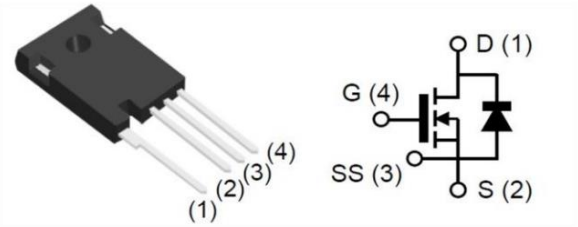
1200V, 40mΩ SiC Power MOSFET

General Description

The AKM120N040T4A 1200V, 40mΩ SiC power MOSFET is an N-channel enhancement mode device. This device shows high current density and great switching behavior. Due to excellent thermal conductivity, this device significantly improved in thermal capability and temperature independent switching behavior.

V_{DS}	$R_{DS(ON)}$	$I_{D(@25℃)}$
1200V	40mΩ	78A

TO-247-4L



Features

- Low On-Resistance and High Current Density
- Low Capacitance for High Frequency Operation
- Positive Temperature Coefficient Device
- AEC-Q101 Qualified
- RoHS Compliant and Halogen Free

Applications

- Switching Mode Power Supply
- Power Inverters
- DC/DC Converters, UPS, and PFC
- Auxiliary Power Supplies
- Solar/Wind Renewable Energy

Ordering Information

Part Number	Package	Marking	Remark
AKM120N040T4A	TO-247-4L	M120N040T4A	Halogen Free

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter		AKM120N040T4A	Unit
$V_{DS, max}$	Drain-to-Source Voltage [1]		1200	V
I_D	Continuous Drain Current	V_{GS}=20V, T_C=25℃	78	A
		V_{GS}=20V, T_C=100℃	57	
P_D	Power Dissipation	T_C=25℃, T_j=175℃	405	W
$V_{GS, op}$	Recommend Gate Source Voltage		-5 to 20	V
$V_{GS, max}$	Maximum Gate Source Voltage		-10 to 25	
T_L	Soldering Temperature		260	℃
T_j , T_{stg}	Soldering Temperature		-55 to 175	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	AKM120N040T4A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.25	℃/W

Electrical Characteristics

T_C =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	1200	--	--	V	V_{GS}=0V, I_D=100μA
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.5	4.0	V	V_{DS}=10V, I_{DS}=40mA
		--	1.5	--		V_{DS}=10V, I_{DS}=40mA, T_j=175℃
I_{DSS}	Zero Gate Voltage Drain Current	--	5	100	μA	V_{DS}=1200V, V_{GS}=0V
I_{GSS}	Gate-to-Source Leakage Current	--	10	200	nA	V_{GS}=20V, V_{DS}=0V
		-	-10	-200		V_{GS}=-10V, V_{DS}=0V
$R_{DS(ON)}$	Drain-to-Source On-State Resistance	--	40	50	mΩ	V_{GS}=20V, I_{DS}=40A
		--	59	--		V_{GS}=20V, I_{DS}=40A T_j=175℃
gfs	Transconductance	--	10.4	--	S	V_{DS}=20V, I_{DS}=40A
		--	7.7	--		V_{DS}=20V, I_{DS}=40A T_j=175℃
C_{iss}	Input Capacitance	--	2101	--	pF	V_{GS}=0V V_{DS}=1000V f=100KHz V_{AC}=25mV
C_{oss}	Output Capacitance	--	161	--		
C_{rss}	Reverse Transfer Capacitance	--	14	--		
$t_{d(on)}$	Turn On Delay Time	--	22	--	ns	V_{GS}=-5/+20V V_{DS}=800V I_D=40A, R_L=20 Ω $R_{G(ext)}$=2.5Ω Timing relative to V_{DS}
t_r	Rise Time	--	49	--		
$t_{d(off)}$	Turn Off Delay Time	--	71	--		
t_f	Fall Time	--	23	--		
E_{oss}	C_{oss} Stored Energy	--	90	--	μJ	V_{GS}=0V, V_{DS}=1000V f=100KHz, V_{AC}=25mV
E_{on}	Turn-on Switching Energy	--	1.1	--	mJ	V_{DS}=800V, V_{GS}=-5/20V I_D=40A, $R_{G(ext)}$= 2.5Ω L=100μH
E_{off}	Turn-off Switching Energy	--	0.9	--		
$R_{G(int.)}$	Internal Gate Resistance	--	1.7	--	Ω	f=1MHz, V_{AC}=25mV

