

ESI120N40R1L

ev™ 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

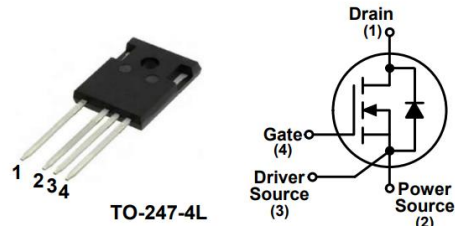
Benefits

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

Applications

- Solar Inverters
- High Voltage DC/DC Converters
- Industrial Power Supply
- EV Charging Station

$BV_{DSS, Tc=25^{\circ}C}$	$I_D, Tc=25^{\circ}C$	$R_{DS(on), typ.}$	$Q_{g, typ.}$
1200V	60A	40mΩ	100nC



Ordering Information

Part Number	Package	Shipping	Quantity
ESI120N40R1L	TO-247-4L	Tube	30 units

Absolute Maximum Ratings ($T_J=25^{\circ}C$, 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	$T_C=25^{\circ}C$	60	A
		$T_C=100^{\circ}C$	42	
I_{DM}	Pulsed Drain Current (Note1)	$T_C=25^{\circ}C$	160	
P_D	Power Dissipation	$T_C=25^{\circ}C$	320	W
		$T_C=100^{\circ}C$	160	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 175	$^{\circ}C$	
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds	260	$^{\circ}C$	

Note1: Limited by maximum junction temperature.

■ Thermal Characteristics

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

■ Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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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
		$V_{DS}=1200V, V_{GS}=0V, T_J=175^\circ\text{C}$		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	m Ω
		$V_{GS}=18V, I_D=30A, T_J=175^\circ\text{C}$		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		μF
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

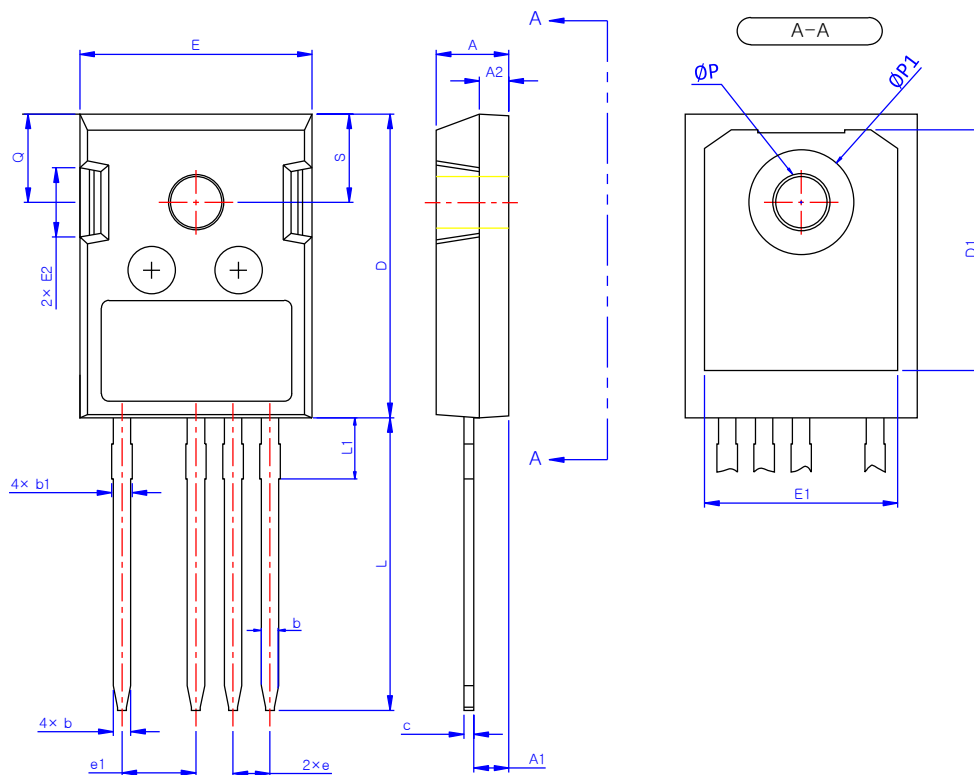
Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=800V, I_D=30A,$ $V_{GS}=-5V/18V, R_G=2\Omega,$ Inductive load		22		ns
t_r	Turn-On Rise Time			16		
$t_{d(off)}$	Turn-Off Delay Time			35		
t_f	Turn-Off Fall Time			8		
E_{on}	Turn-On Switching Energy			448		μJ
E_{off}	Turn-Off Switching Energy			96		
E_{tot}	Total Switching Energy			544		

■ Reverse Diode Characteristics ($T_J=25^\circ\text{C}$, 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
		$V_{GS}=-5V, I_{SD}=30A, T_J=175^\circ\text{C}$		3.6		
t_{rr}	Reverse Recovery Time	$V_{DD}=800V, I_{SD}=30A, V_{GS}=-5V, dI_S/dt=1000A/\mu s$		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-247-4L



SYMBOL	MIN	MAX
A	4.80	5.20
A1	2.29	2.54
A2	1.90	2.10
b	1.10	1.30
b1	1.30	1.50
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	2.54 BSC	
e1	5.08 BSC	
L	19.85	20.25
L1	-	4.49
$\varnothing P$	3.55	3.65
$\varnothing P1$	7.00	7.40
Q	5.59	6.19
S	6.15 BSC	

*Dimensions in millimeters

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