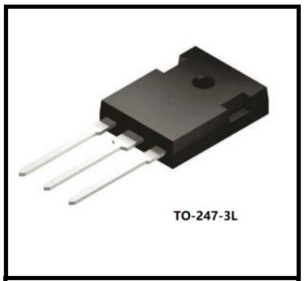
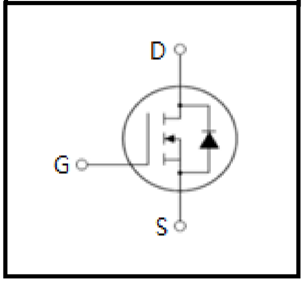
1200V N-Channel Silicon Carbide Power MOSFET





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
C2M120W280	TO-247-3L	C2M120W280

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, T_C=25°C	10	A
		VGS=20V, T_C=110°C	8	
Pulsed Drain Current	I_{DM}	t_{PW} limitation per Fig.17	23	
Single Pulse Avalanche Energy	E_{AS}	VDD=100V, ID=5A	310	mJ
Power Dissipation	P_D	T_C=25℃	80	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}	1.55	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	--	1	200	
Gate-Source Leakage	I_{GSS}	V_{GS} = 20V， V_{DS} = 0V	--	--	250	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = 10V, I_D = 2.5mA	--	2.6	--	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 20V, I_D = 5A	--	280	360	mΩ
		VGS = 20V, I_D= 5A, TJ = 150ºC	--	420	--	
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V V_{DS} = 800V f = 1.0MHz VAC=25mV	--	494	--	pF
Output Capacitance	C_{oss}		--	34	--	
Reverse Transfer Capacitance	C_{rss}		--	8	--	
Effective Output Capacitance, Energy Related	Co(er)	VGS=0V V_{DS}=0 to 800V	--	43	--	
Effective Output Capacitance, Time Related	Co(tr)	I_D=const., VGS=0V V_{DS}=0 to 800V	--	56	--	
Total Gate Charge	Q_g	V_{DS}=800V, VGS=-5/+20V, I_D=5A	--	47	--	nC
Gate-Source Charge	Q_{gs}		--	10	--	
Gate-Drain Charge	Q_{gd}		--	25	--	
Gate plateau voltage	Vpl		--	8.5	--	V
Turn-on Delay Time	$t_{d(on)}$	V_{DS}=800V V_{GS}=-4/20V I_D=4.8A RL=167Ω RG(ext)= 2.7Ω	--	24	--	ns
Turn-on Rise Time	t_r		--	22	--	
Turn-off Delay Time	$t_{d(off)}$		--	30	--	
Turn-off Fall Time	t_f		--	29	--	
Coss Stored Energy	Eoss	V_{GS}=0V, V_{DS}=800V f =1MHz, VAC=25mV	--	18*	--	μJ
Turn-on Switching Energy	Eon	V_{DS}=800V,V_{GS}=0/20V I_D=5A,RG(ext)= 2.7Ω	--	17*	--	
Turn-off Switching Energy	Eoff		--	23*	--	
Internal Gate Resistance	RG(int.)	f =1MHz, VAC=25mV	--	3.7	--	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} = -5V	--	11	--	A
Inverse Diode Forward Voltage	V_{SD}	I_S = 1.25A, V_{GS} = -5V	--	4.4	--	V
Reverse Recovery Time	t_{rr}	V_{GS} = 0V, I_F = 5A, V_{DS}=400V, di_F/dt =300A /μs	--	47	--	ns
Reverse Recovery Charge	Q_{rr}		--	36	--	nC
Peak Reverse Recovery Current	Irrm		--	1.5	--	A

