Powering the SiC evolution™

GCMX010A120B3B1P

V_{DS}	1200 V
$R_{DS,on}$	9 mΩ
$I_{D\ (TC=25C)}$	173 A
T_J,max	175°C

QSiC™ 1200V SiC Half-Bridge Module

Features

- High speed switching SiC MOSFETs
- Reliable body diode
- All parts tested to above 1350V
- Kelvin reference for stable operation
- Press fit terminal connections

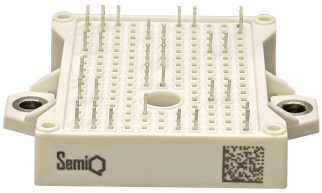
Benefits

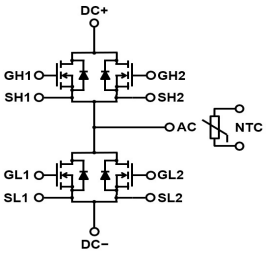
- Low switching losses
- Low junction to case thermal resistance
- Very rugged and easy mounting
- Direct mounting to heatsink (isolated package)

Applications

- Photovoltaic Inverter
- Battery charger
- Energy storage system
- High voltage DC to DC converter

Package





Part #	Package	Marking
GCMX010A120B3B1P	B3	GCMX010A120B3B1P

Absolute Maximum Ratings, at T_J=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values	Unit
Drain-Source Voltage	V_{rated}	V_{GS}=0V, I_D=1μA	1200	V
Continuous Drain Current	I_{DS}	T_C=25°C, V_{GS}=20V, T_J=175°C	173	A
		T_C=65°C, V_{GS}=20V, T_J=175°C	151	
Body Diode Drain Current	I_{SD}	T_C=25°C, V_{GS}=-5V, T_J=175°C	154	
Pulsed Drain Current	$I_{DS,pulse}$	T_C=25°C, V_{GS}=20V	350	
Gate Source Voltage	V_{GSmax}		-10/25	V
	V_{GSop}	Recommended operational	-5/20	
Power Dissipation	P_{tot}	T_C=25°C, T_J=175°C	577	W
Junction Temperature	T_J	Continuous	-40...175	°C
Case & Storage Temperature	T_C, $T_{storage}$	Continuous	-40...150	°C

Static Electrical Characteristics, at T_J=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=1mA	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V	-	0.2	2	μA
		V_{DS}=1200V, V_{GS}=0V, T_J=150°C	-	2	200	
Gate-Source Leakage Current	I_{GSS+}	V_{GS}=20V, V_{DS}=0V	-	20	1000	nA
	I_{GSS-}	V_{GS}=-5V, V_{DS}=0V	-	-20	-1000	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=40mA	1.8	3.1	4	V
		V_{GS}=V_{DS}, I_D=40mA, T_J=150°C	-	1.8	-	
Drain-Source On-Resistance	R_{DSon}*	V_{GS}=20V, I_D=100A	-	8.9	14	m
		V_{GS}=20V, I_D=50A	-	8.6	-	
		V_{GS}=20V, I_D=100A, T_J=150°C	-	14.8	-	
Transconductance	g_{fs}	V_{DS}=20V, I_D=100A	-	43.8	-	S
		V_{DS}=20V, I_D=100A, T_J=150°C	-	47.3	-	
Internal Gate Resistance	$R_{G(int)}$	f=1MHz, V_{AC}=25mV, D-S Short, including internal 1.0 ohm series gate resistor**	-	1.5	-	Ω

*R_{DSon} including package resistance

**Internal series gate resistor limits maximum switching frequency defined by Figure 31

AC Electrical Characteristics, at T_J=25°C, unless otherwise specified

Characteristics	Symbol	Conditions		Values			Unit
				min.	typ.	max.	
Input Capacitance	C_{ISS}	V_{GS}=0V V_{DS}=800V f=200kHz Vac=25mV		-	13.8	-	nF
Output Capacitance	C_{OSS}			-	0.65	-	
Reverse Transfer Capacitance	C_{RSS}			-	0.03	-	
Coss Stored Energy	E_{OSS}***			-	252	-	μJ
Turn-On Switching Energy	E_{ON}	T_J=25°C	V_{DD}=600V, I_{DS}=100A, $R_{G(ext)}$=3.9Ω, V_{GS}=-5/+20V, L=90μH	-	1.77	-	mJ
		T_J=125°C		-	2.07	-	
		T_J=150°C		-	2.22	-	
Turn-Off Switching Energy	E_{OFF}	T_J=25°C		-	0.55	-	
		T_J=125°C		-	0.63	-	
		T_J=150°C		-	0.64	-	
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=600V, I_{DS}=100A, $R_{G(ext)}$=3.9Ω, V_{GS}=-5V/20V, L=90μH		-	43	-	ns
Rise Time	t_R			-	17	-	
Turn-Off Delay Time	$t_{D(off)}$			-	86	-	
Fall Time	t_F			-	28	-	
Total Gate Charge	Q_G	V_{DD}=800V, I_{DS}=100A V_{GS}=-5/20V		-	483	-	nC
Gate to Source Charge	Q_{GS}			-	173	-	
Gate to Drain Charge	Q_{GD}			-	76	-	

