1200V N-Channel Silicon Carbide Power MOSFET

FEATURES

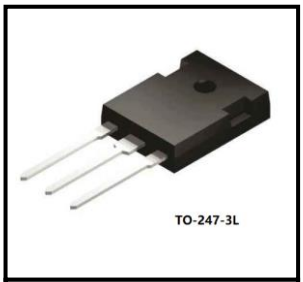
- Low On-Resistance
- Low Capacitance
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

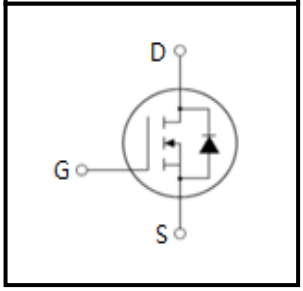
BENEFITS

- Higher System Efficiency
- Parallel Device Convenience
- High Temperature Application
- High Frequency Operation

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Power Factor Correction (PFC)
- Uninterruptible Power Supply (UPS)
- EV Charging station & Motor Drives
- Solar/ Wind Renewable Energy
- Power Inverters & DC/DC Converters





Device Marking and Package Information

Device	Package	Marking
C2M120W040	TO-247-3L	C2M120W040

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value	Unit
Drain-Source Voltage	V_{DSS}	VGS=0V, IDS=100μA	1200	V
Continuous Drain Current	I_D	VGS=20V, Tc=25° C	60	A
Pulsed Drain Current	I_{DM}	t_{PW} limitation per Fig.17	240	
Power Dissipation	P_D	Tc=25° C	338	W
Recommend Gate Source Voltage	$V_{GS, op}$	Static	-5/+20	V
Maximum Gate Source Voltage	$V_{GS, max}$	AC (f > 1Hz)	-10/+25	
Soldering Temperature	T_L		260	ºC
Operating Junction and Storage Temperature Range	T_J, T_{stg}		-55/+150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	0.37	K/W

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 100μA	1200	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1200V,V_{GS} = 0V,T_J = 25ºC	--	<1	50	μA
		V_{DS} = 1200V,V_{GS} = 0V,T_J = 150ºC	--	10	200	
Gate-Source Leakage	I_{GSS}	V_{GS} = 20V,V_{DS} = 0V	--	--	200	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{GD} = 0V,I_D = 5mA	2	--	3.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 20V,I_D = 30A	--	40	--	mΩ
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V V_{DS} = 800V f = 1.0MHz V_{AC}=25mV	--	2446	--	pF
Output Capacitance	C_{oss}		--	135	--	
Reverse Transfer Capacitance	C_{rss}		--	22	--	
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS}=0V V_{DS}=0 to 800V		187		
Effective Output Capacitance, Time Related	$C_{o(tr)}$	I_D=const., V_{GS}=0V V_{DS}=0 to 800V		253		
Total Gate Charge	Q_g	V_{DS}=800V, VGS=0/+20V, I_D=10A	--	174	--	nC
Gate-Source Charge	Q_{gs}		--	24	--	
Gate-Drain Charge	Q_{gd}		--	65.5	--	
Gate plateau voltage	V_{pl}		--	7.8	--	V
Turn-on Delay Time	$t_{d(on)}$	V_{DS}=800V V_{GS}=0/20V I_D=10A $R_{G(ext)}$= 2.5Ω	--	43	--	ns
Turn-on Rise Time	t_r		--	24	--	
Turn-off Delay Time	$t_{d(off)}$		--	81.5	--	
Turn-off Fall Time	t_f		--	37.5	--	
Coss Stored Energy	Eoss	V_{GS}=0V, V_{DS}=1200V f =1MHz, V_{AC}=25mV	--	119	--	μJ
Turn-on Switching Energy	Eon	V_{DS}=1200V, V_{GS}=0/20V, I_D=10A, $R_{G(ext)}$= 2.5Ω	--	194*	--	
Turn-off Switching Energy	Eoff		--	326*	--	
Internal Gate Resistance	$R_{G(int.)}$	f =1MHz, V_{AC}=25mV	--	0.7	--	Ω

*Base on the results of calculation, note that the energy loss caused by the reverse recovery of FWD is not included in E on .

