text{V}, (\text{Note 3})$	-	125	-	nC
$Q_{gs}$	Gate to Source Charge		-	35	-	nC
$Q_{gd}$	Gate to Drain Charge		-	25	-	nC

**Note:**

1. Repetitive rating: pulse-width limited by maximum junction temperature
2.  $V_{DD}=100\text{V}, L=10\text{mH}, V_{\text{clamp}}=1200\text{V}, V_G=10\text{V}$
3. Essentially independent of operating temperature typical characteristics

## Typical Performance Characteristics

Fig. 1. Typical on-Resistance Characteristics

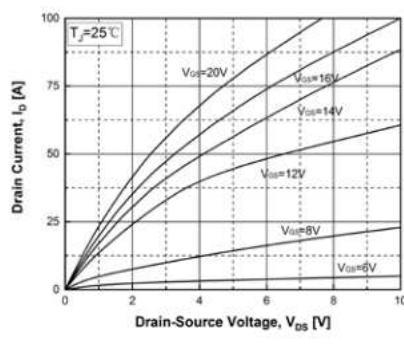


Fig. 2. Resistance vs. Drain Current and Gate Voltage

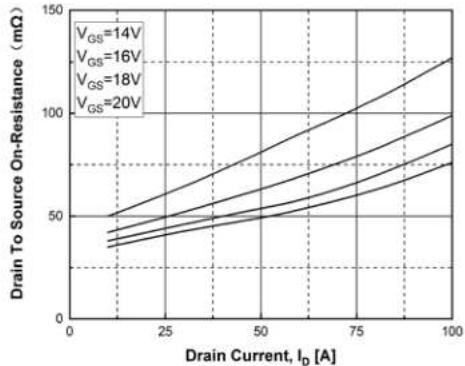


Fig. 3. Normalized On-Resistance vs. Junction Temperature

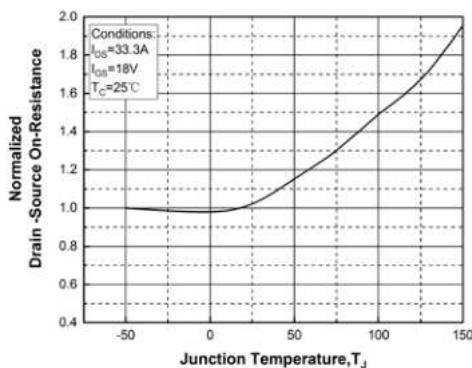


Fig. 4. On-Resistance vs. Gate-to-source Voltage

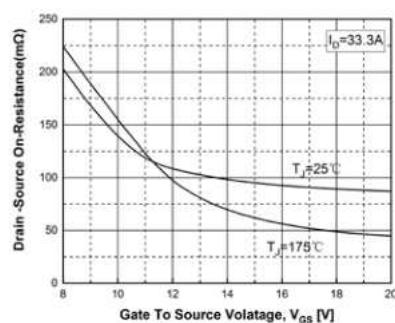


Fig. 5. Transfer Characteristics

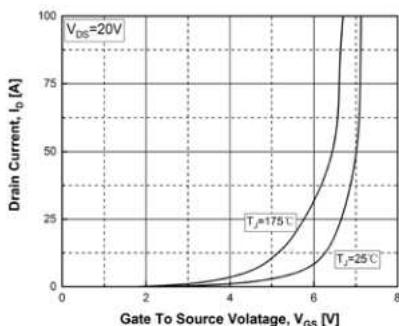
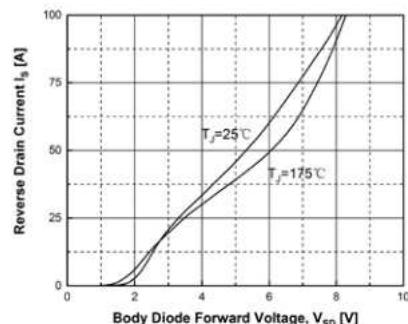


Fig. 6. Source-to-Drain Diode Forward Voltage vs. Source Current



## Typical Performance Characteristics

Fig. 7. Gate Charge Characteristics

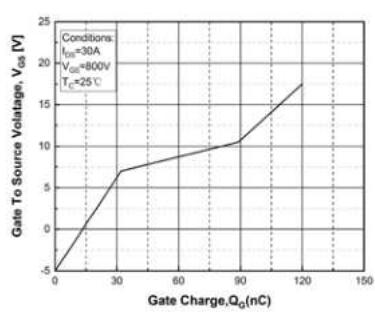


Fig. 8. Characteristics vs. Drain-to-Source Voltage

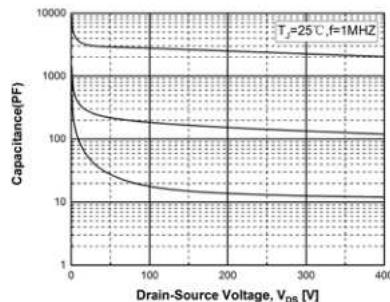
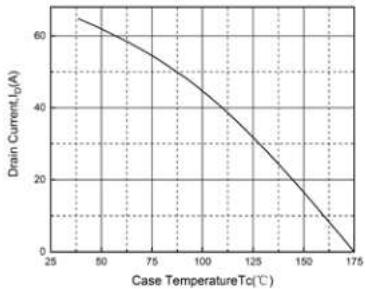


Fig. 9. Maximum Drain Current vs. Temperature



**Package Dimensions****TO-247-4L**

(Dimensions in Millimeters)

