Powering the SiC evolution™

GCMS1P0B120S4B1

V_{DS}	1200 V
$R_{DS,on}$	1.2 mΩ
$I_{D\ (TC=25C)}$	1160 A
T_J,max	175°C

QSiC™ 1200V SiC Half-Bridge Module

Features

- 62mm x 152mm industry standard footprint
- High speed switching SiC MOSFETs
- Freewheeling SiC SBD with zero reverse recovery
- All parts tested to above 1350V
- Kelvin reference for stable operation
- ZTA Isolated baseplate

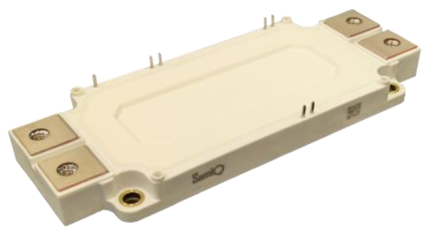
Benefits

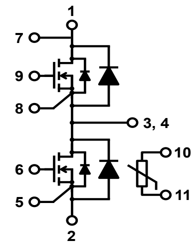
- Low switching losses
- Low junction to case thermal resistance
- Very rugged and easy mounting
- Direct mounting to heatsink (isolated package)
- Lower Q_{RR} at high temperature

Applications

- Motor drives
- EV applications
- Smart-grid
- Uninterruptible power supply (UPS)

Package





Part #	Package	Marking
GCMS1P0B120S4B1	S4	GCMS1P0B120S4B1

RoHS

PRELIMINARY

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_{DS}=1100µA	1200	V
Continuous Drain Current	I_{DS}	T_C=25°C, V_{GS}=18V, T_J=175 °C	1160	A
		T_C=65°C, V_{GS}=18V, T_J=175 °C	999	
Body Diode Drain Current	I_{SD}	T_C=25°C, V_{GS}=-4.5V, T_J=175 °C	655	
Pulsed Drain Current	$I_{DS,pulse}$	T_C=25°C, V_{GS}=18V	2800	
Gate Source Voltage	V_{GSmax}		-8/22	V
	V_{GSop}	Recommended operational	-4.5/18	
Power Dissipation	P_{tot}	T_C=25°C, T_J=175°C	2344	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_{DS}=16.5mA	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V	-	0.02	1.1	mA
		V_{DS}=1200V, V_{GS}=0V, T_J=150°C	-	0.34	18	
Gate-Source Leakage Current	I_{GSS+}	V_{GS}=22V, V_{DS}=0V	-	140	2000	nA
	I_{GSS-}	V_{GS}=-8V, V_{DS}=0V	-	-140	-2000	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_{DS}=280mA	1.8	3.1	4	V
		V_{GS}=V_{DS}, I_{DS}=280mA, T_J=150°C	-	2.1	-	
Drain-Source On-Resistance	R_{DSon}*	V_{GS}=18V, I_{DS}=700A	-	1.2	1.7	mΩ
		V_{GS}=18V, I_{DS}=700A, T_J=150°C	-	1.9	-	
Transconductance	g_{fs}	V_{DS}=20V, I_{DS}=700A	-	57	-	S
		V_{DS}=20V, I_{DS}=700A, TJ=150°C	-	79	-	
Internal Gate Resistance	$R_{G(int)}$	f=1MHz, V_{AC}=25mV, D-S Short, including internal 0.26 ohm series gate resistor**	-	0.5	-	Ω

*R_{DSon} measured at kelvin and sense pins (pin # 7-8 and pin # 8-5), typical 1 mΩ chip only

**Internal series gate resistor limits maximum switching frequency defined by Figure 35

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=100kHz, V_{AC}=25mV		-	129.5	-	nF
Output Capacitance	C_{OSS}			-	4.95	-	
Reverse Transfer Capacitance	C_{RSS}			-	0.19	-	
Coss Stored Energy	E_{OSS}***			-	2002	-	µJ
Turn-On Switching Energy	E_{ON}	T_J=25°C	V_{DD}=600V, I_{DS}=700A, $R_{G(ext)}$=1Ω, V_{GS}=-4.5/+18V, L=8.9µH,	-	16.8	-	mJ
		T_J=125°C		-	15.5	-	
		T_J=150°C		-	15.4	-	
Turn-Off Switching Energy	E_{OFF}	T_J=25°C		-	16.2	-	
		T_J=125°C		-	18.1	-	
		T_J=150°C		-	18.7	-	
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=600V, I_{DS}=700A, $R_{G(ext)}$=1Ω, V_{GS}=-4.5/+18V, L=8.9µH,		-	112	-	ns
Rise Time	t_R			-	50	-	
Turn-Off Delay Time	$t_{D(off)}$			-	249	-	
Fall Time	t_F			-	99	-	
Total Gate Charge	Q_G	V_{DD}=800V, I_{DS}=700A, V_{GS}=-4.5/+18V		-	3489	-	nC
Gate to Source Charge	Q_{GS}			-	1086	-	
Gate to Drain Charge	Q_{GD}			-	727	-	

