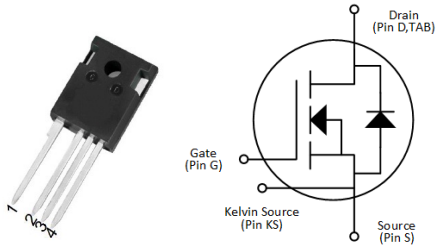
1200V G1 Silicon Carbide Power MOSFET
N-Channel Enhancement Mode

V_{DS}	=	1200V
$R_{DS(ON)}$	=	13mΩ
$I_{D(MAX)@25^{\circ}C}$	=	174A

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitances
- Very low switching losses
- Temperature independent turn-off switching losses
- Halogen free, RoHS compliant
- Optimized package with separate kelvin source pin
- Integrated lumped gate resistance



Benefits

- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Main inverters(electric traction)
- High voltage DC/DC converters
- EV battery chargers
- PV inverters

Part number	Package Type
CC3M013120K	TO-247-4L

Maximum Ratings (T_C=25˚C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain - Source Voltage	1200	V	V_{GS} = 0V, I_D = 100μA
V_{GSmax}	Gate - Source Voltage	-8 /+22	V	Absolute maximum values
V_{GSop}	Gate - Source Voltage	-4 /+18	V	Recommended operational values
I_D	Continuous Drain Current	174	A	V_{GS} = 18V, T_C = 25˚C
		123		V_{GS} = 18V, T_C = 100˚C
$I_{D(pluse)}$	Pulsed Drain Current	368	A	Pulse width t_P limited by $T_{j,max}$
P_D	Power Dissipation	731	W	T_C = 25˚C, T_J = 175˚C
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	˚C	/
T_L	Soldering Temperature	260	˚C	1.6mm (0.063”) from case for 10s
M	Mounting Torque	1 8.8	Nm lbf-in	M3 or 6-32 screw

Electrical Characteristics (T_C = 25˚C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	-	-	V	V_{GS} = 0V, I_D = 100μA
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.7	4.0	V	V_{DS} = V_{GS}, I_D = 28mA
		-	1.8	-		V_{DS} = V_{GS}, I_D = 28mA T_J = 175˚C
I_{DSS}	Zero Gate Voltage Drain Current	-	1	50	μA	V_{DS} = 1200V, V_{GS} = 0V
I_{GSS}	Gate-Source Leakage Current	-	-	250	nA	V_{GS} = 18V, V_{DS} = 0V
$R_{DS(on)}$	Drain-Source On-State Resistance	-	13	18	mΩ	V_{GS} = 18V, I_D = 100A
		-	23	-		V_{GS} = 18V, I_D = 100A T_J = 175˚C
g_{fs}	Transconductance	-	48	-	S	V_{DS} = 10V, I_D = 100A
		-	46	-		V_{DS} = 10V, I_D = 100A T_J = 175˚C
C_{ISS}	Input Capacitance	-	5500	-	pF	V_{DS} = 1000V, V_{GS} = 0V T_J = 25˚C, V_{AC} = 25mV f = 100KHz
C_{OSS}	Output Capacitance	-	250	-		
C_{RSS}	Reverse Transfer Capacitance	-	17	-		
E_{OSS}	Coss Stored Energy	-	289	-	μJ	
E_{ON}	Turn-On Switching Energy	-	2183	-	μJ	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 100A, R_G = 6.2Ω L = 120μH
E_{OFF}	Turn-Off Switching Energy	-	1870	-		
$t_{d(on)}$	Turn-On Delay Time	-	42	-	ns	
t_r	Rise Time	-	58	-		
$t_{d(off)}$	Turn-Off Delay Time	-	96	-		
t_f	Fall Time	-	28	-		
$R_{G(int)}$	Internal Gate Resistance	-	6.1	-	Ω	V_{AC} = 25mV, f = 1MHz
Q_{GS}	Gate to Source Charge	-	54	-	nC	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 100A
Q_{GD}	Gate to Drain Charge	-	31	-		
Q_G	Total Gate Charge	-	210	-		

Reverse Diode Characteristics (T_C = 25˚C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	4.0	-	V	V_{GS} = -4V, I_{SD} = 50A
		3.6	-		V_{GS} = -4V, I_{SD} = 50A T_J = 175˚C
I_{SD}	Continuous Diode Forward Current	152	-	A	V_{GS} = -4V, T_C = 25˚C
t_{RR}	Reverse Recover Time	59	-	ns	V_R = 800V, V_{GS} = -4V I_D = 100A di/dt = 3000A/μs T_J = 175˚C
Q_{RR}	Reverse Recovery Charge	1351	-	nC	
I_{RRM}	Peak Reverse Recovery Current	59	-	A	

Note1: When using SiC Body Diode the maximum recommended V_{GS} = -4V.