Built-in SiC Diode Characteristics						
Continuous Diode Forward Current	I_S	V_{GS} = 0V	--	60	--	A
Inverse Diode Forward Voltage	V_{SD}	I_{SD} = 18A, V_{GS} = -5V	--	--	6	V
Reverse Recovery Time	t_{rr}	I_F = 10A, V_{DS}=25V, di_F/dt =100A /μs	--	40	--	ns
Reverse Recovery Charge	Q_{rr}		--	48.5	--	nC
Peak Reverse Recovery Current	IRM		--	2	--	A

Typical Device Performance

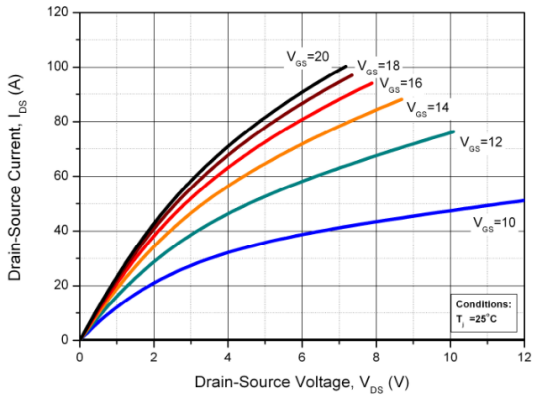


Fig. 1 Forward Output Characteristics at T_j = 25°C

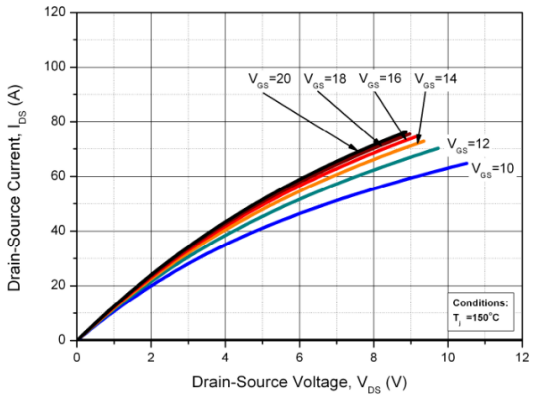


Fig. 2 Forward Output Characteristics at T_j = 150°C

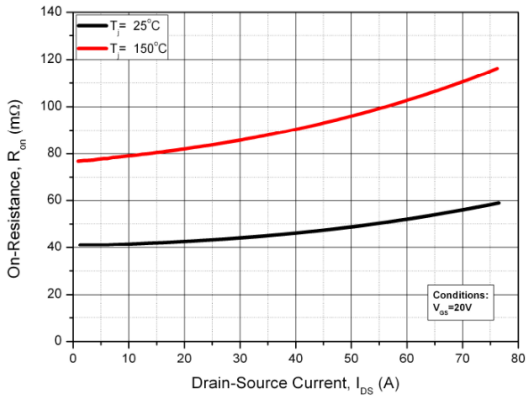


Fig. 3 On-Resistance vs. Drain Current for Various T_j

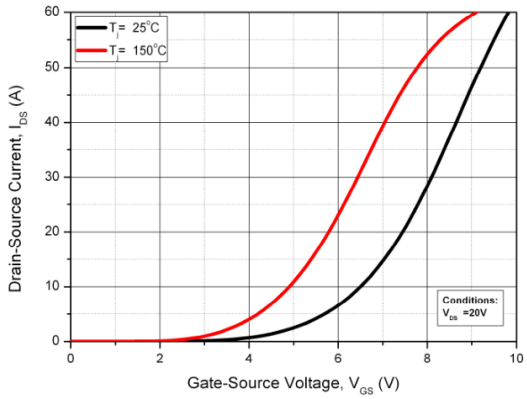


Fig. 4 Transfer Characteristics for Various T_j

Typical Device Performance