***E_{OSS} is calculated from C_{OSS} curve

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_{SD}=550A		-	1.6	1.9	V
		V_{GS}=-5V, I_{SD}=550A, T_J=150°C		-	2.2	-	V
Reverse Recovery Time	t_{RR}	T_J=25°C	I_S=700A, V_R=600V, V_{GS}=-4.5V, di/dt=16.3A/ns	-	38	-	ns
Reverse Recovery Charge	Q_{RR}			-	10.2	-	µC
Peak Reverse Recovery Current	I_{RRM}			-	395	-	A
Reverse Recovery Energy	E_{RR}	T_J=25°C	I_S=700A, V_R=600V, V_{GS}=-4.5/18V, $R_{G(ext)}$=1Ω	-	3.74	-	mJ
		T_J=125°C		-	5.11	-	
		T_J=150°C		-	5.43	-	

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

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction-case	$R_{thJC,MOSFET}$		-	0.058	0.064	°C/W
	$R_{thJC,DIODE}$		-	0.077	0.085	
Thermal resistance, junction-heatsink	$R_{thJH,MOSFET}$	Thermal grease, Thickness=75um, k = 4.0 W/mK	-	0.070	-	°C/W
	$R_{thJH,DIODE}$		-	0.091	-	
Material of module baseplate	-		-	Cu	-	-
Creepage distance	d_{Creep}	terminal to heatsink	-	14.5	-	mm
	d_{Creep}	terminal to terminal	-	13.0	-	mm
Clearance	d_{Clear}	terminal to heatsink	-	12.5	-	mm
	d_{Clear}	terminal to terminal	-	10.0	-	mm
Comparative tracking index	CTI		250	-	400	-
Mounting torque	M_d	M5-0.8 screws	3	-	6	N-m
Terminal connection torque	M_{dt}	M6-1.0 screws	3	-	6	N-m
Package weight	W_t		-	382	-	g
Isolation voltage	V_{ISOL}	I_{ISOL} < 1mA,50/60 Hz, 1 min	2500	-	-	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	-	kΩ
Resistance tolerance	ΔR/R		-5	-	5	%
Beta Value (T_2 = 50°C)	$\beta_{25/50}$	$R_2 = R_{25} \cdot \exp [B_{25/50}(1/T_2 - 1/(298,15\ K))]$	-	3375	-	k
Power dissipation	P_{MAX}	T_{NTC} = 25°C	-	-	50	mW