Thermal/Package Characteristics

Symbol	Parameter	Typ.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.205	˚C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	30	˚C/W

Typical Performance

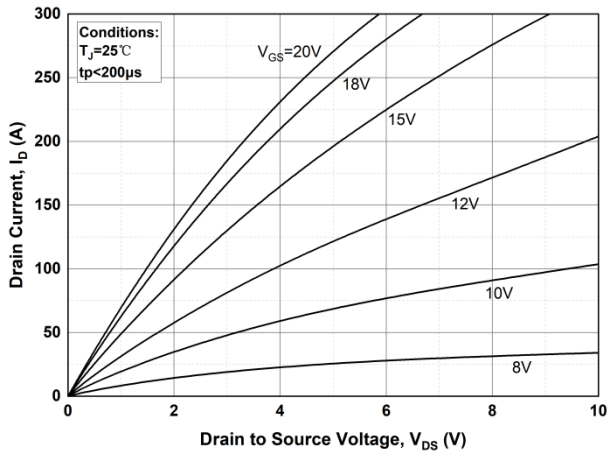


Figure 1. Output Characteristics T_J=25℃

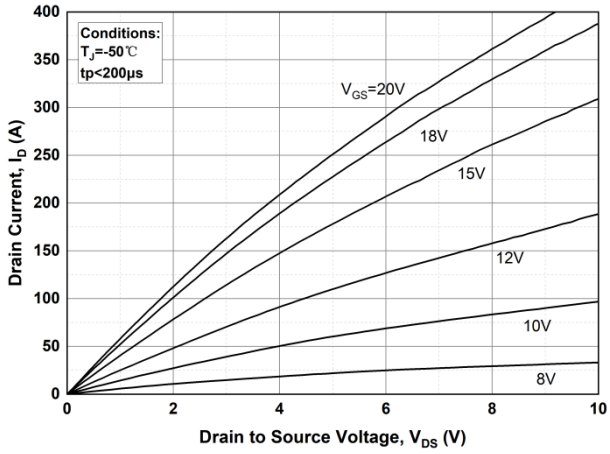


Figure 2. Output Characteristics T_J=-50℃

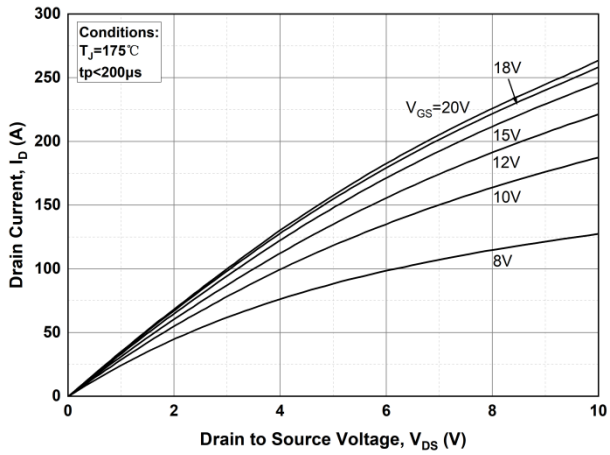


Figure 3. Output Characteristics T_J=175℃

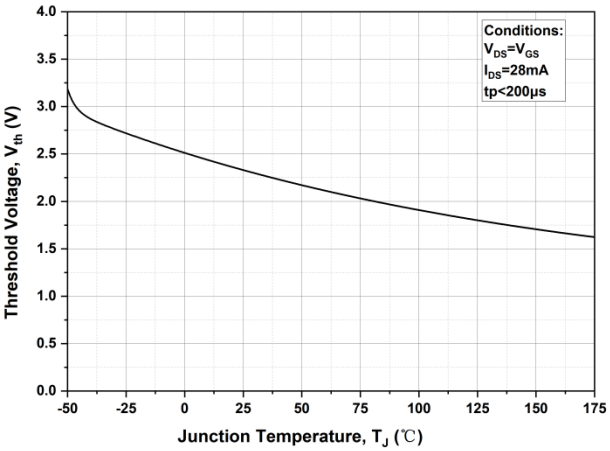