Freewheeling Diode Characteristics, at T_J=25°C, unless otherwise specified

Characteristics	Symbol	Conditions		Values			Unit
				min.	typ.	max.	
Diode Forward Voltage	V_{SD}	V_{GS}=-5V, I_S=100A		-	3.9	-	V
		V_{GS}=-5V, I_S=100A, T_J=150°C		-	3.5	-	
Reverse Recovery Time	t_{RR}	T_J=25°C	I_S=100A, V_R=600V, V_{GS}=-5V, di/dt=7.1A/ns	-	36	-	ns
Reverse Recovery Charge	Q_{RR}			-	987	-	nC
Peak Reverse Recovery Current	I_{RRM}			-	77	-	A
Reverse Recovery Energy	E_{RR}	T_J=25°C	I_S=100A, V_R=600V, V_{GS}=-5V/20V, $R_{G(ext)}$ = 3.9Ω	-	0.22	-	mJ
		T_J=125°C		-	0.47	-	
		T_J=150°C		-	0.59	-	

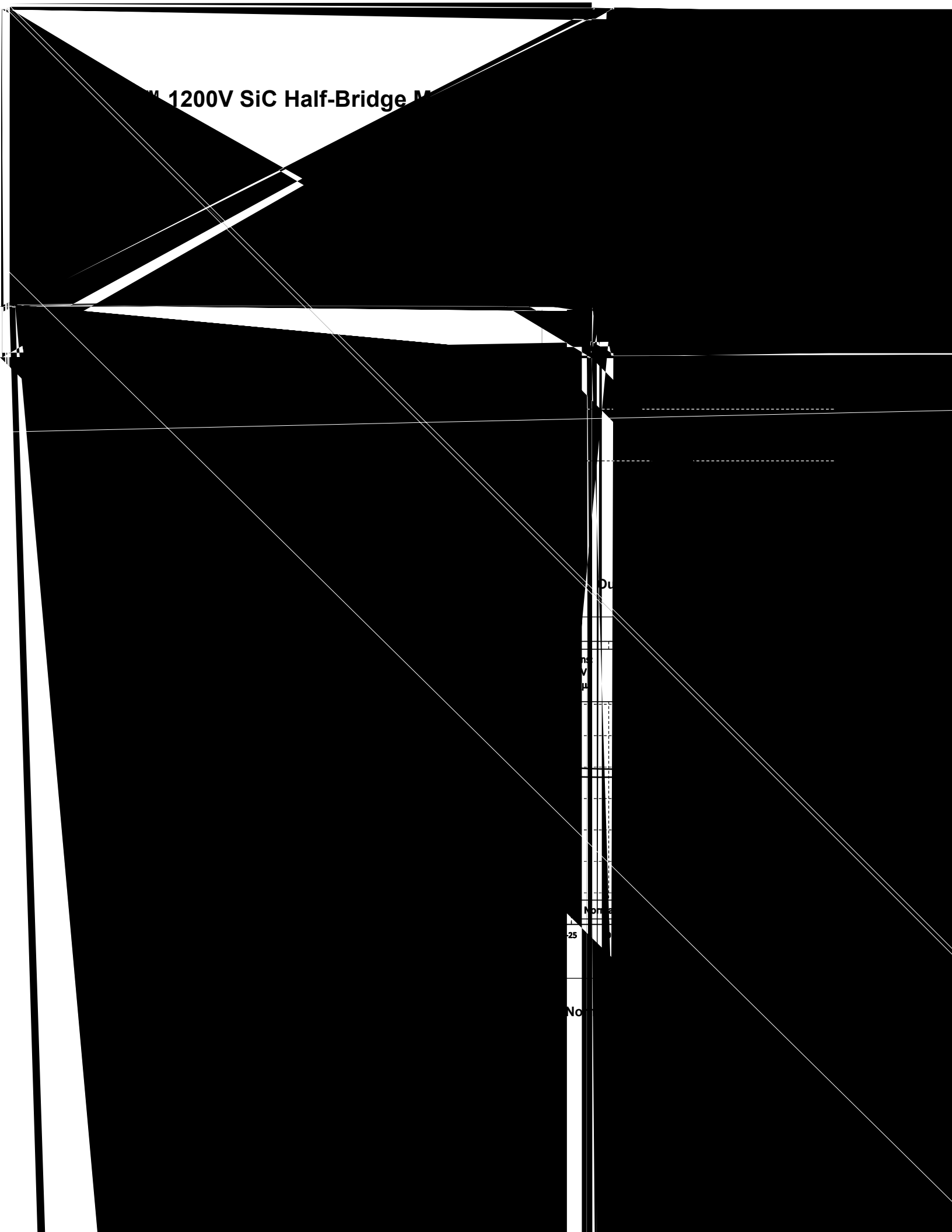
Thermal and Package Characteristics, at T_j=25 °C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction-case	R_{thJC}		-	0.24	0.26	C/W
Mounting torque	M_d	M4-0.7 screws	-	2.00	2.3	N-m
Press fit pin PCB end hole diameter			0.99	-	1.09	mm
Press fit pin PCB hole drill diameter			1.12	1.15	-	mm
Press fit pin PCB hole copper thickness			25	-	50	m
Package weight	W_t		-	40	-	g
Isolation voltage	V_{ISOL}	I_{ISOL} < 1mA,50/60 Hz, 1 min	3000	-	-	V

