

1200V 40mΩ N-Channel SiC Power MOSFET

Description

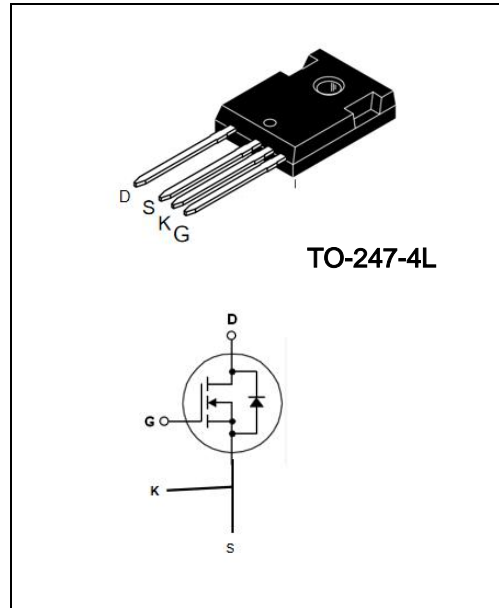
The AKCT40N120H4L is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

Features

- Typical on-Resistance: $R_{DS(on)}=40m\Omega$ (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 @ $T_C=25^\circ C$ 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	$T_C=25^\circ C$	61 A
		$T_C=100^\circ C$	42 A
I_{DM}	Pulsed Drain Current (Note1)	120	A
P_D	Maximum Power Dissipation	$T_C=25^\circ C$	250 W
	Derate above $25^\circ C$		1.67 W/ $^\circ C$
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	300	mJ
T_J	Operating Junction Temperature Range	-50~+175	$^\circ C$
T_{STG}	Storage Temperature Range	-50~+175	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$	Thermal Resistance, Junction to case	0.6	$^\circ C/W$
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	40	$^\circ C/W$

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	$V_{GS}=0V, I_D=2mA$	1200	-	-	V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=5mA$	2.0	2.5	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=20V, I_D=20A$	-	44	65	m Ω
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=V_{DSS}, V_{GS}=0V$	-	-	100	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0V$	-	-	± 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	$V_{GS}=0V, I_S=40A$	-	3.9	-	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_S=40A,$ $di/dt=-290A/\mu s$	-	30	-	ns
Q_{rr}	Reverse Recovery Charge		-	590	-	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	$I_D=40A,$ $V_{DD}=800V,$ $R_G=2.5\Omega$ $V_{GS}=-5/20V,$ (Note 3)	-	12	-	ns
t_r	Turn-on Rise Time		-	12	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	23	-	ns
t_f	Turn-off Fall Time		-	6.7	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=1000V,$ $f=1.0MHz$	-	2946	-	pF
C_{oss}	Output Capacitance		-	167	-	pF
C_{riss}	Reverse Transfer Capacitance		-	6.6	-	pF
Q_g	Total Gate Charge	$I_D=40A,$ $V_{DD}=800V$ $V_{GS}=-5V/20V$ (Note 3)	-	142	-	nC
Q_{ge}	Gate to Source Charge		-	37	-	nC
Q_{gd}	Gate to Drain Charge		-	18	-	nC

Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. $V_{DD}=100V, L=10mH, V_{clamp}=1600V, V_G=10V, I_D=19.0A$
3. Essentially independent of operating temperature typical characteristics