Typical Device Performance

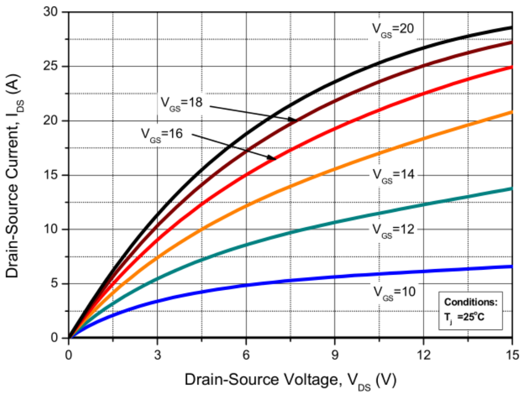


Fig. 1 Forward Output Characteristics at T_j = 25°C

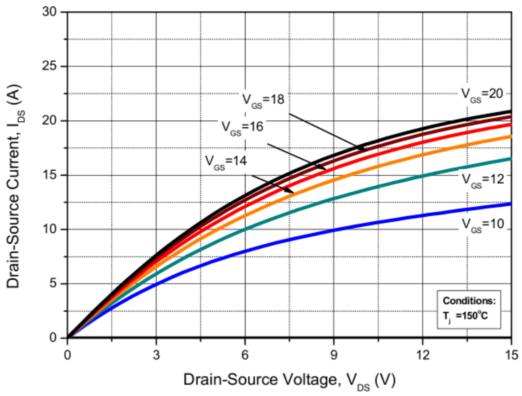


Fig. 2 Forward Output Characteristics at T_j = 150°C

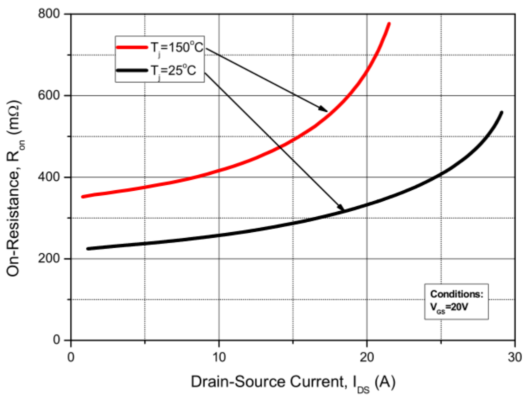


Fig. 3 On-Resistance vs. Drain Current for Various T_j

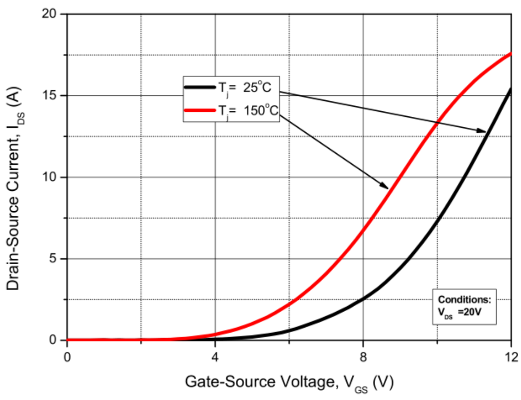


Fig. 4 Transfer Characteristics for Various T_j

Typical Device Performance

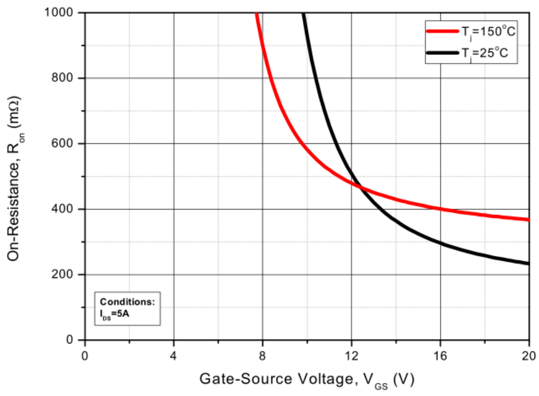


Fig. 5 On-Resistance vs. Gate Voltage for Various Tj