Figure 4. Threshold Voltage vs. Temperature

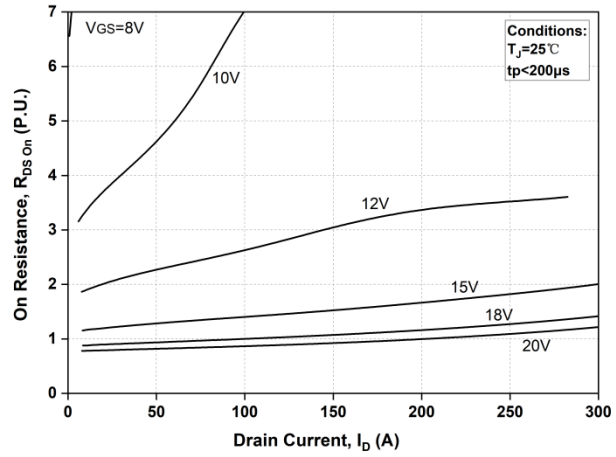


Figure 5. Normalized On Resistance vs. Drain Current and Gate to Source Voltage

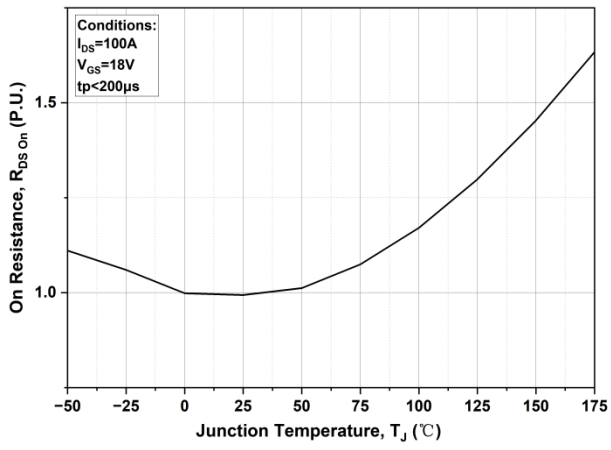


Figure 6. Normalized On Resistance vs. Temperature

Typical Performance

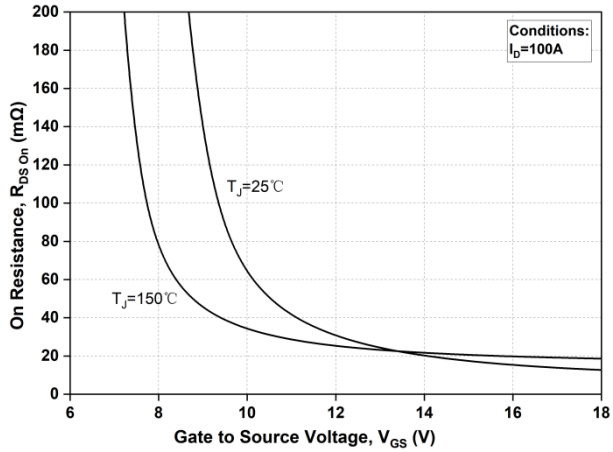


Figure 7. On Resistance vs. Gate to Source Voltage

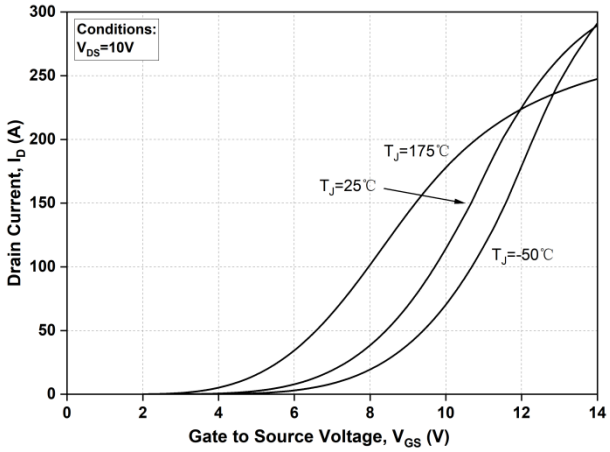


Figure 8. Transfer Characteristics

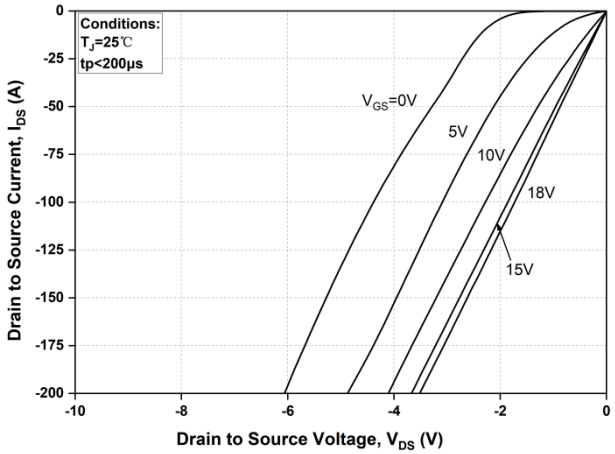