NTC Characteristics, at T_j=25 °C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Rated resistance	R_{NTC}	T_{NTC} = 25°C	-	5.0	-	
Resistance tolerance	ΔR/R		-5	-	5	%
Beta Value (T_2 = 50°C)	$\beta_{25/50}$		-	3380	-	k
Beta Value (T_2 = 80°C)	$\beta_{25/80}$		-	3440	-	k
Power dissipation	P_{MAX}	T_{NTC} = 25°C	-	-	50	mW

1200V SiC Half-Bridge M



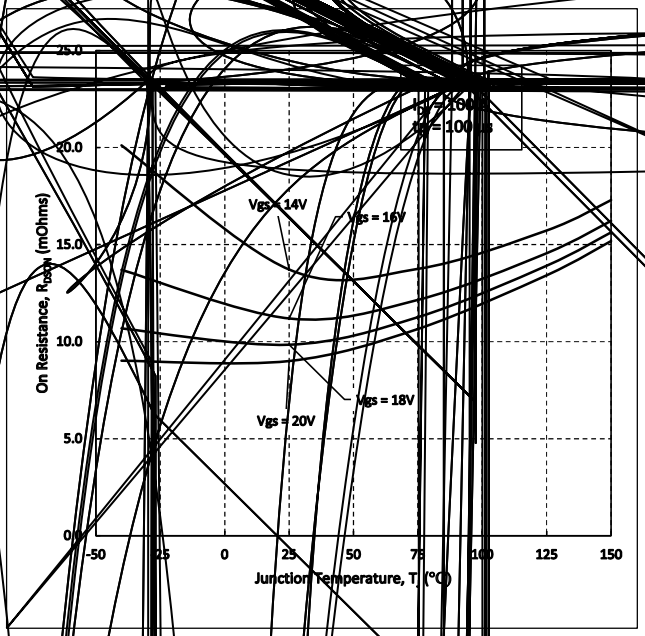