Built-in SiC Diode Characteristics

T_C =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Inverse Diode Forward Voltage	--	4.1	--	V	V_{GS}=-5V, I_{SD}=2A
		--	3.5	--		V_{GS}=-5V, I_{SD}=2A T_j=175℃
Is	Continuous Diode Forward Current	--	--	83	A	V_{GS}=-5V, T_C=25°C
t_{rr}	Reverse Recovery Time	--	56	--	ns	V_{GS}=-5V, I_{SD}=40A, V_{DS}=800V, di/dt=1165A/μs
Q_{rr}	Reverse Recovery Charge	--	508	--	nC	
I_{rrm}	Peak Reverse Recovery Current	--	18	--	A	

Gate Charge Characteristics

T_C=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Units	Test Conditions
Q_{GS}	Gate-to-Source Charge	--	33	--	nC	V_{DS}=800V, V_{GS}=-5/+20V, I_D=40A
Q_{GD}	Gate-to-Drain Charge	--	51	--		
QG	Total Gate Charge	--	131	--		

Typical Characteristics

Figure 1. Output Characteristics $I_{DS}=f(V_{DS})$, T_J=-55℃

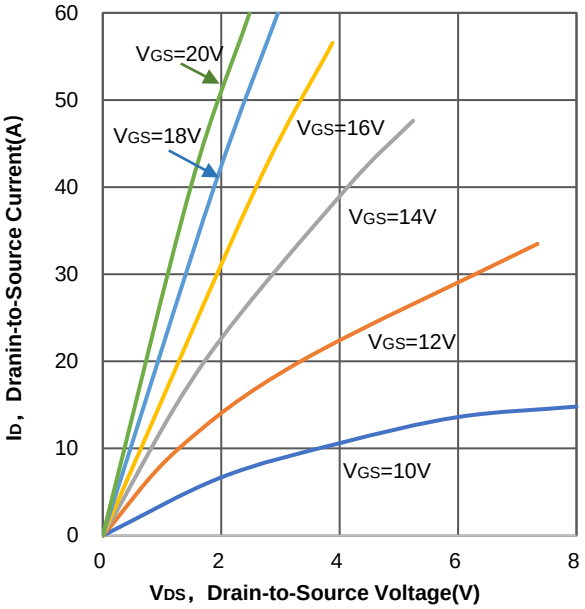


Figure 2. Output Characteristics $I_{DS}=f(V_{DS})$, T_J=25℃

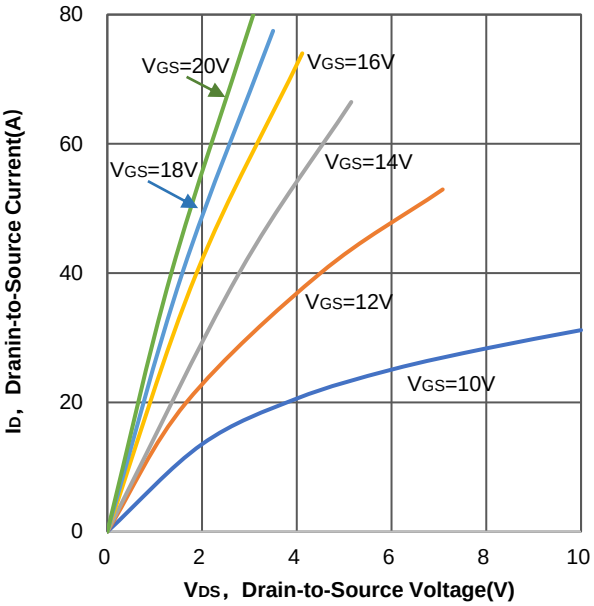


Figure 3. Output Characteristics $I_{DS}=f(V_{DS})$, T_J=150℃

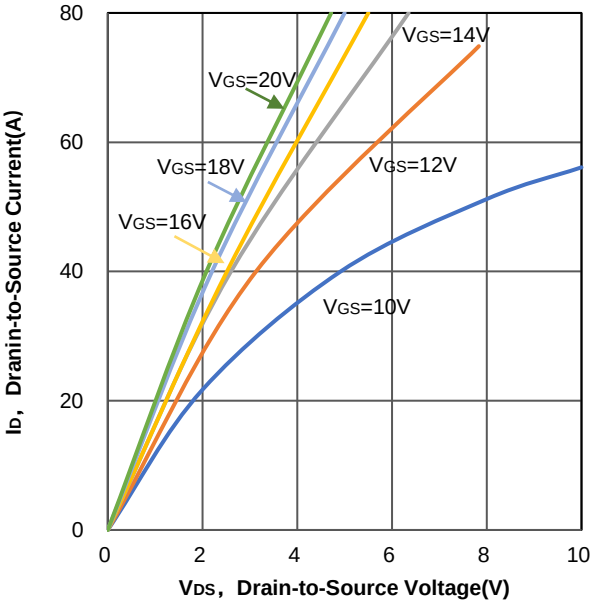


Figure 4. Output Characteristics $I_{DS}=f(V_{DS})$, T_J=175℃

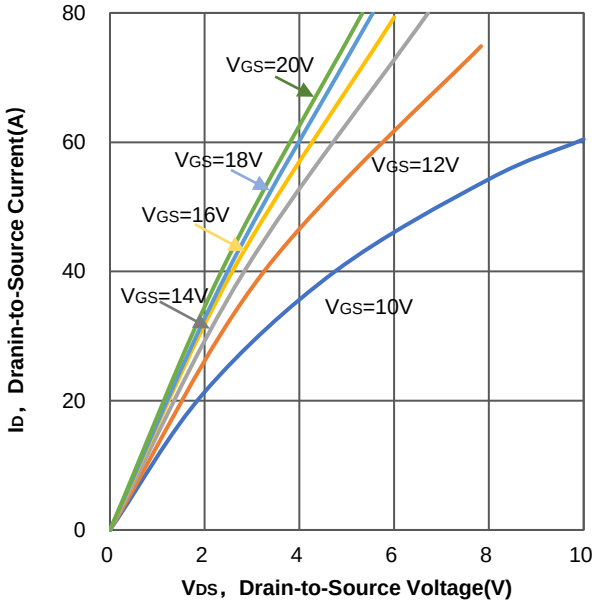


Figure 5. Output Capacitor $I_{DS}=f(V_{GS})$, $V_{DS}=20V$

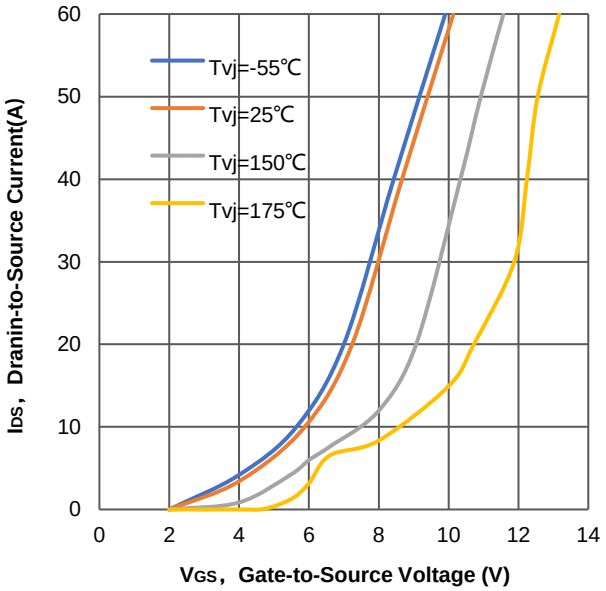


Figure 6. Output Capacitor Stored Energy $E_{OSS}=f(V_{DS}),T_J=25℃$