Figure 9. 3rd Quadrant Characteristic at T_J=25℃

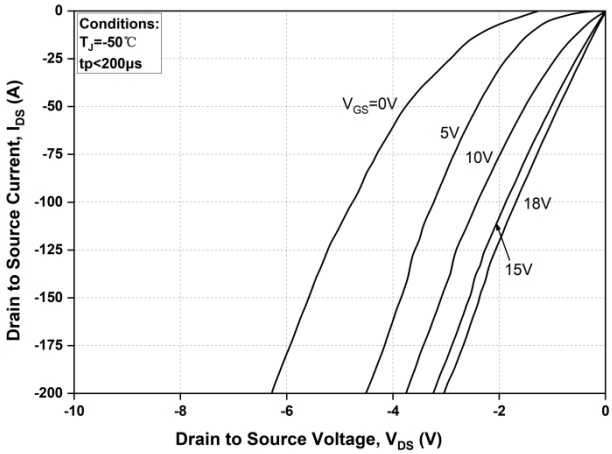


Figure 10. 3rd Quadrant Characteristic at T_J=-50℃

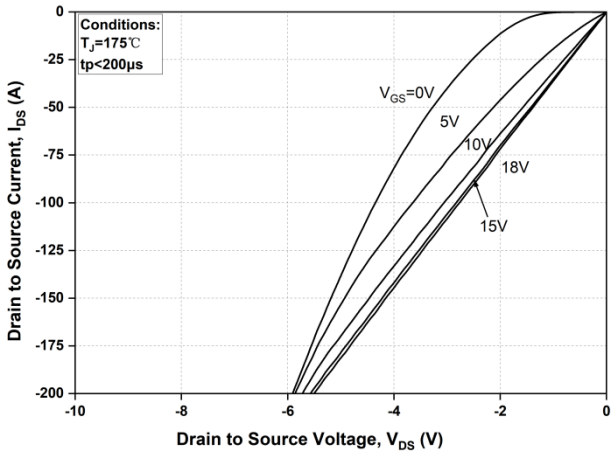


Figure 11. 3rd Quadrant Characteristic at T_J=175℃

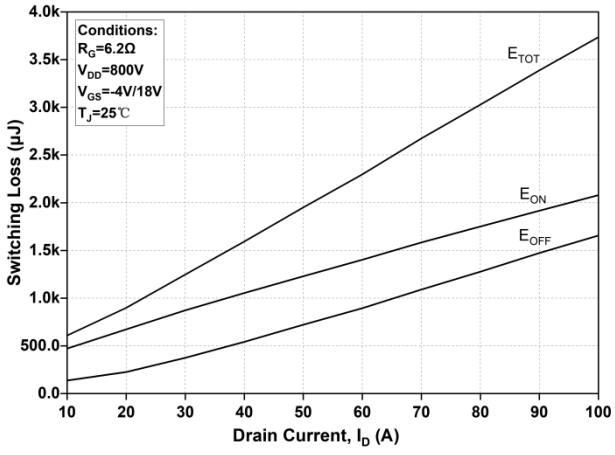


Figure 12. Switching Loss vs. Drain Current

Typical Performance

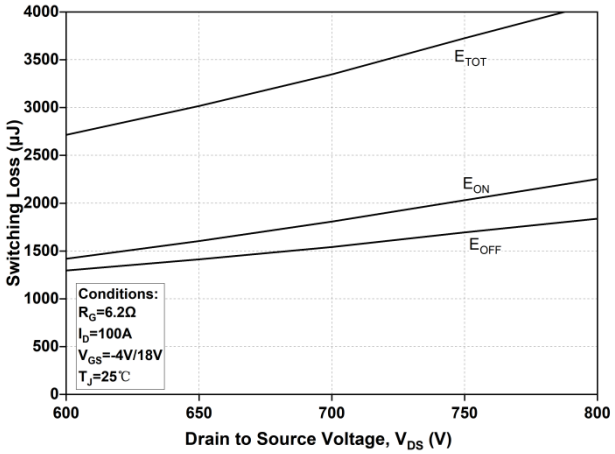


Figure 13. Switching Loss vs. Drain to Source Voltage

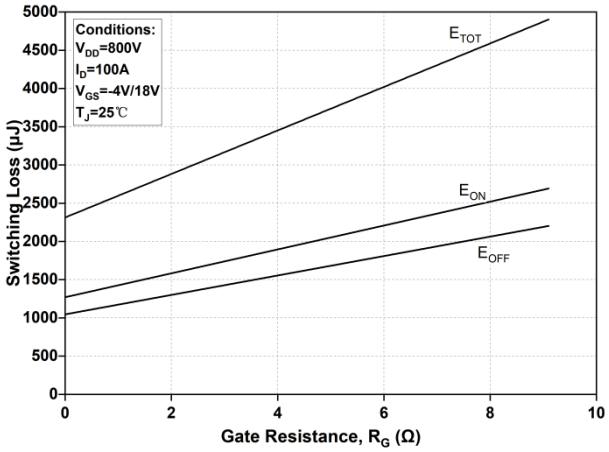