Figure 5. On-Resistance vs. Temperature For Various Gate Voltages

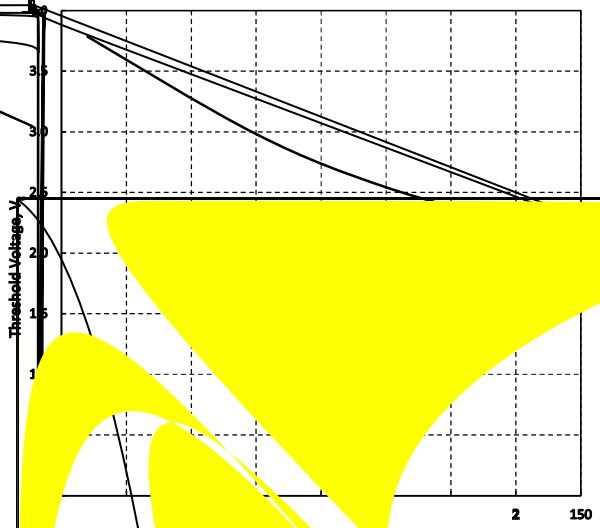


Figure 6. Threshold Voltage vs. Temperature

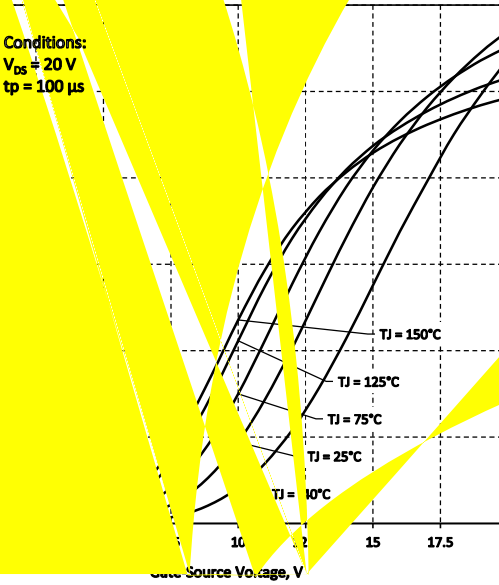


Figure 7. Transfer Characteristic for Various Junction Temperatures

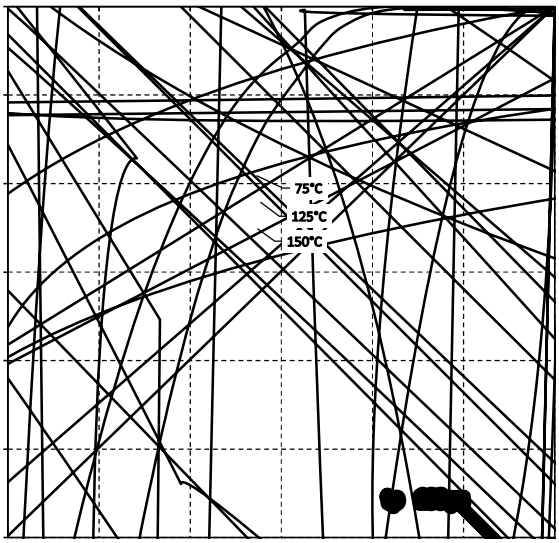


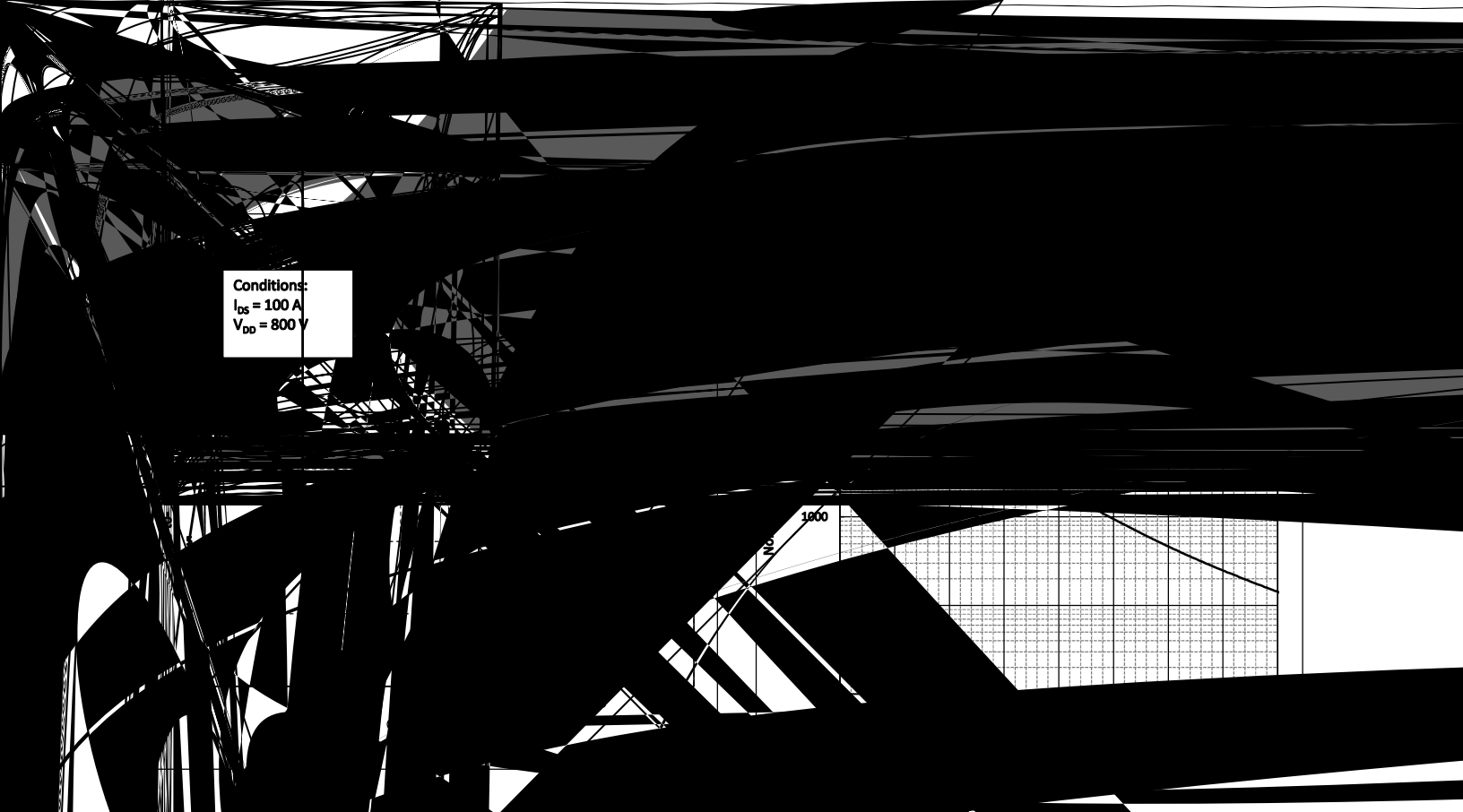
Figure 9. Body Diode Characteristics at V_{GS} = 0V