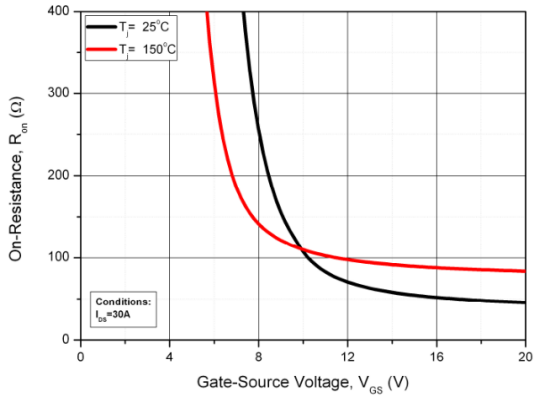


Fig. 5 On-Resistance vs. Gate Voltage for Various T_j

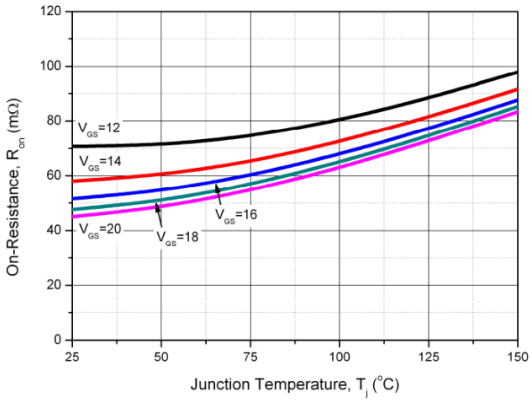


Fig. 6 On-Resistance vs. Temperature for Various Gate Voltage

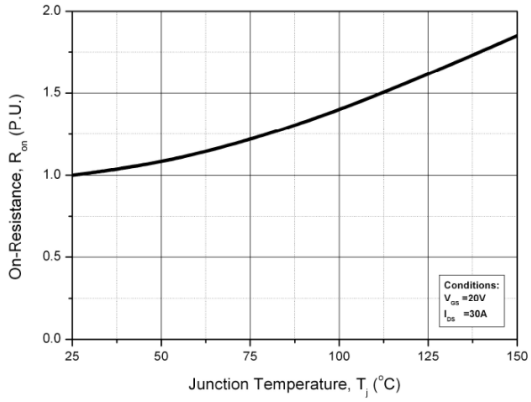


Fig. 7 Normalized On-Resistance vs. Temperature

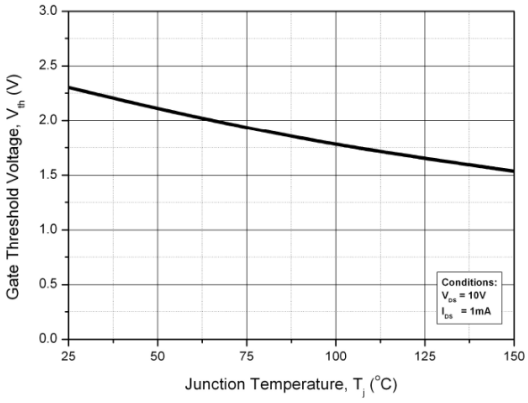


Fig. 8 Threshold Voltage vs. Temperature

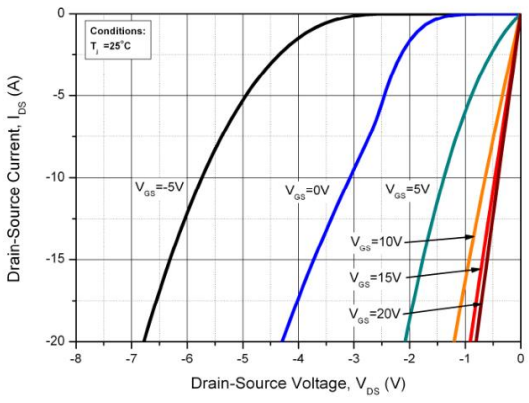


Fig. 9 Reverse Output Characteristics at T_j = 25°C

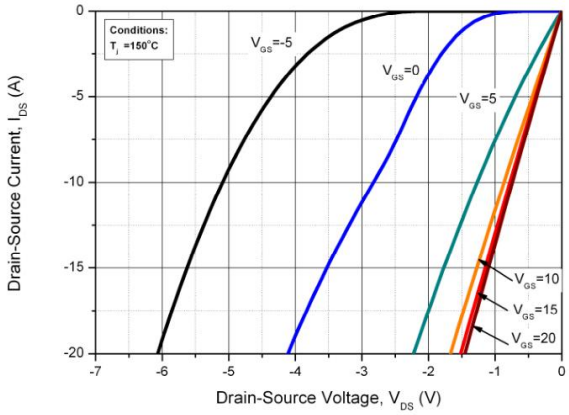


Fig. 10 Reverse Output Characteristics at T_j = 150°C

Typical Device Performance

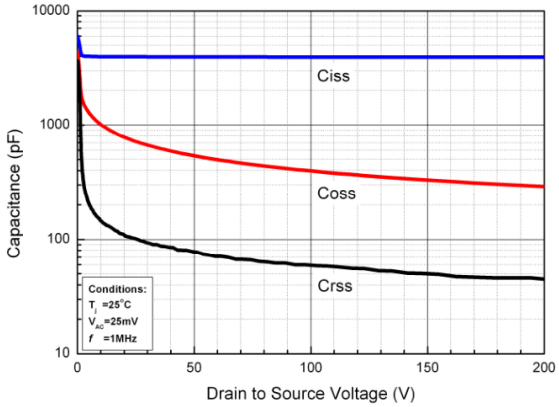


Fig. 11 Capacitances vs. Drain to Source Voltage (0 - 200V)

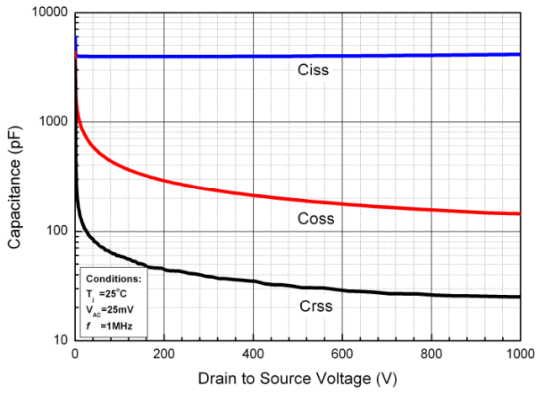


Fig. 12 Capacitances vs. Drain to Source Voltage (0 - 1000V)

