ESH120N40R1V

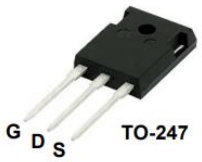
ev™ Automotive Grade Silicon Carbide Power MOSFET

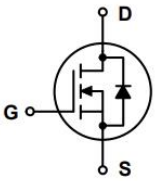
1200V, 60A, 40mΩ

Features

- High switching speed with a low gate charge
- Very fast diode with low reverse recovery
- Robust Avalanche Capability
- 100% Avalanche Tested
- Easy to Parallel and Simple to Drive
- Pb-free, Halogen Free, and RoHS Compliant
- Qualified to AEC-Q101

$BV_{DSS,\ Tc=25℃}$	$I_{D,\ Tc=25℃}$	$R_{DS(on),typ.}$	$Q_{g,typ.}$
1200V	60A	40mΩ	100nC





Benefits

- Higher System Efficiency
- Higher Frequency Applicability
- Increased Power Density
- Reduced Cooling Requirements

Applications

- On-board Charger/PFC
- DC-DC Converter
- Auxiliary Inverter

Ordering Information

Part Number	Package	Shipping	Quantity
ESH120N40R1V	TO-247	Tube	30 units

■ Absolute Maximum Ratings (T_J=25℃, unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1200	V
V_{GS}	Gate to Source Voltage (DC)		-10/+22	
V_{GSop}	Recommended Operation Value		-5/+18	
I_D	Continuous Drain Current	T_C=25℃	60	A
		T_C=100℃	42	
I_{DM}	Pulsed Drain Current (Note1)	T_C=25℃	160	
P_D	Power Dissipation	T_C=25℃	320	W
		T_C=100℃	160	W
T_J , T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃
T_L	Maximum Lead Temperature for Soldering, 1/8” from Case for 10 Seconds		260	℃

Note1: Limited by maximum junction temperature.

■ Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Maximum Thermal Resistance, Junction to Case	0.47	℃/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	40	

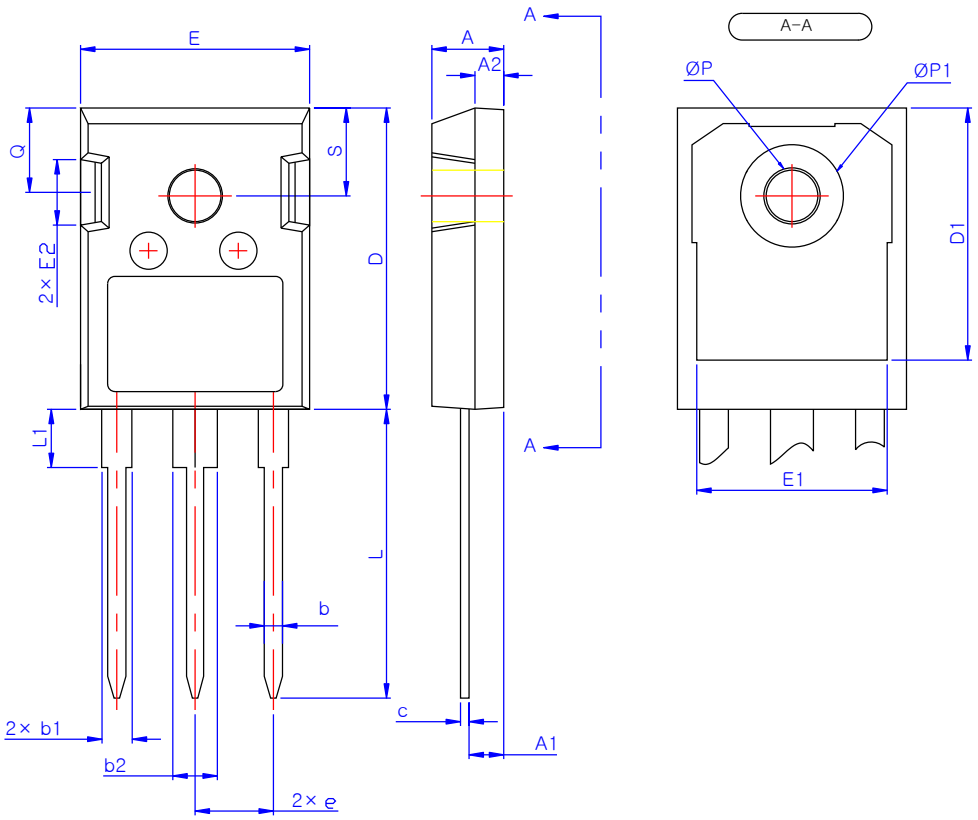
■ Electrical Characteristics (T_C=25℃, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D =1mA	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V		1	100	μA
		V_{DS}=1200V, V_{GS}=0V, T_J=175℃		10		
I_{GSS}	Gate-Source Leakage Current	V_{GS}=+22V, V_{DS}=0V			+100	nA
		V_{GS}=-10V, V_{DS}=0V			-100	
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS}, I_D=10mA	2.0	3.0	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS}=18V, I_D=30A		40	56	mΩ
		V_{GS}=18V, I_D=30A, T_J=175℃		57		
g_{fs}	Transconductance	V_{DS}=20V, I_D=30A		16.1		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=800V, V_{GS}=0V, f=1MHz		2012		pF
C_{oss}	Output Capacitance			123		
C_{rss}	Reverse Capacitance			8		
E_{oss}	Stored Energy in Output Capacitance			49		μJ
$Q_{g(tot)}$	Total Gate Charge	V_{DS}=800V, I_D=30A, V_{GS}=-5V/18V, Inductive load		100		nC
Q_{gs}	Gate to Source Charge			29		
Q_{gd}	Gate to Drain “Miller” Charge			33		
R_G	Internal Gate Resistance	f=1MHz		3.2		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=800V, I_D =30A, V_{GS}=-5V/18V, R_G=2Ω, Inductive load		22		ns
t_r	Turn-On Rise Time			35		
$t_{d(off)}$	Turn-Off Delay Time			34		
t_f	Turn-Off Fall Time			9		
E_{on}	Turn-On Switching Energy			872		μJ
E_{off}	Turn-Off Switching Energy			108		
E_{tot}	Total Switching Energy			980		

■ Reverse Diode Characteristics (T_C=25℃, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Diode Forward Current	V_{GS}=-5V			60	A
I_{SM}	Pulsed Diode Forward Current	V_{GS}=-5V			160	
V_{SD}	Diode Forward Voltage	V_{GS}=-5V, I_{SD}=30A		4.1		V
		V_{GS}=-5V, I_{SD}=30A, T_J=175℃		3.6		
t_{rr}	Reverse Recovery Time	V_{DD}=800V, I_{SD}=30A, V_{GS}=-5V, dI_S/dt=1000A/μs		47		ns
Q_{rr}	Reverse Recovery Charge			226		nC
E_{rec}	Reverse Recovery Energy			15		μJ
I_{rrm}	Peak Reverse Recovery Current			15.5		A

Package Outlines
TO-247



SYMBOL	MIN	MAX
A	4.80	5.20
A1	2.29	2.54
A2	1.90	2.10
b	1.10	1.30
b1	1.91	2.20
b2	2.92	3.20
c	0.50	0.70
D	20.80	21.34
D1	17.43	17.83
E	15.75	16.13
E1	13.06	13.46
E2	4.32	4.83
e	5.45 BSC	
L	19.85	20.25
L1	–	4.49
ØP	3.55	3.65
ØP1	7.08	7.28
Q	5.59	6.19
S	6.15 BSC	

*Dimensions in millimeters

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