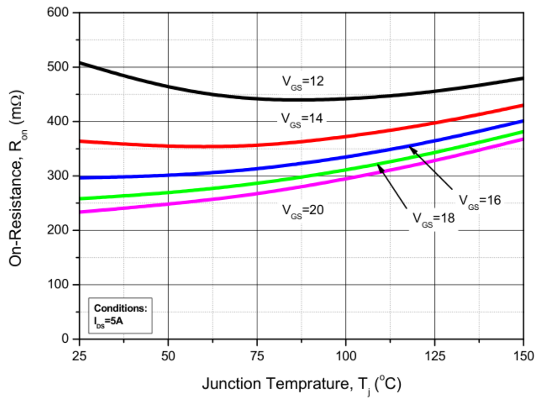


Fig. 6 On-Resistance vs. Temperature for Various Gate Voltage

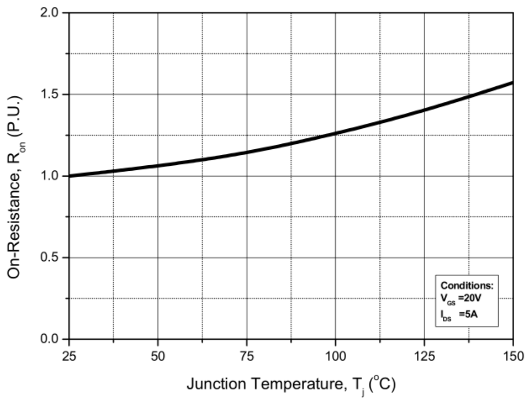


Fig. 7 Normalized On-Resistance vs. Temperature

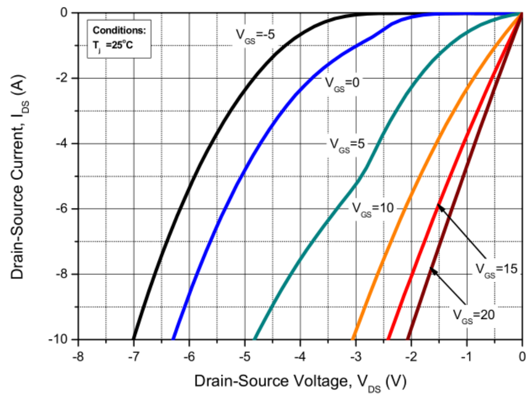


Fig. 8 Reverse Output Characteristics at Tj = 25°C

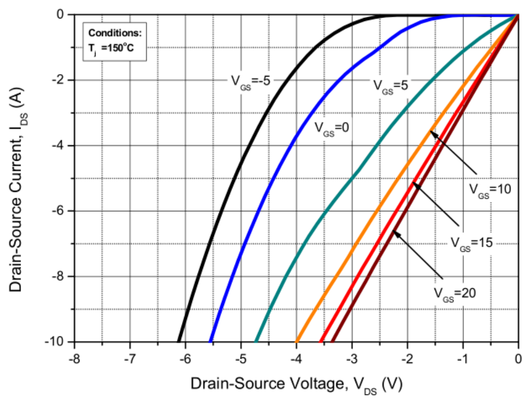


Fig. 9 Reverse Output Characteristics at Tj = 150°C

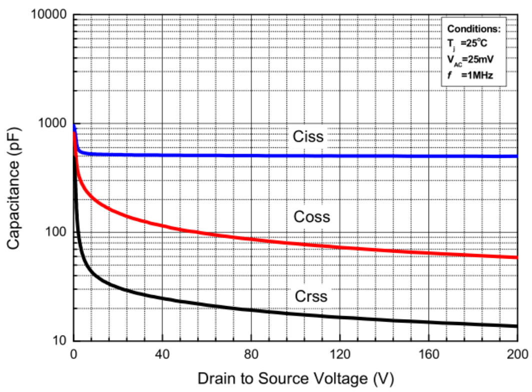


Fig. 10 Capacitances vs. Drain to Source Voltage (0 - 200V)