Typical Performance

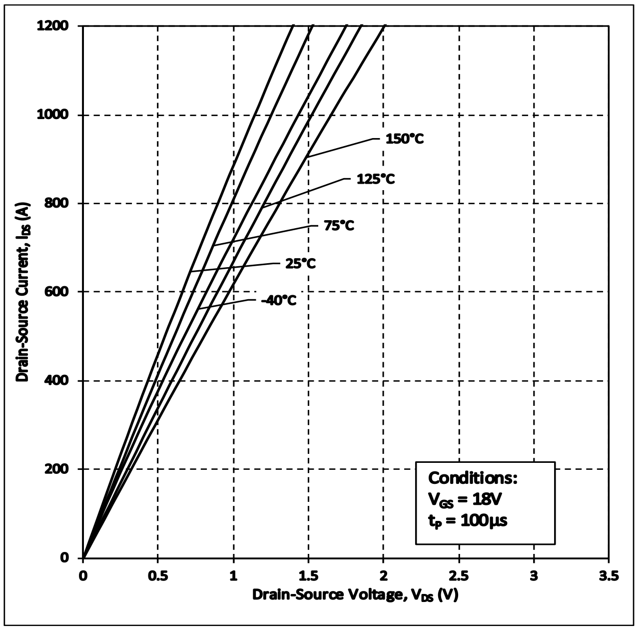


Figure 1. Output Characteristics for Various Temperatures

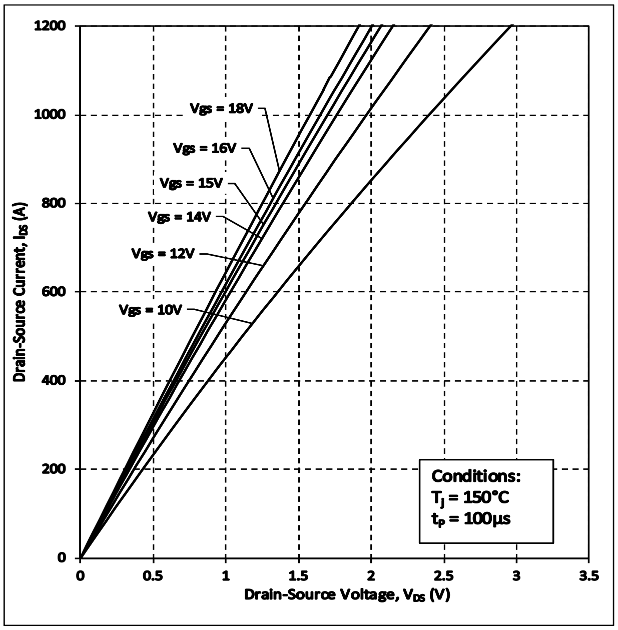


Figure 2. Output Characteristics T_J = 150°C

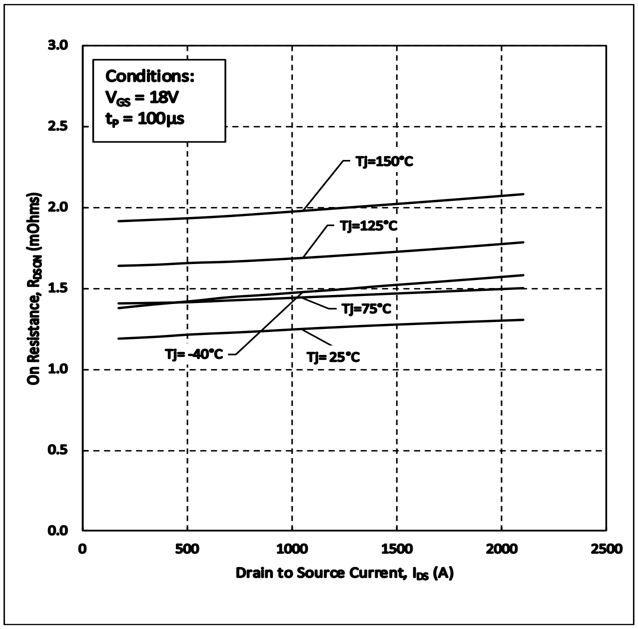


Figure 3. On-Resistance vs. Drain Current For Various Temperatures