Figure 14. Switching Loss vs. Gate Resistance

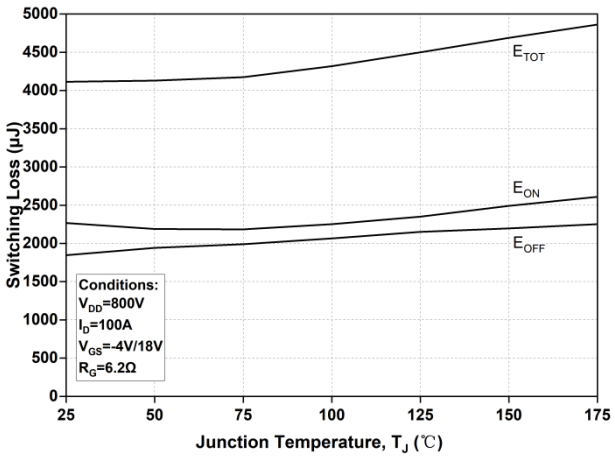


Figure 15. Switching Loss vs. Temperature

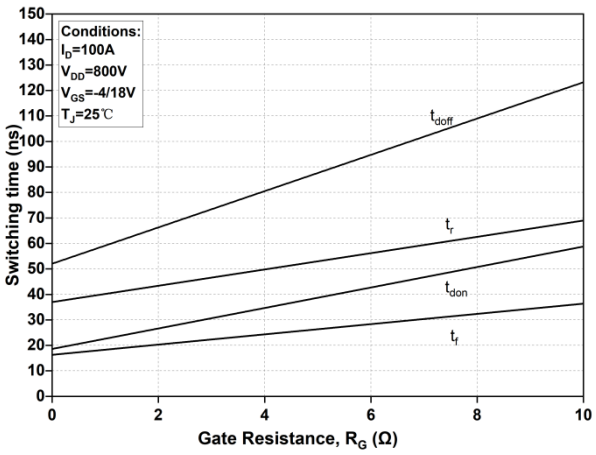


Figure 16. Switching Time vs. Gate Resistance

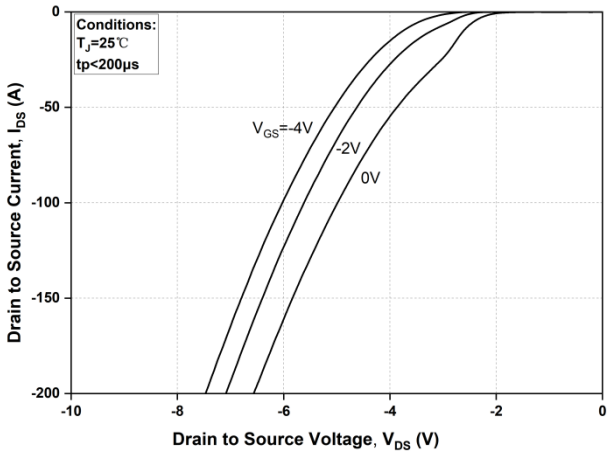


Figure 17. Body Diode Characteristics T_J=25℃

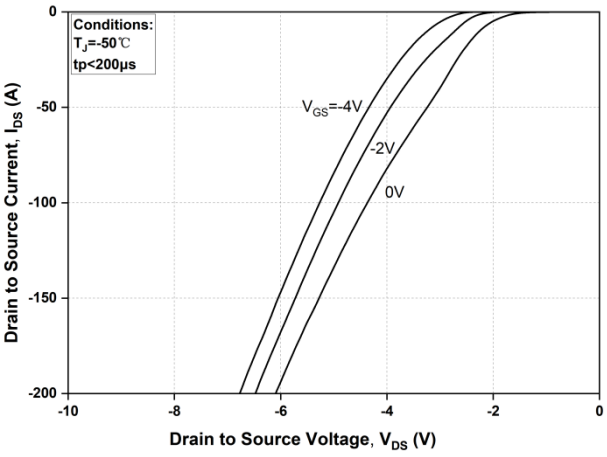


Figure 18. Body Diode Characteristics T_J=-50℃

Typical Performance

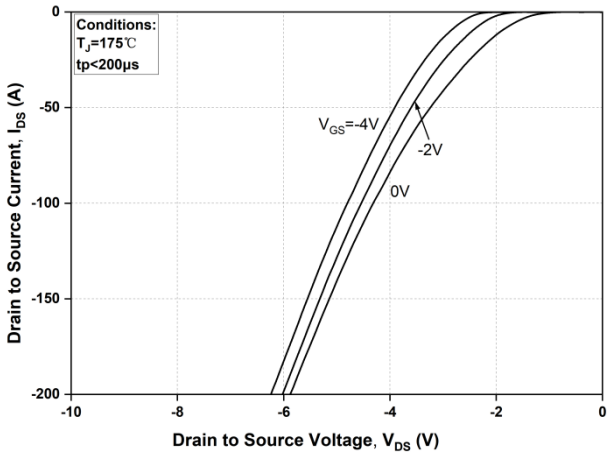


Figure 19. Body Diode Characteristics T_J=175℃