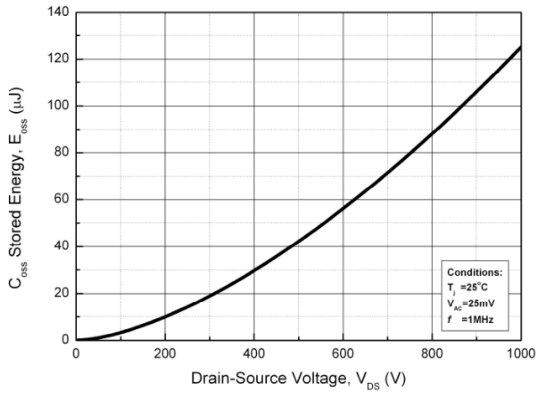


Fig. 13 Output Capacitor Stored Energy

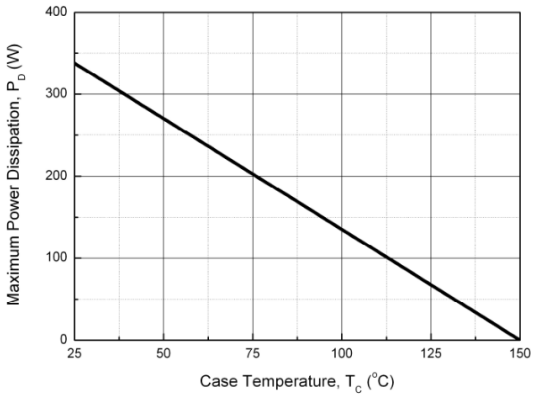


Fig. 14 Maximum Power Dissipation Derating vs. Case Temperature

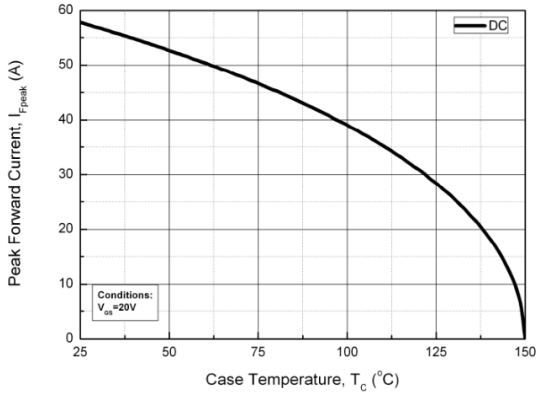


Fig. 15 Drain Current Derating vs. Case Temperature

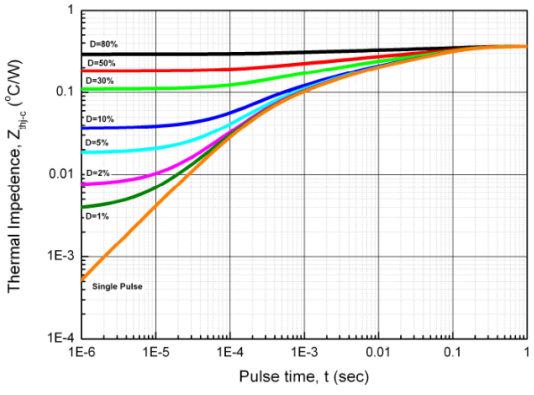


Fig. 16 Transient Junction to Case Thermal Impedance

Typical Device Performance

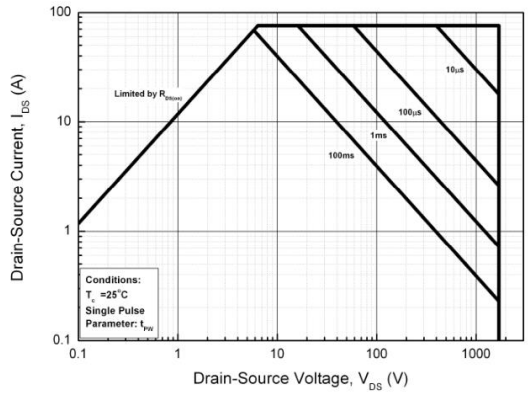


Fig. 17 Safe Operating Area

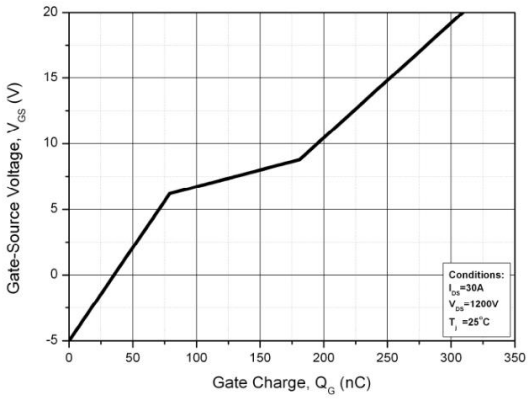