Figure 10. Body Diode Characteristics at V_{GS} = -5V

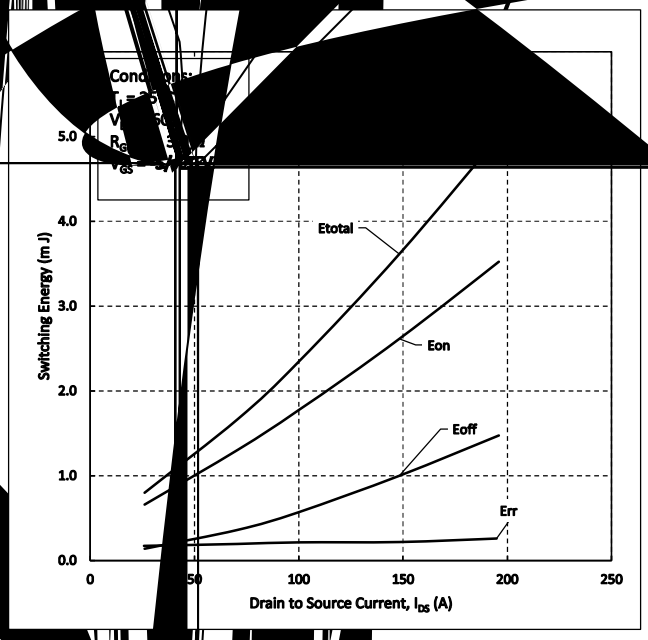
Figure 11. Output Capacitor Stored Energy

Figure 12. Capacitance vs. Drain-Source Voltage


10us
0.1



s. Temperature



itching Energy vs. Drain
0V)

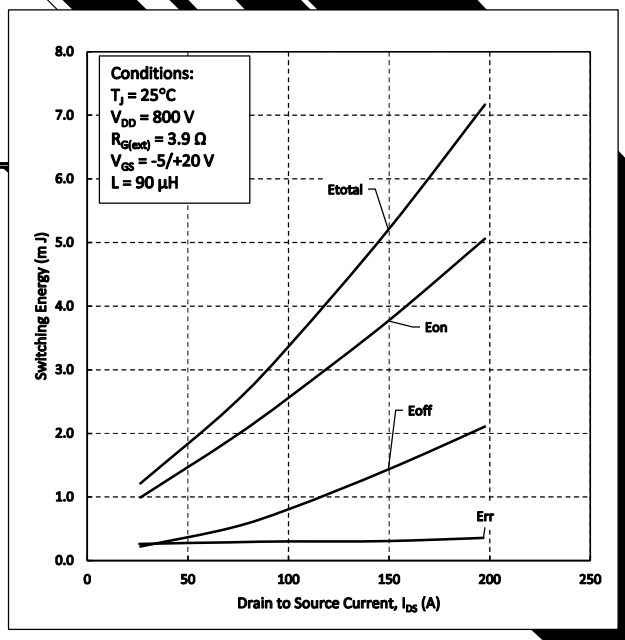
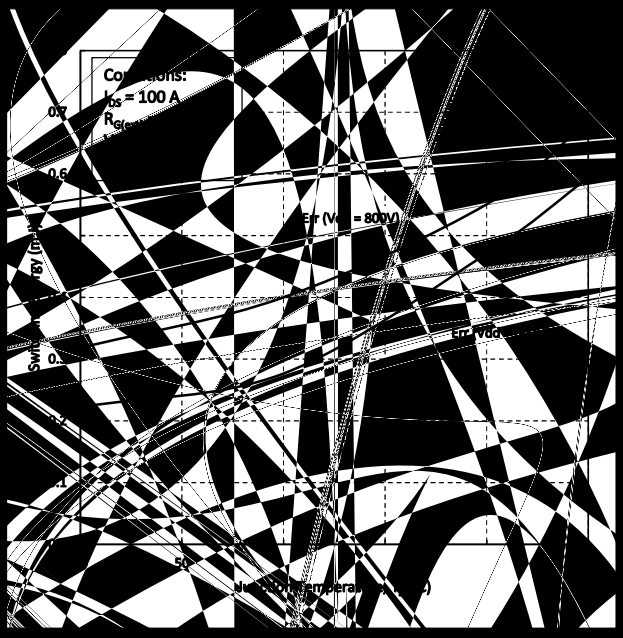
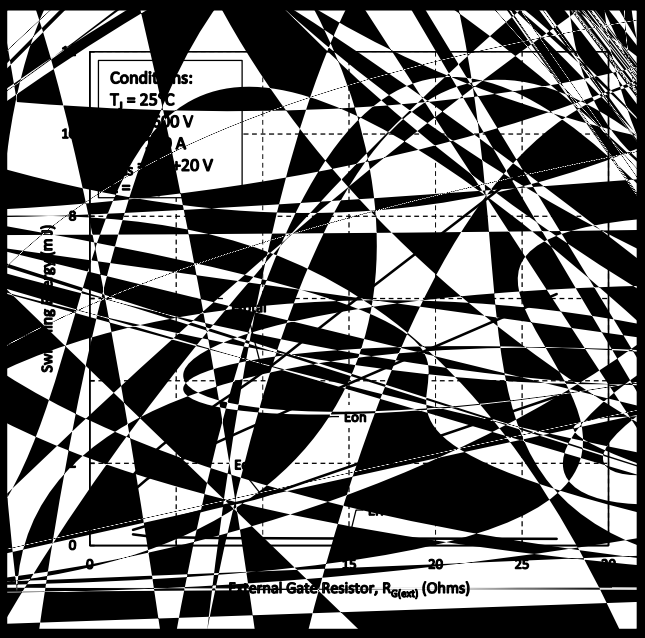
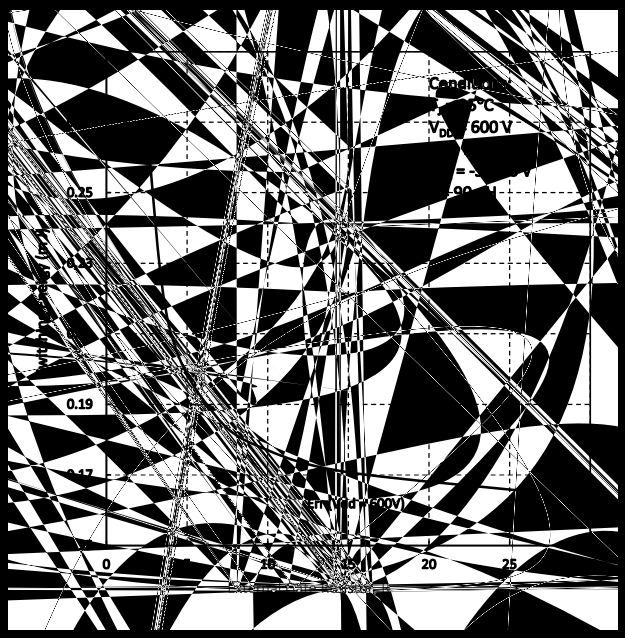