Typical Performance Characteristics

Fig. 1. Typical on-Resistance Characteristics

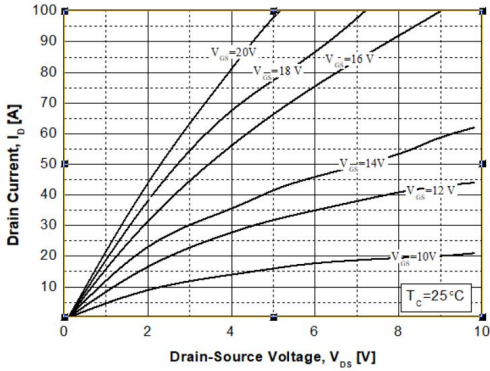


Fig. 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

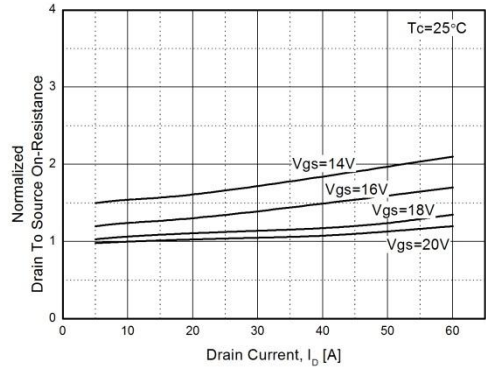


Fig. 3. Normalized On-Resistance vs. Junction Temperature

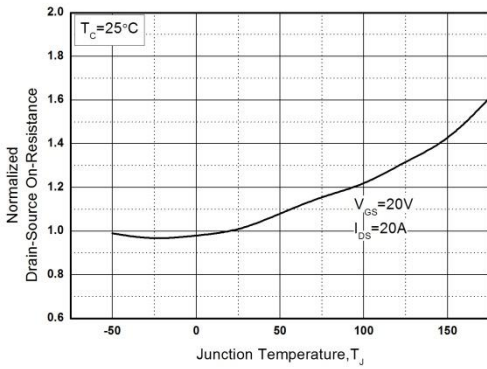


Fig. 4. On-Resistance vs. Gate-to-source Voltage

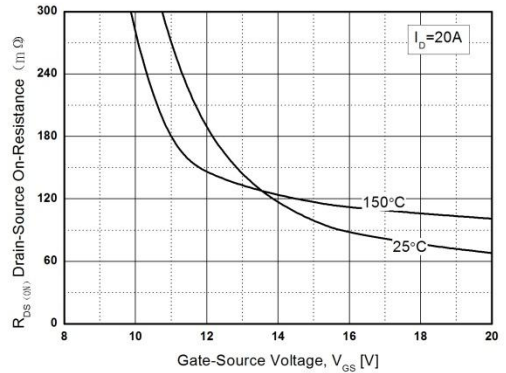


Fig. 5. Transfer Characteristics

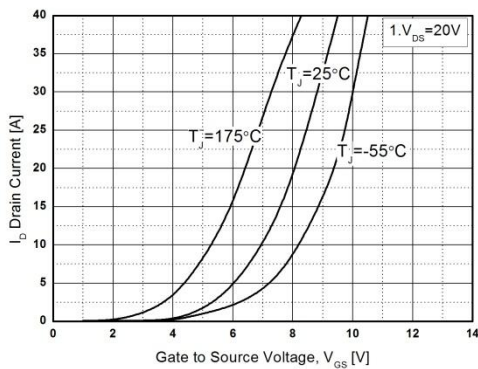
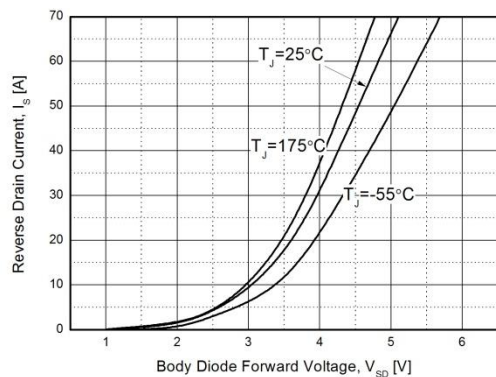


Fig. 6. Source-to-Drain Diode Forward Voltage vs. Source Current



Typical Performance Characteristics

Fig. 7. Gate Charge Characteristics

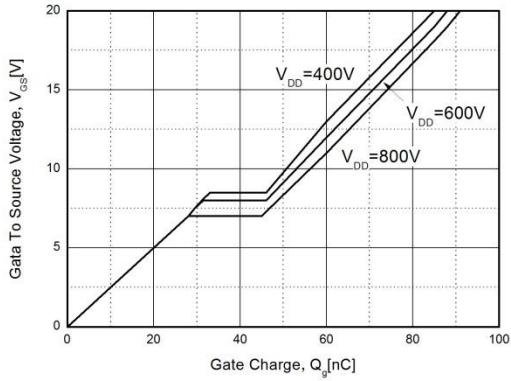


Fig. 8. Characteristics vs. Drain-to-Source Voltage

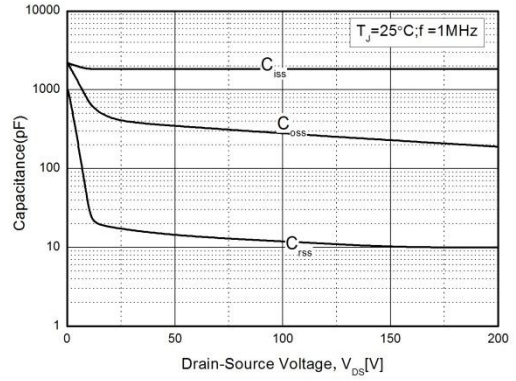
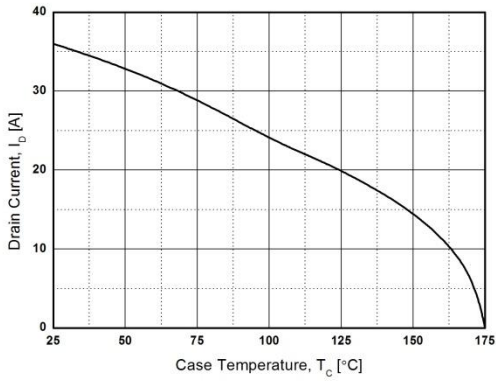


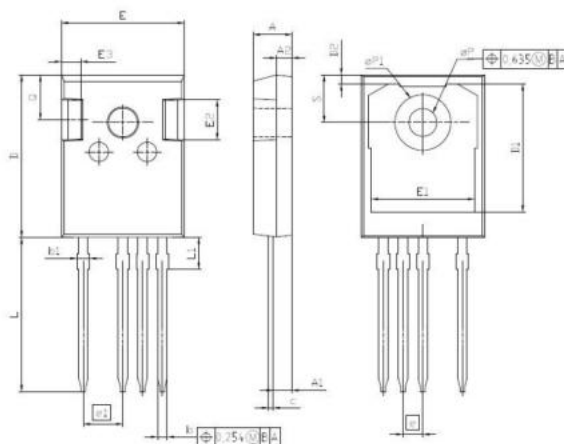
Fig. 9. Maximum Drain Current vs. Temperature



Package Dimensions

TO-247-4L

(Dimensions in Millimeters)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.90	2.16	0.075	0.085
b	1.07	1.33	0.042	0.052
b1	1.10	1.70	0.043	0.067
c	0.50	0.70	0.020	0.028
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	2.54 (BSC)		0.100 (BSC)	
e1	5.08		0.200	
N	4		4	
L	19.72	20.32	0.776	0.800
L1	4.02	4.40	0.158	0.173
øP	3.50	3.70	0.138	0.146
øP1	7.00	7.40	0.276	0.291
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248