Fig. 18 Gate Charge Characteristics

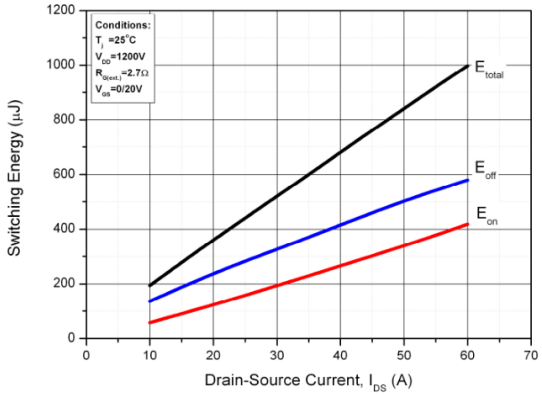


Fig. 19 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=1200V)*

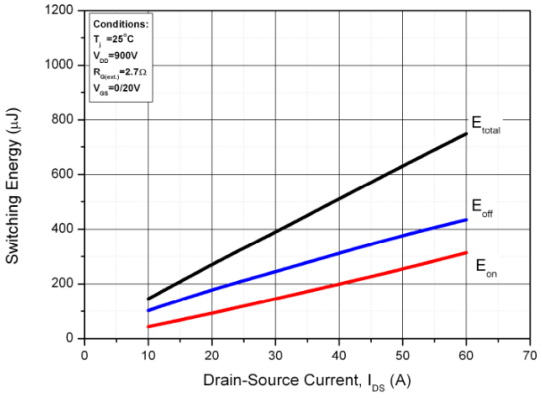


Fig. 20 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=900V)*

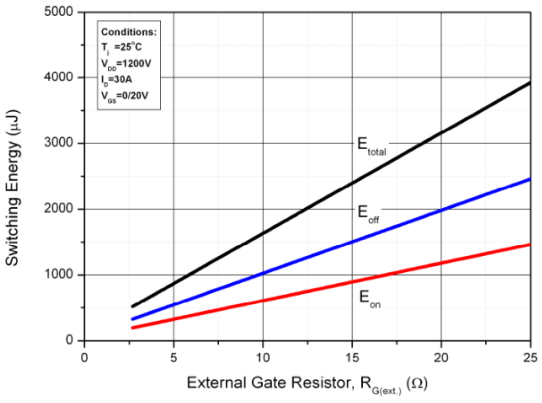


Fig. 21 Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)*

*Base on the results of calculation, note that the energy loss caused by the reverse recovery of FWD is not included in E on .