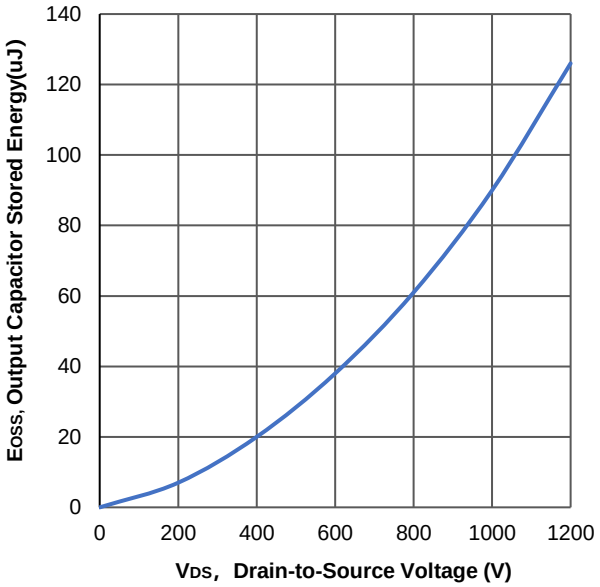
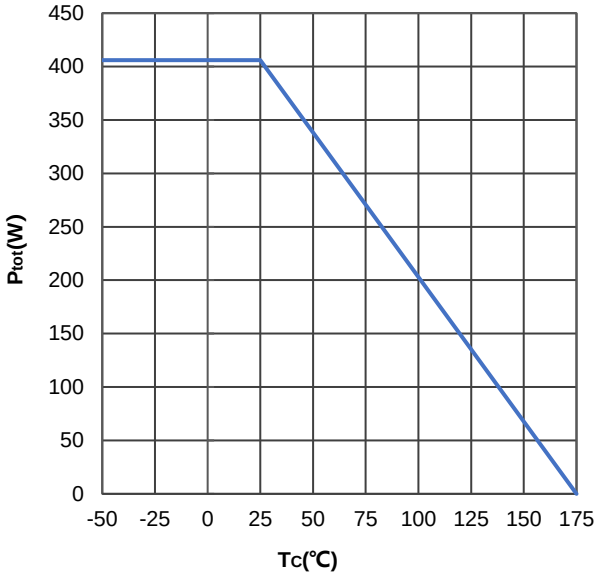
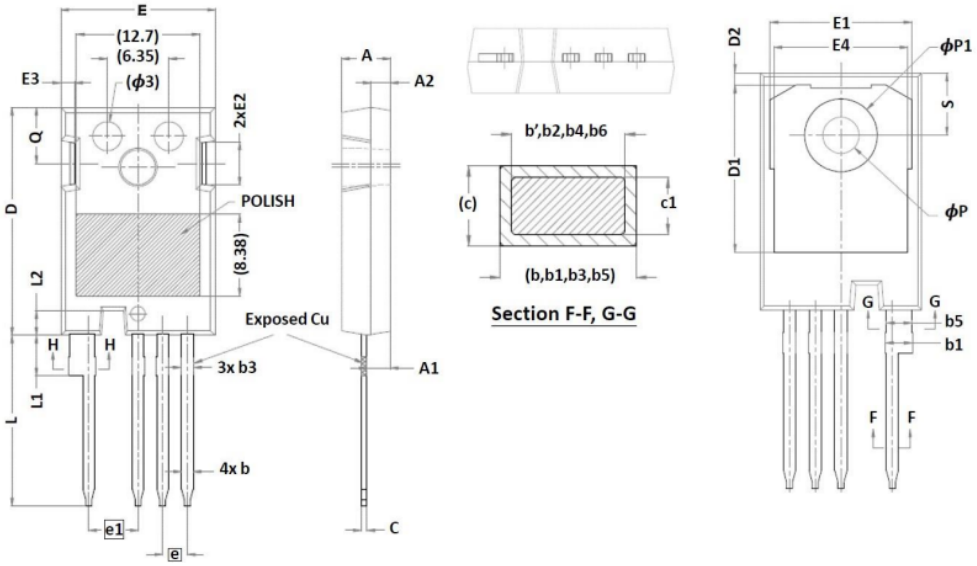


Figure 7. Maximum Power Dissipation Derating $P_{tot}=f(T_C),T_J\leq175℃$



Package Dimensions

TO-247-4L



Symbol	Dimensions In Millimeters		
	Min.	Avg.	Max.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65

Symbol	Dimensions In Millimeters		
	Min.	Avg.	Max.
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e		2.54 BSC	
e1		5.08 BSC	
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ϕP	3.51	3.61	3.65
ϕP1		7.19 REF.	
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

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