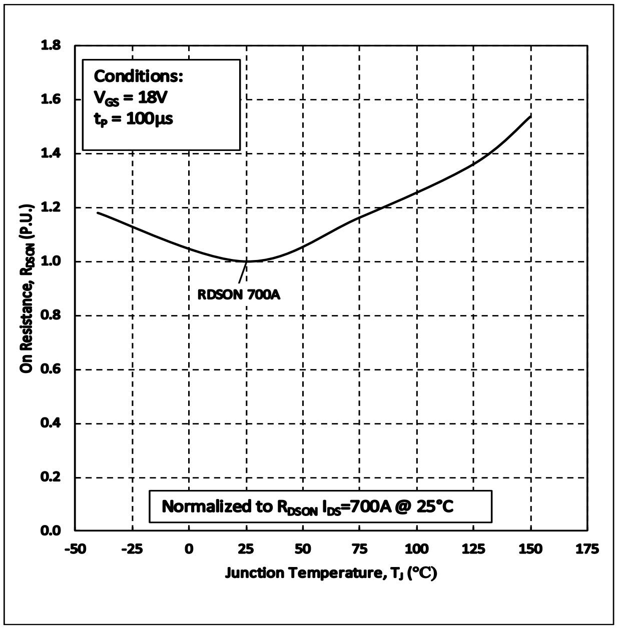


Figure 4. Normalized On-Resistance vs. Temperature

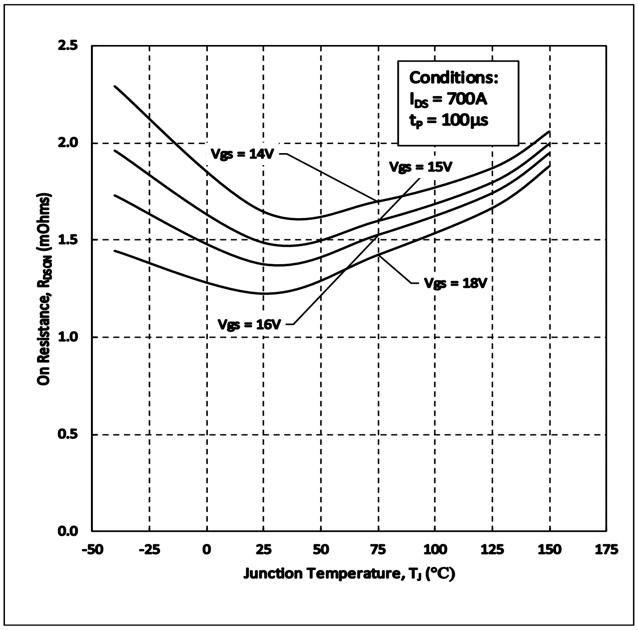


Figure 5. On-Resistance vs. Temperature For Various Gate Voltages

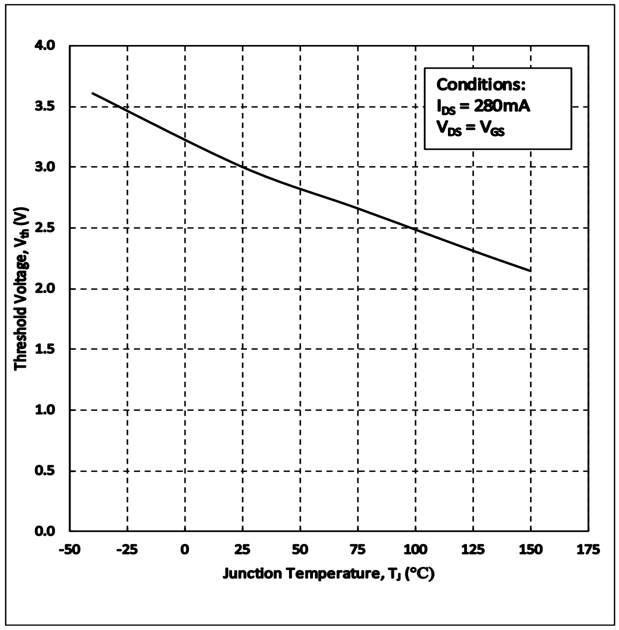


Figure 6. Threshold Voltage vs. Temperature

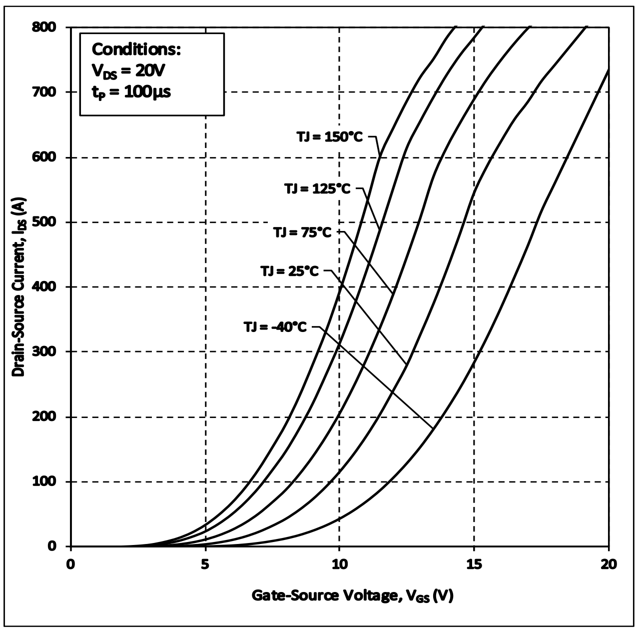