Typical Device Performance

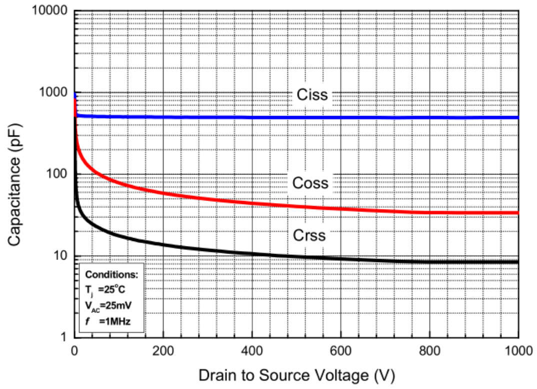


Fig. 11 Capacitances vs. Drain to Source Voltage (0 - 1000V)

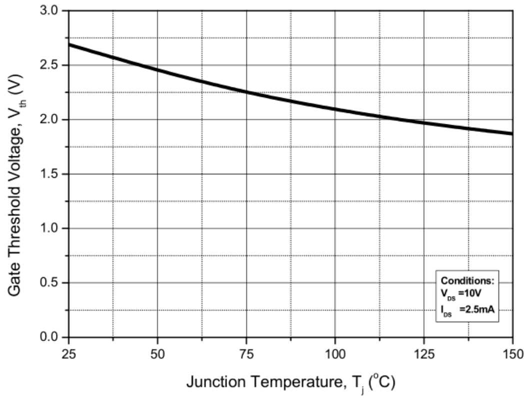


Fig. 12 Threshold Voltage vs. Temperature

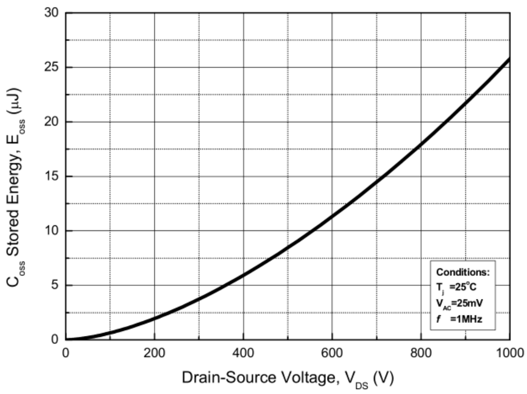


Fig. 13 Output Capacitor Stored Energy*

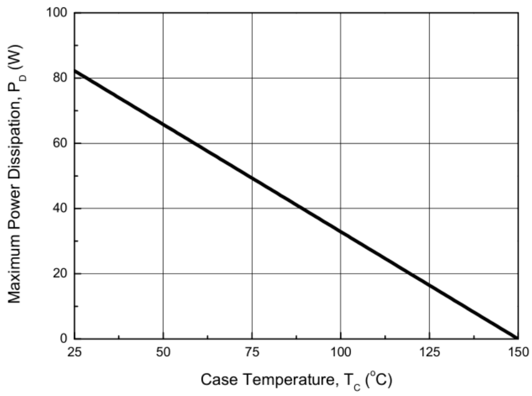


Fig. 14 Maximum Power Dissipation Derating vs. Case Temperature

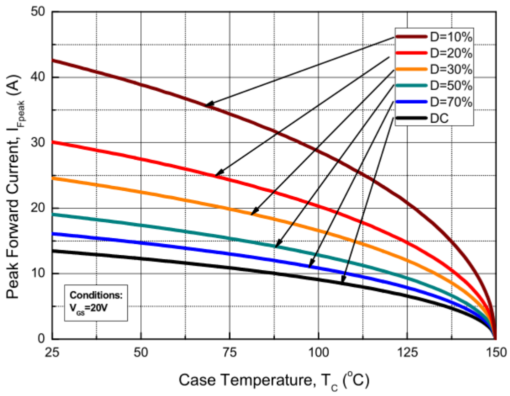


Fig. 15 Drain Current Derating vs. Case Temperature

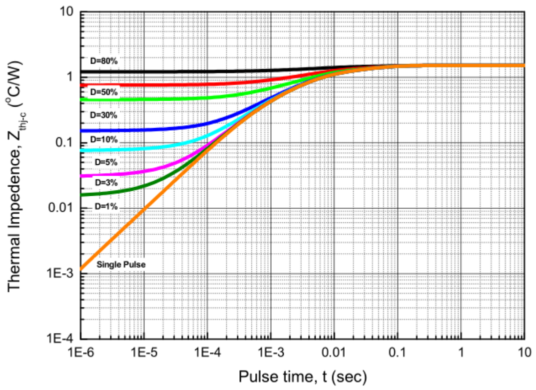


Fig. 16 Transient Junction to Case Thermal Impedance

Typical Device Performance

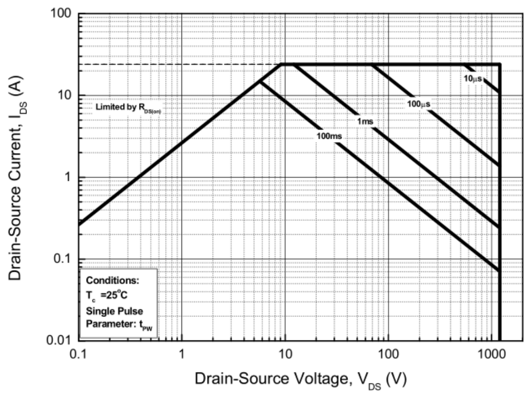


Fig. 17 Safe Operating Area

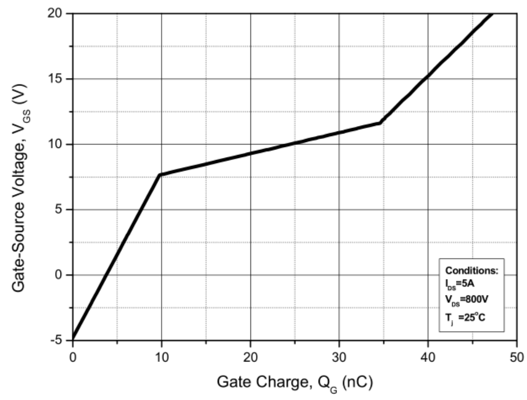


Fig. 18 Gate Charge Characteristics