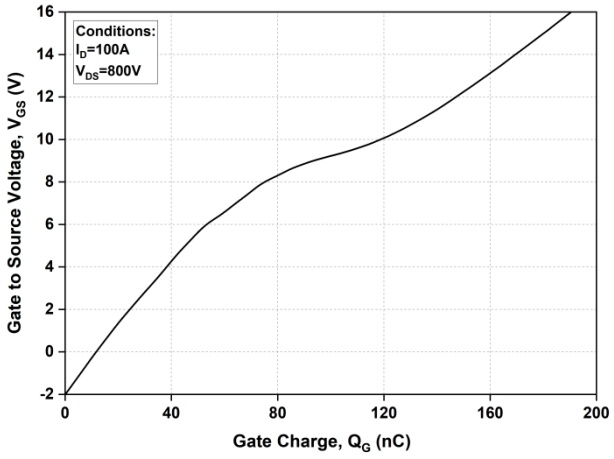


Figure 20. Gate to Source Voltage vs. Total Charge

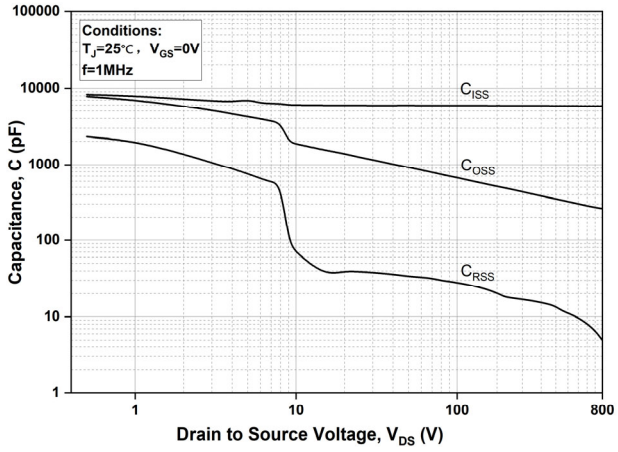


Figure 21. Capacitance vs. Drain to Source Voltage

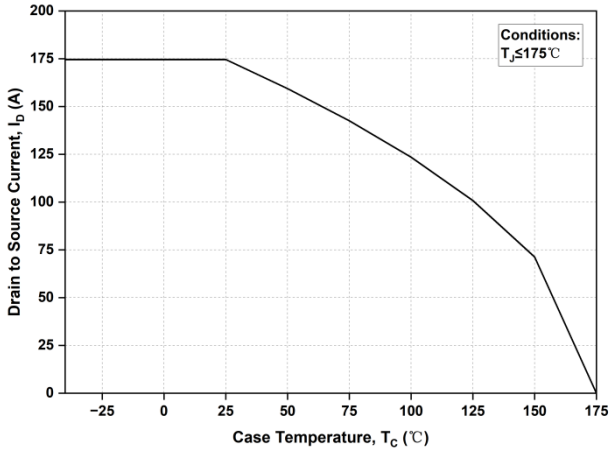


Figure 22. Continuous Drain Current Derating vs. Case Temperature

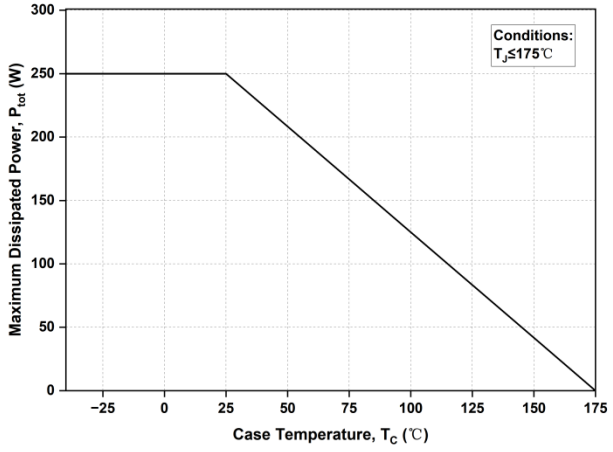


Figure 23. Maximum Power Dissipation Derating vs. Case Temperature

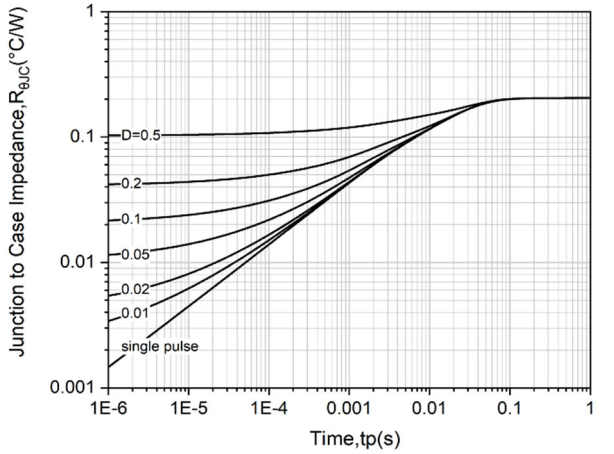


Figure 24. Transient Thermal Impedance (Junction to Case)