Figure 7. Transfer Characteristic for Various Junction Temperatures

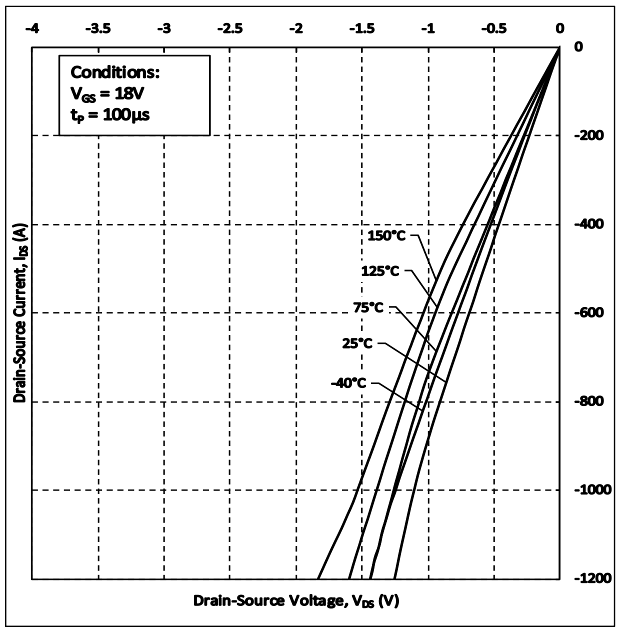


Figure 6. 3rd Quadrant Characteristics at V_{GS} = 18V

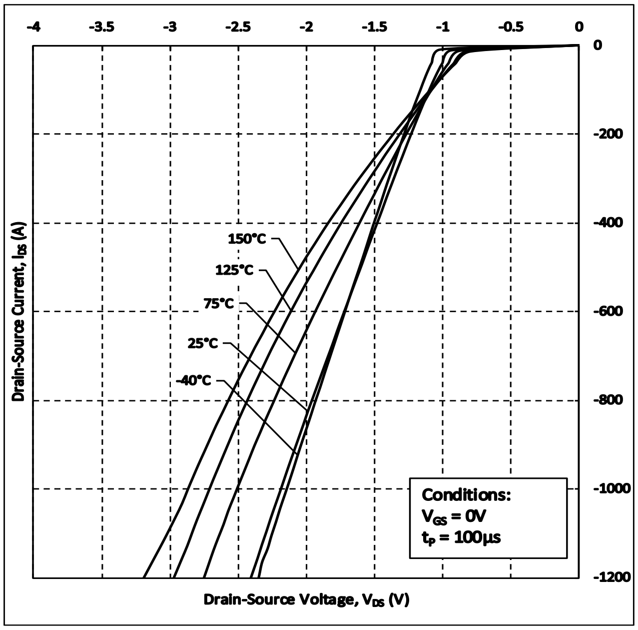


Figure 9. Body Diode Characteristics at V_{GS} = 0V

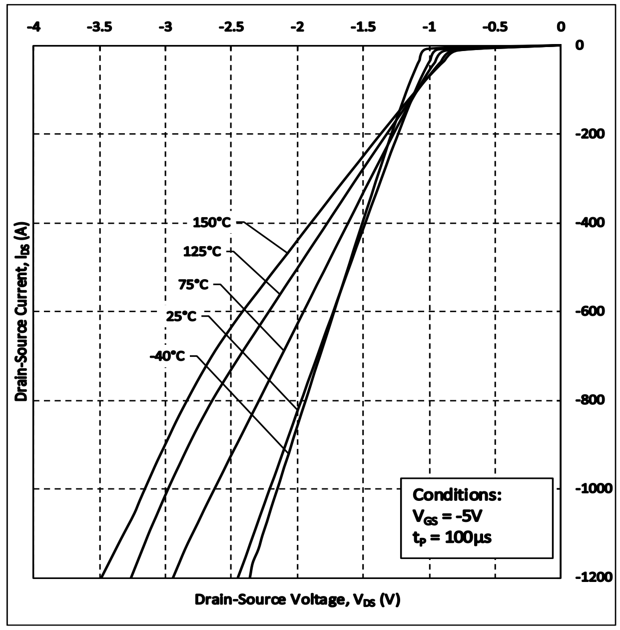


Figure 10. Body Diode Characteristics at V_{GS} = -5V