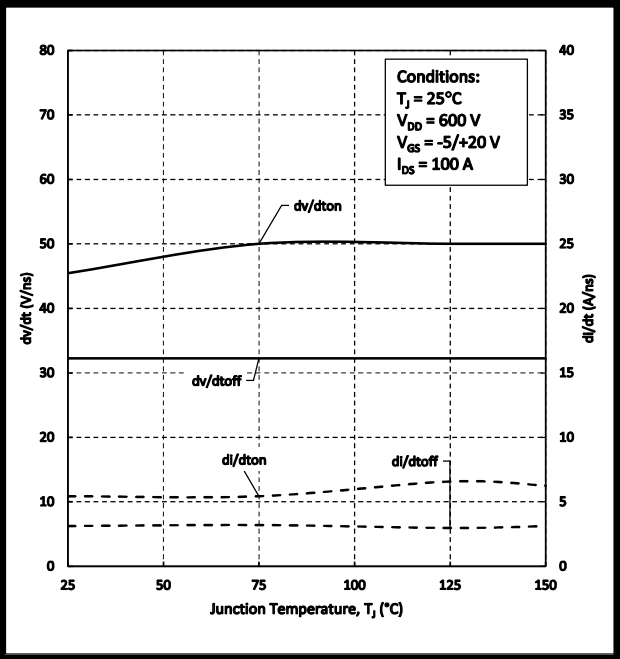
Figure 20. Clamped Inductive Switching Energy vs. Drain Current (800V)