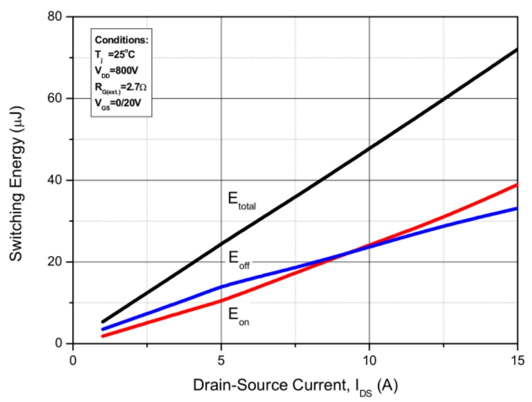


Fig. 19 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=800V)*

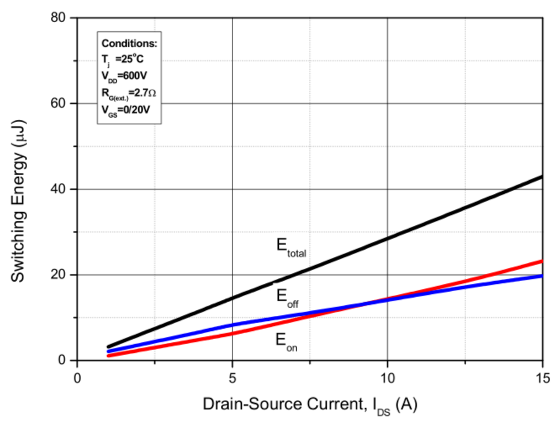


Fig. 20 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=600V)*

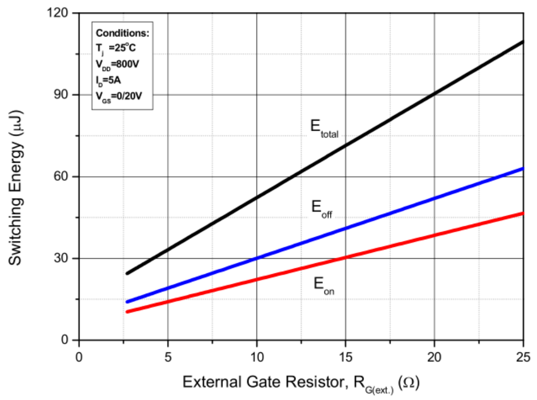
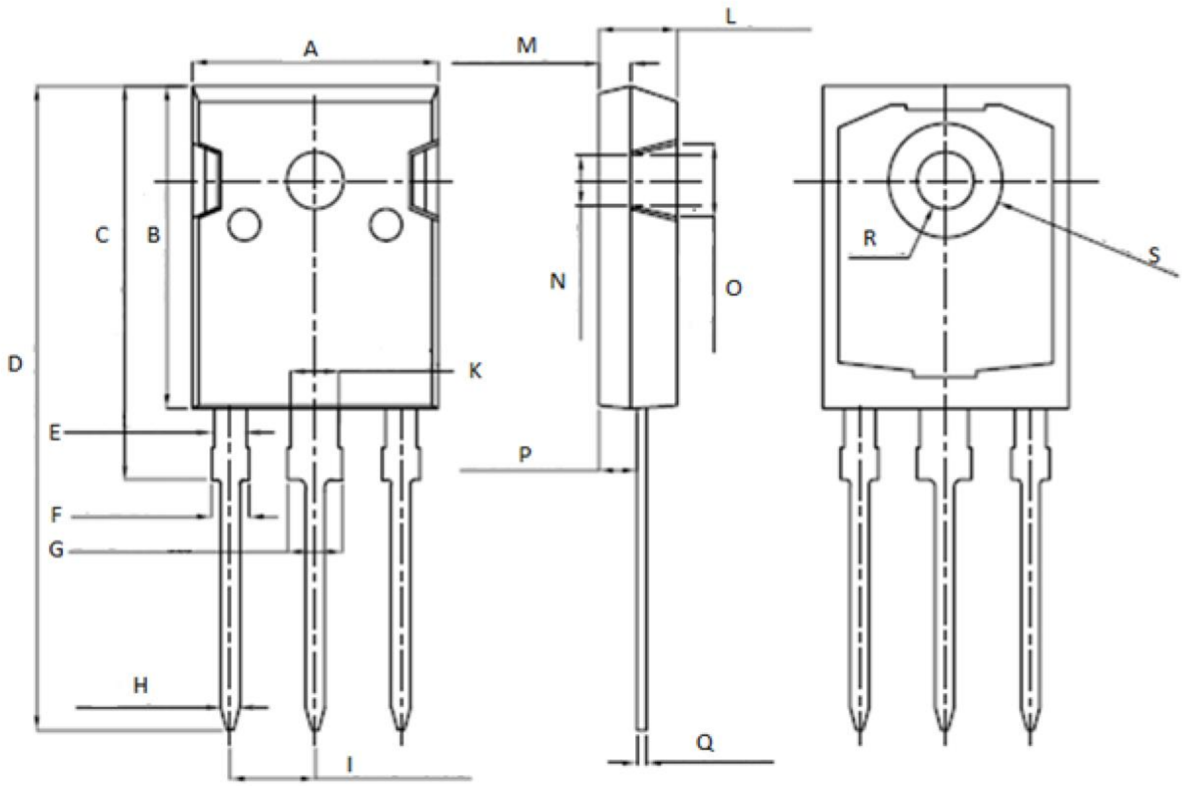


Fig. 21 Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)*

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

TO-247



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.

Disclaimer

All product specifications and data are subject to change without notice.

For documents and material available from this datasheet, Suzhou Convert does not warrant or assume any legal liability or responsibility for the accuracy, completeness of any product or technology disclosed hereunder.

No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document or by any conduct of Suzhou Convert.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless. Customers using or selling Suzhou Convert products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Suzhou Convert for any damages arising or resulting from such use or sale.

Suzhou Convert disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Suzhou Convert's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

Suzhou Convert SemiConductor CO., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all Suzhou Convert products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. Suzhou Convert believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.