Typical Performance

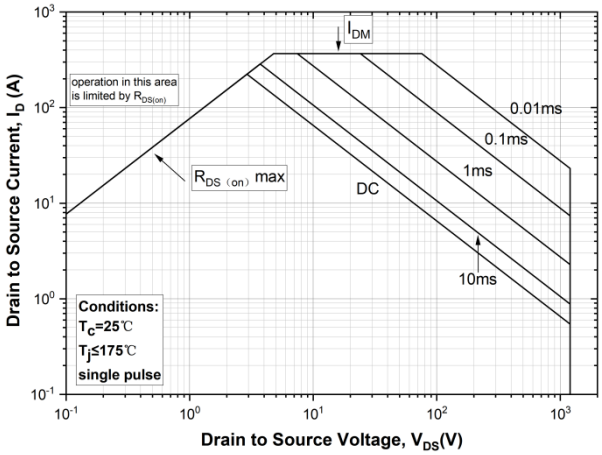


Figure 25. Safe Operating Area

Test conditions

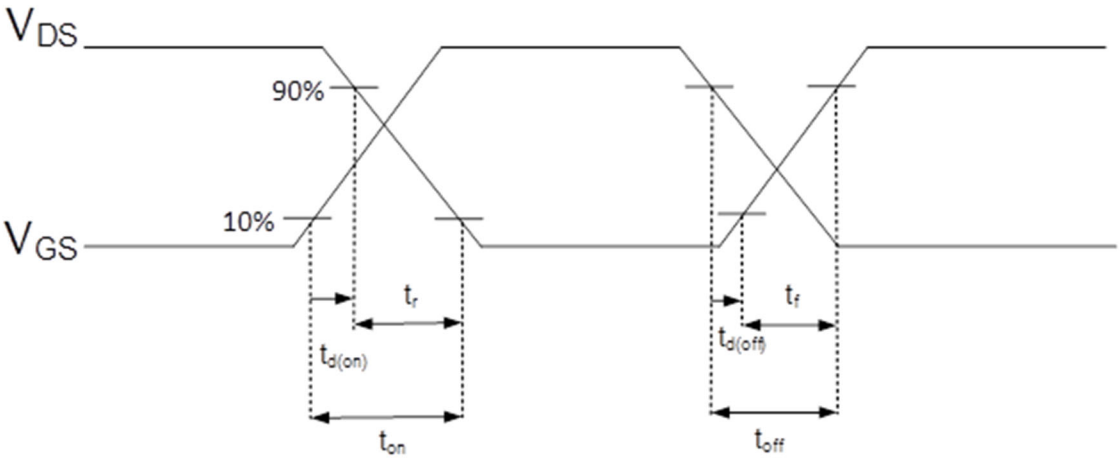


Figure 26. Definition of Switching Times

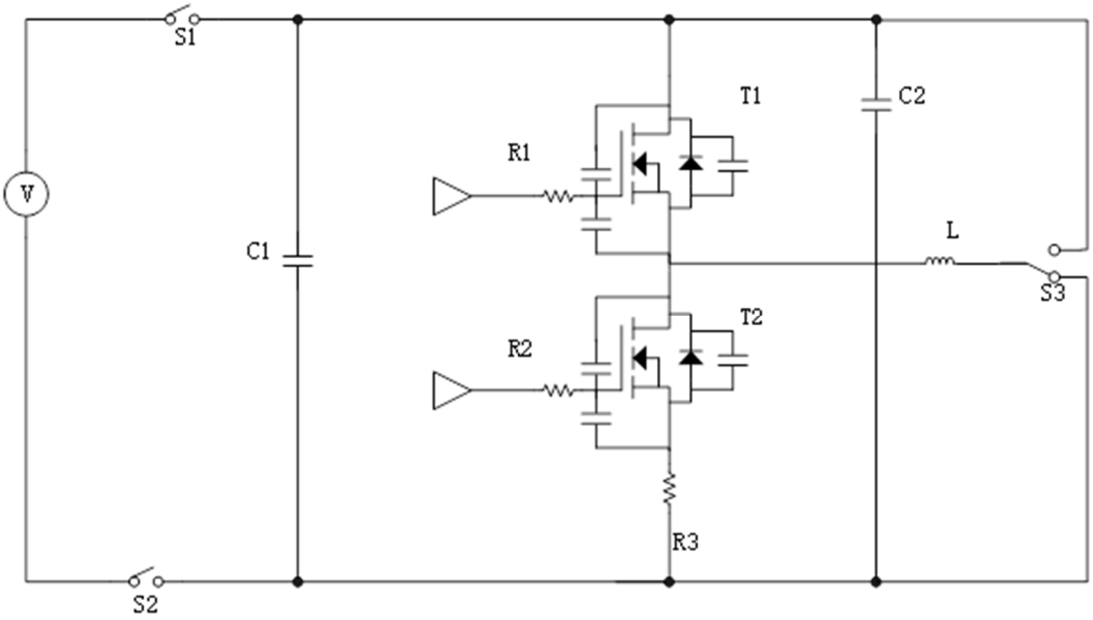
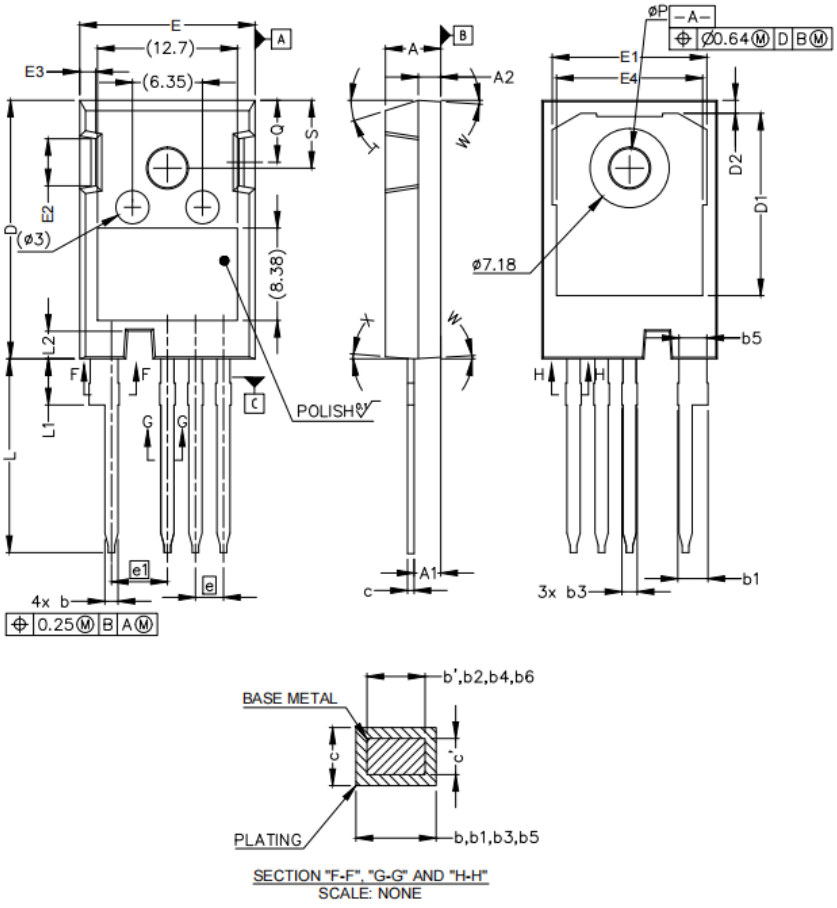


Figure 27. Dynamic Test Circuit

Package Dimensions

TO-247-4L Package Outline



SYMBOL	MILLMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b`	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	1.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c`	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54BSC	
e1	5.08BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5°REF.	
W	3.5°REF.	
X	4°REF.	

Revision History

Document Version	Date of Release	Brief Summary
Rev.01	2025.03.21	Initial Release.
Rev.02	2025.04.09	Update $R_{DS(on)}$.

Notes & Disclaimer

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- facilities.
  RoHS Compliance
  The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted
- application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013.
  REACh Compliance
  REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact your CLASSIC CHIP representative to ensure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information is also a vailable upon request.