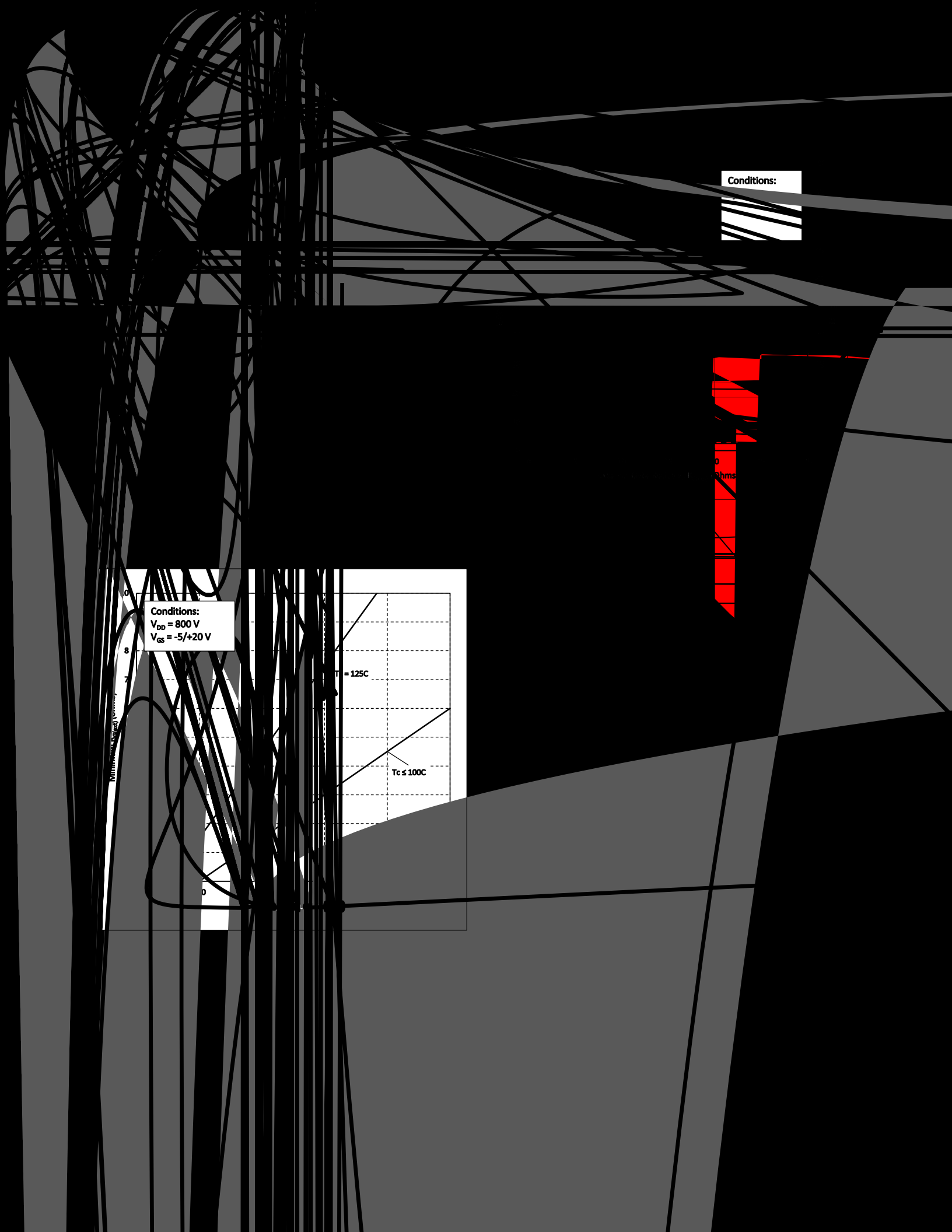



External Gate Resistor, $R_{G(ext)}$ (Ohms)



Conditions:
T_J = 25°C
V_{DD} = 600 V
V_{GS} = -5/+20 V
I_{DS} = 100 A




Conditions:
Conditions:
V_{DD} = 800 V
V_{GS} = -5/+20 V
T = 125C
Tc ≤ 100C

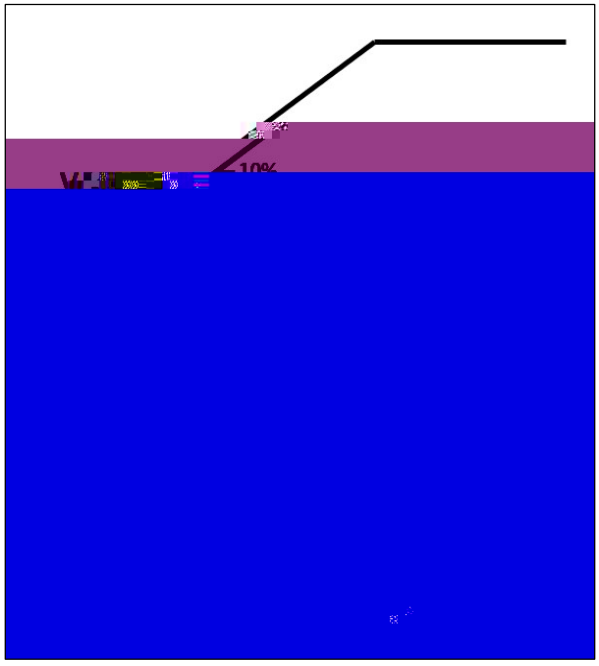


Figure 33. Turn-on Transient Definitions

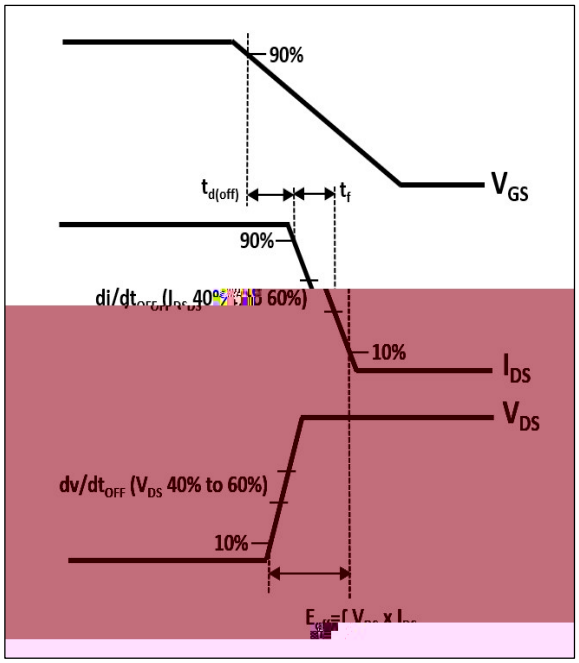
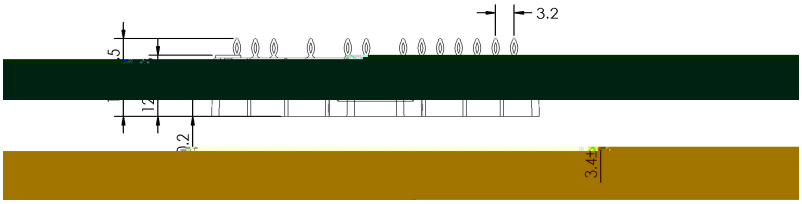