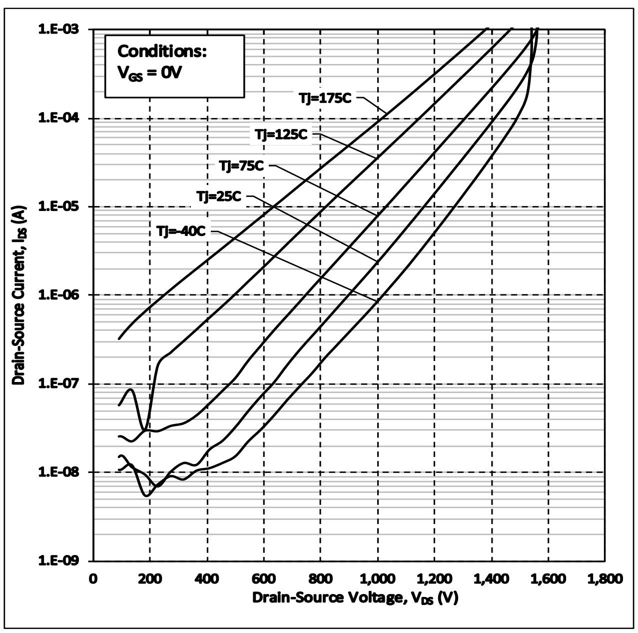


Figure 11. IDSS vs Temperature

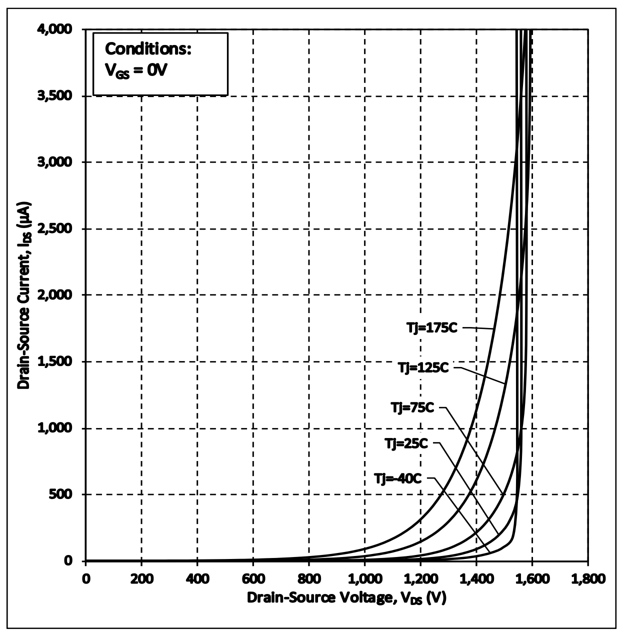


Figure 12. BVDSS vs Temperature

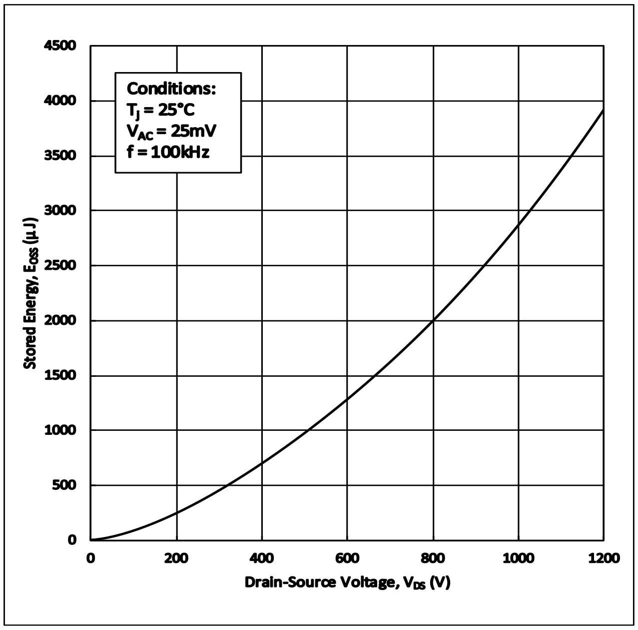


Figure 13. Output Capacitor Stored Energy

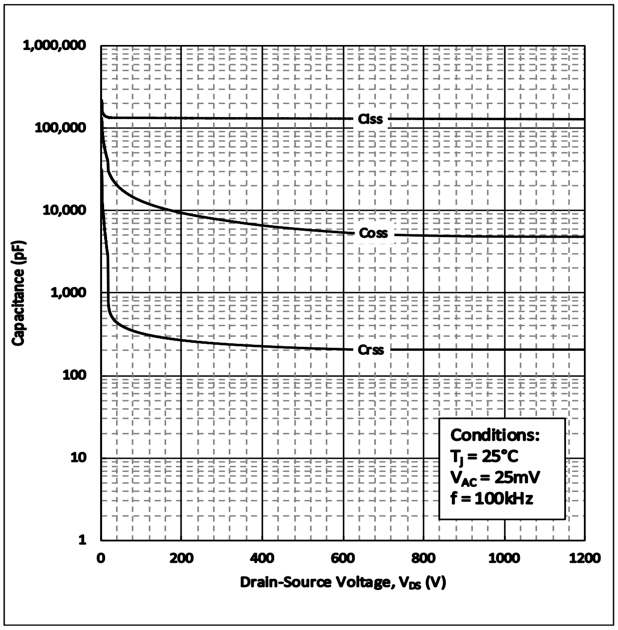


Figure 14. Capacitance vs. Drain-Source Voltage