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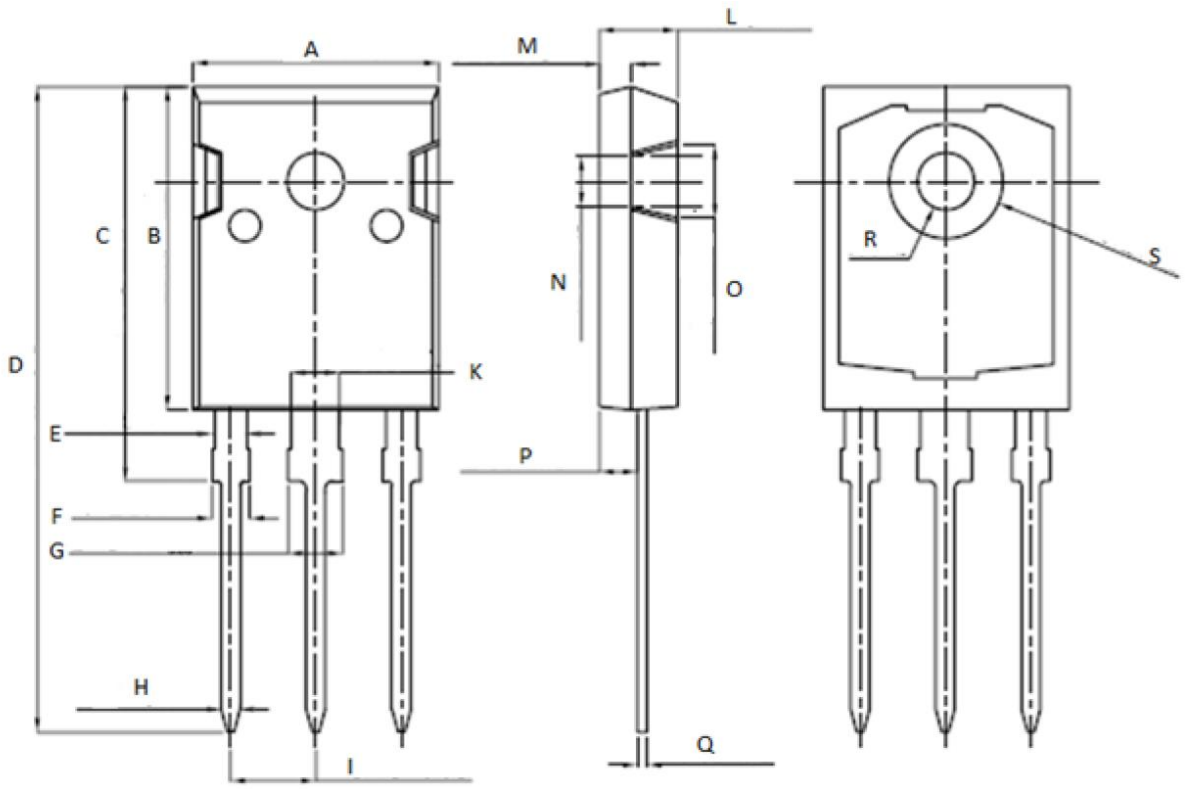

Unit: mm		
Symbol	Min.	Max.
A	15.95	16.25
B	20.85	21.25
C	20.95	21.35
D	40.5	40.9
E	1.9	2.1
F	2.1	2.25
G	3.1	3.25
H	1.1	1.3
I	5.40	5.50

Unit: mm		
Symbol	Min.	Max.
K	2.90	3.10
L	4.90	5.30
M	1.90	2.10
N	4.50	4.70
O	5.40	5.60
P	2.29	2.49
Q	0.51	0.71
R	ϕ3.5	ϕ3.7
S	ϕ7.1	ϕ7.3

*The information provided herein is subject to change without notice.

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