

650V 30mΩ N-Channel SiC Power MOSFET

Description

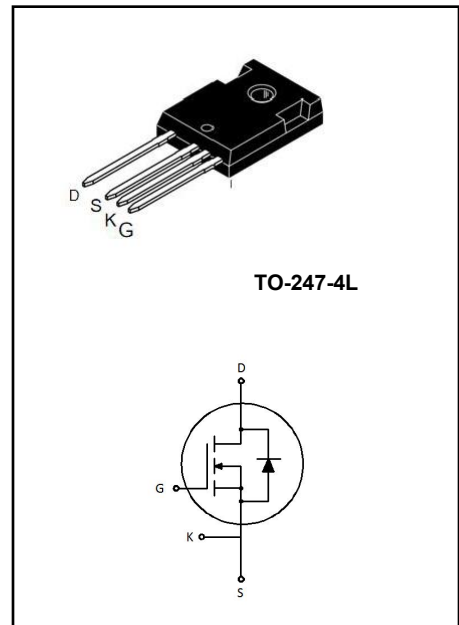
The AKCT30N65H4L is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

Features

- Typical on-Resistance: $R_{DS(on)}=30m\Omega$ (typ.)
- High Blocking Voltage
- 100% Avalanche Test
- Good Stability and Uniformity with High E_{AS}

Applications

- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Solar PV Inverters/UPS
- EV Chargers



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

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain to Source Voltage	650	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	$T_C=25^\circ\text{C}$	55
		$T_C=100^\circ\text{C}$	39
I_{DM}	Pulsed Drain Current (Note1)	197	A
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	187
	Derate above 25°C		1.25
T_J	Operating Junction Temperature Range	-55~+175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55~+175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$	Thermal Resistance, Junction to case	0.8	$^\circ\text{C/W}$
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	40	$^\circ\text{C/W}$

Electrical Characteristics @T_c=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain to Source Breakdown Voltage	V _{GS} =0V, I _D =1mA	650	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =10mA	1.8	2.6	4.3	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =18V, I _D =25A	-	30	50	mΩ
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =V _{DSS} , V _{GS} =0V	-	1	50	uA
I _{GSS}	Gate to Source Leakage Current	V _{GS} =V _{GSS} , V _{DS} =0V	-	-	±250	nA

D-S Diode Characteristics and Maximum Rating @T_c=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} =-4V, I _S =12.5A	-	4.2	-	V
t _{rr}	Reverse Recovery Time	V _R =400V, I _S =25A, di/dt=-290A/us	-	25	-	ns
Q _{rr}	Reverse Recovery Charge		-	100	-	nC

Switching Characteristics @T_c=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on Delay Time	I _D =25A, V _{DD} =400V, R _G =2.5Ω, V _{GS} = -5/20V, (Note 3)	-	14	-	ns
t _r	Turn-on Rise Time		-	15	-	ns
t _{d(off)}	Turn-off Delay Time		-	28	-	ns
t _f	Turn-off Fall Time		-	8	-	ns
E _{on}	Turn-on Switching Loss	V _{DS} =400V, V _{GS} =5/18V, I _D =25.0A, R _G =2.5Ω, L=100μH		0.050		mJ
E _{off}	Turn-off Switching Loss			0.065		mJ
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =400V, f=1.0MHz	-	1850	-	pF
C _{oss}	Output Capacitance		-	160	-	pF
C _{rss}	Reverse Transfer Capacitance		-	15	-	pF
Q _g	Total Gate Charge	I _D =25A, V _{DD} =400V V _{GS} =-5V/20V (Note 3)	-	110	-	nC
Q _{gs}	Gate to Source Charge		-	30	-	nC
Q _{gd}	Gate to Drain Charge		-	32	-	nC

Note:

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

Typical Performance Characteristics

Fig. 1. Typical on-Resistance Characteristics

$T_J=25^\circ\text{C}$

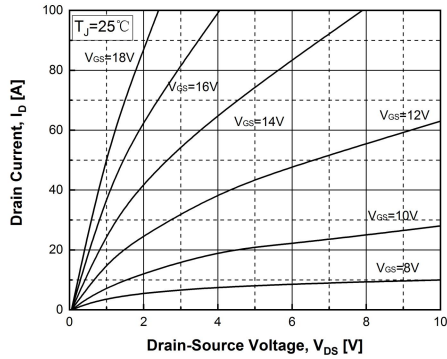


Fig. 2. Typical on-Resistance Characteristics

$T_J=175^\circ\text{C}$

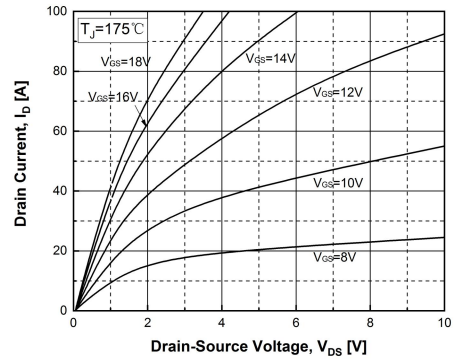


Fig. 3. Normalized On-Resistance vs. Junction Temperature

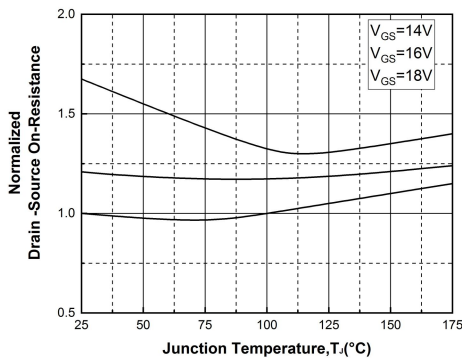


Fig. 4. Source-to-Drain Diode Forward Voltage vs. Source Current

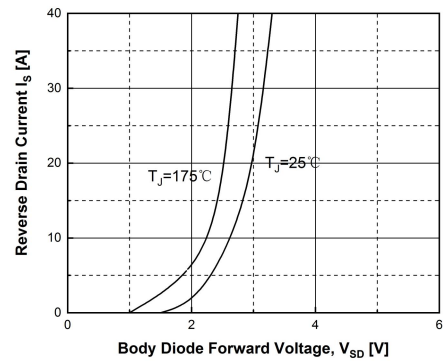


Fig. 5. Maximum Drain Current vs. Case Temperature

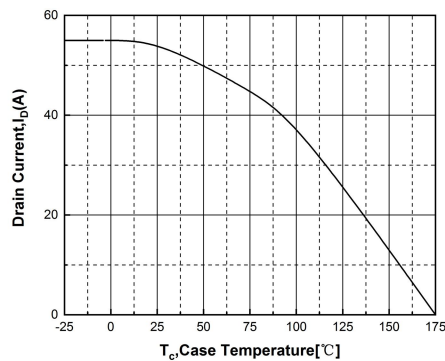
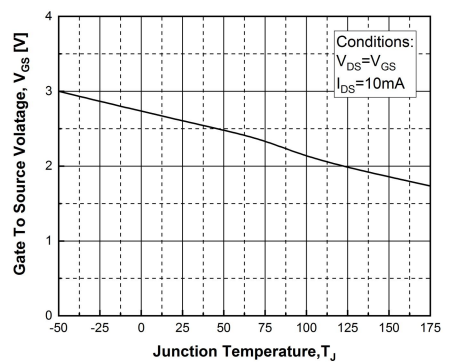