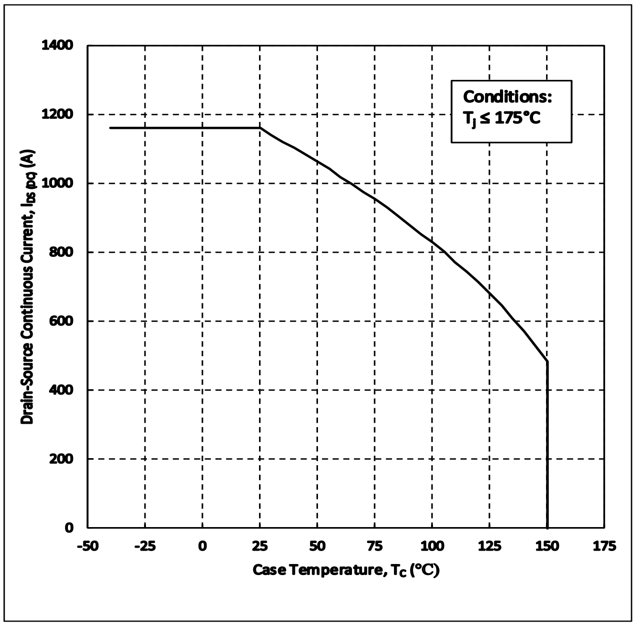


Figure 15. Continuous Drain Current Derating vs. Case Temperature

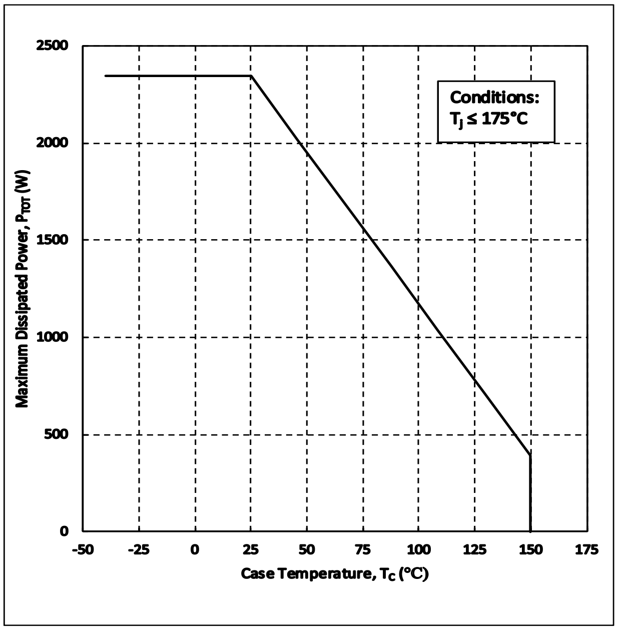


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

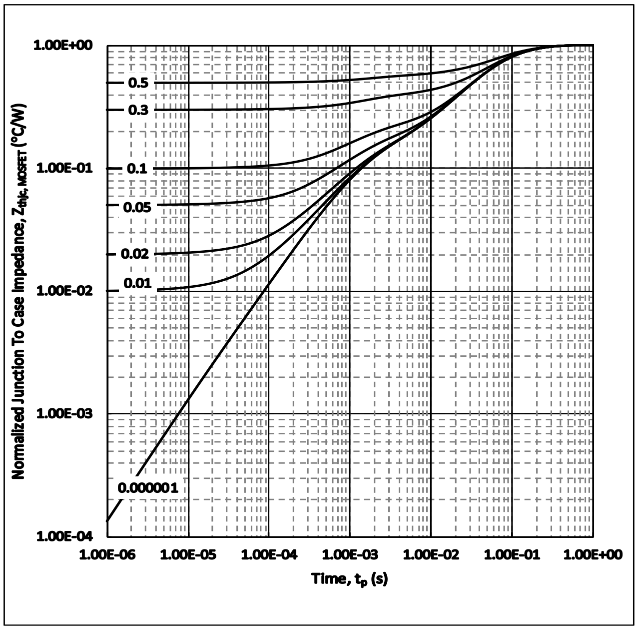


Figure 17. MOSFET Transient Thermal impedance (Junction to Case)