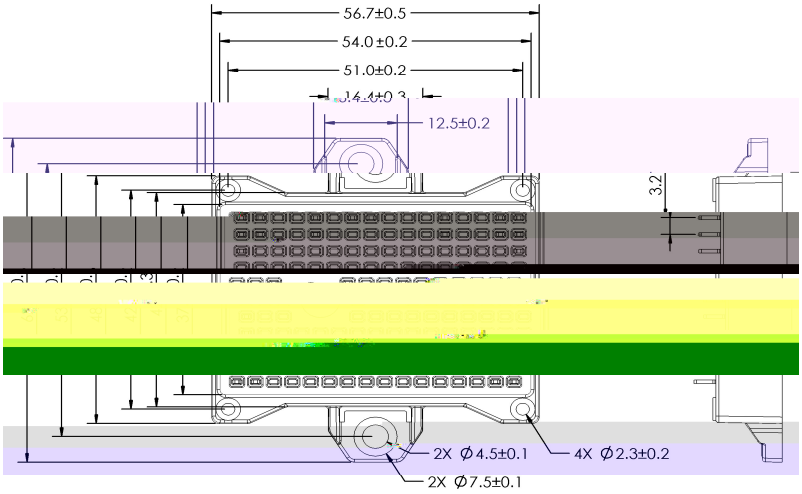
Figure 34. Turn-off Transient Definitions

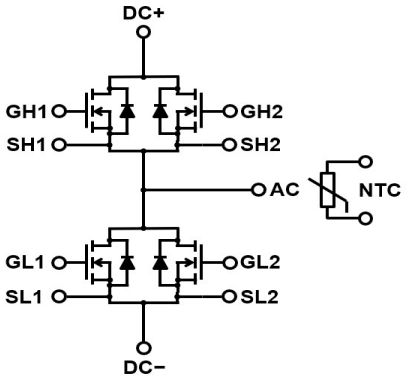
QSiC™ 1200V SiC Half-Bridge Module

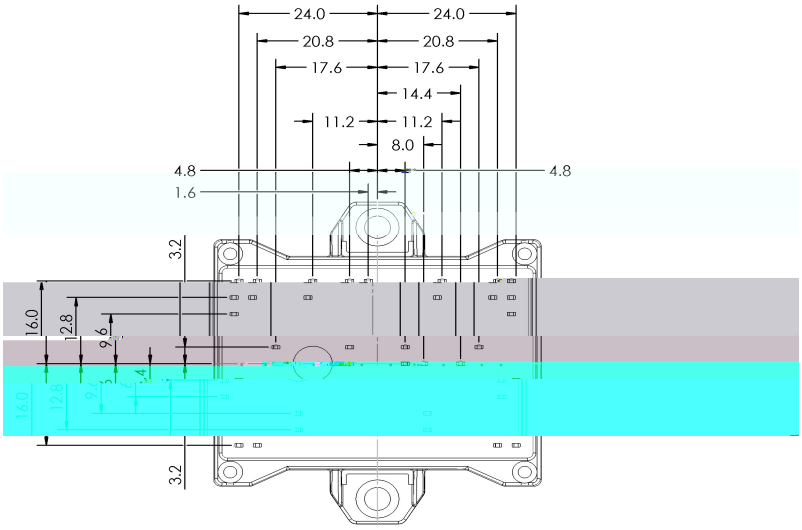
GCMX010A120B3B1P

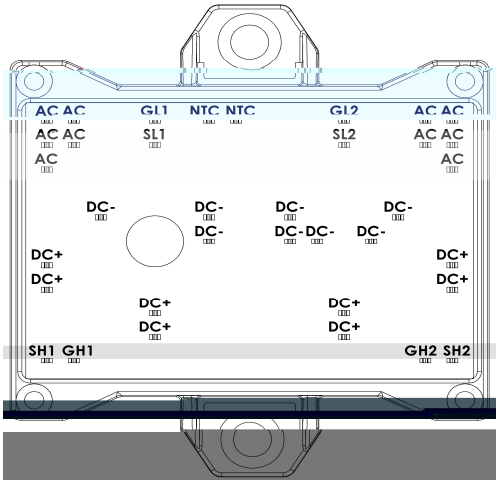
Package Dimensions (mm), Pinout and Circuit Diagram











Notes: Gate pin pairs for high side and low side (GL1-GL2, GH1-GH2) are not internally connected.
All source sense (SL1, SL2, SH1, SH2) pins and gate (GL1, GL2, GH1, GH2) pins should be connected to the gate driver circuits.
Recommended to use separate R_{Gext} for each gate pin.

Revision History		
Date	Revision	Notes
12/20/2022	0.1	Preliminary release
7/14/2023	1.0	Initial release
1/8/2024	1.1	Updated logo and isolation test
4/16/2025	1.2	Updated pinout diagram, updated thermal impedance curve

RoHS Compliance

REACh Compliance