Fig. 6. Threshold Voltage vs. Temperature



Typical Performance Characteristics

Fig. 7. Maximum Power Dissipation vs. Case Temperature

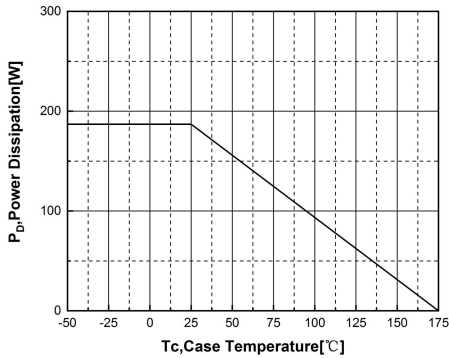


Fig. 8. Gate Charge Characteristics

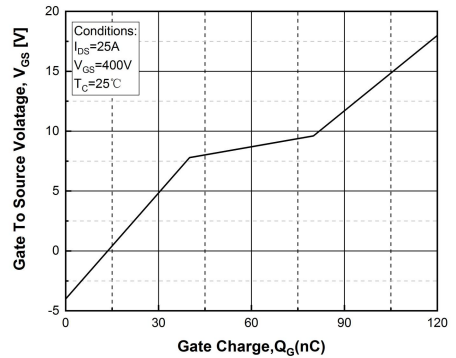


Fig. 9. Characteristics vs. Drain-to-Source Voltage

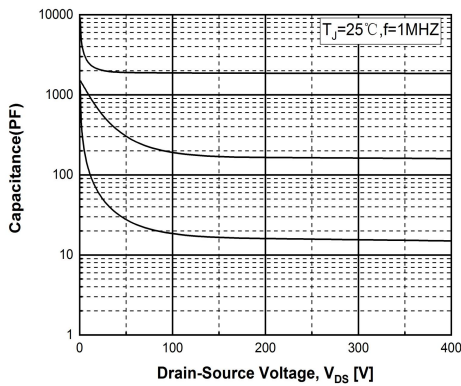


Fig. 10. Maximum Safe Operating Area

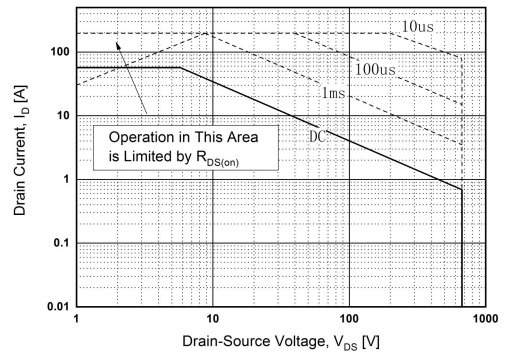


Fig. 11. Typ. Switching losses vs. Gate resistance

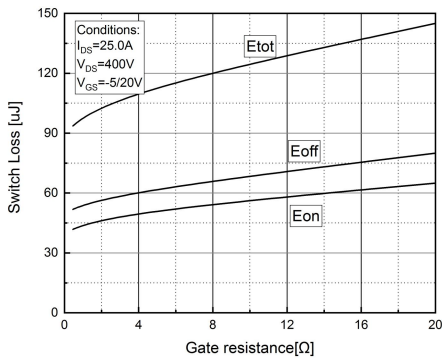
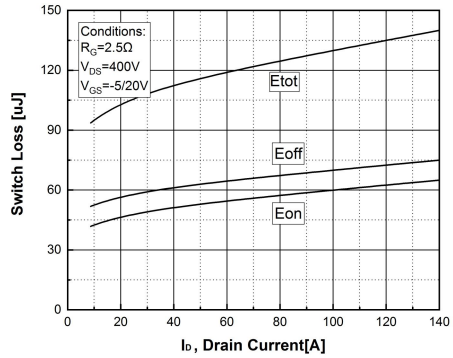
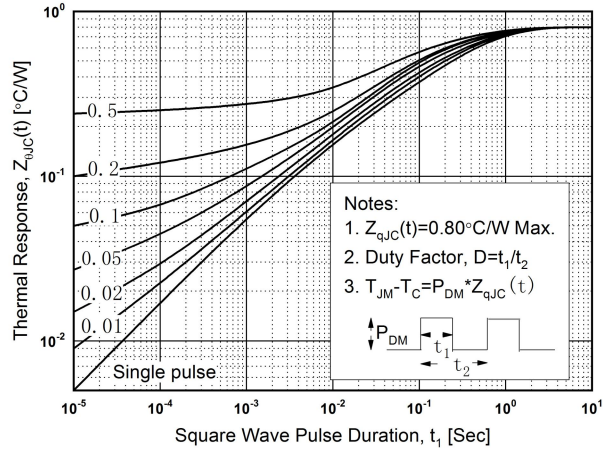


Fig. 12. Typ. Switching losses vs. Drain current



Typical Performance Characteristics

Fig. 13. Transient Thermal Response Curve



Package Dimensions

TO-247-4L

(Dimensions in Millimeters)