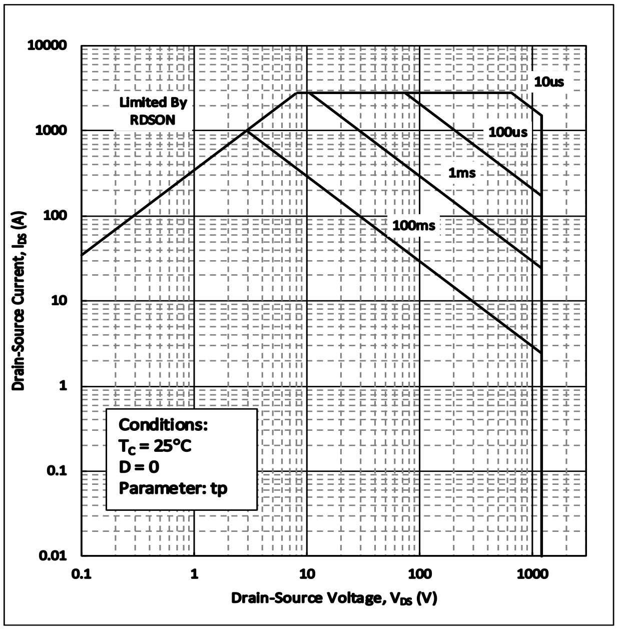


Figure 18. Safe Operating Area

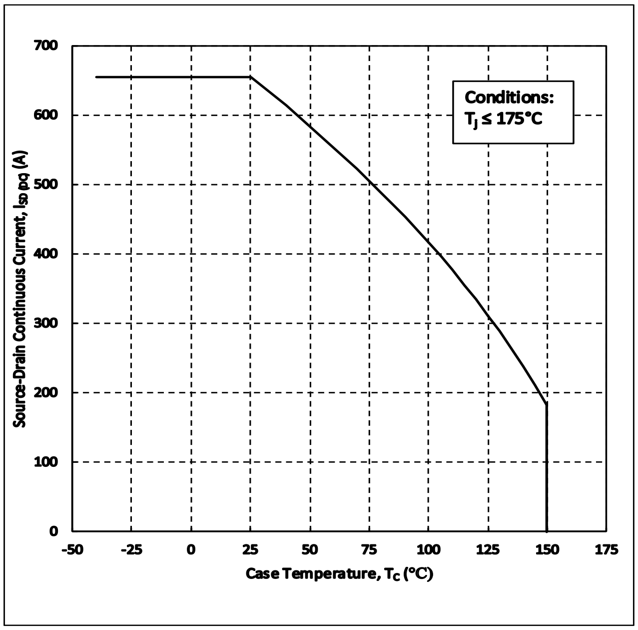


Figure 19. Continuous Source Current Derating vs. Case Temperature

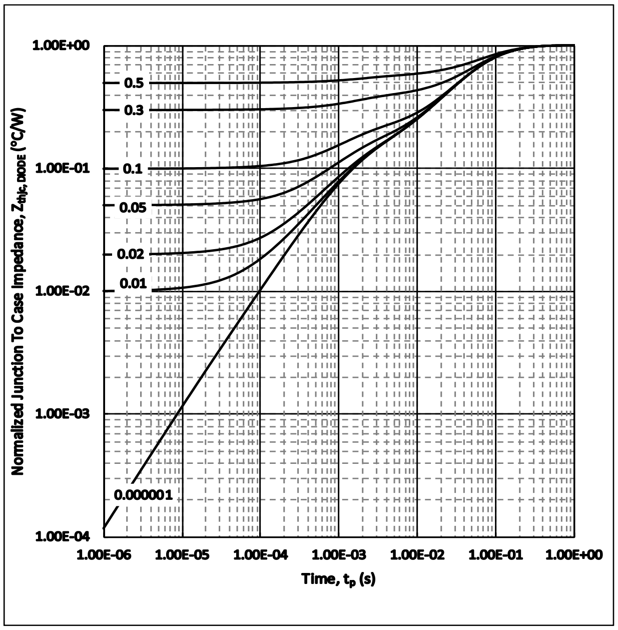


Figure 20. Diode Transient Thermal impedance (Junction to Case)

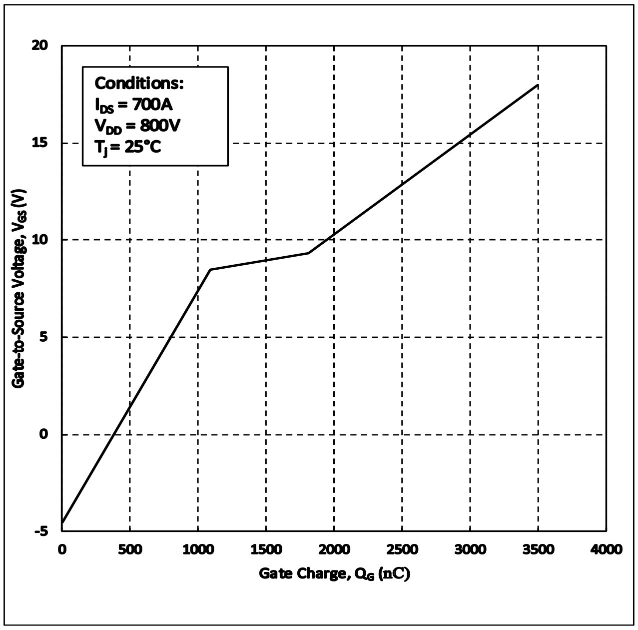


Figure 21. Gate Charge Characteristics

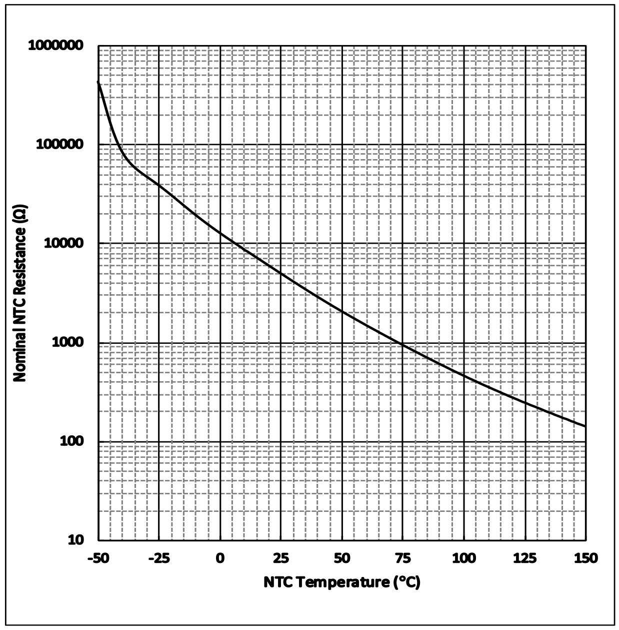


Figure 22. Nominal NTC Resistance vs. Temperature

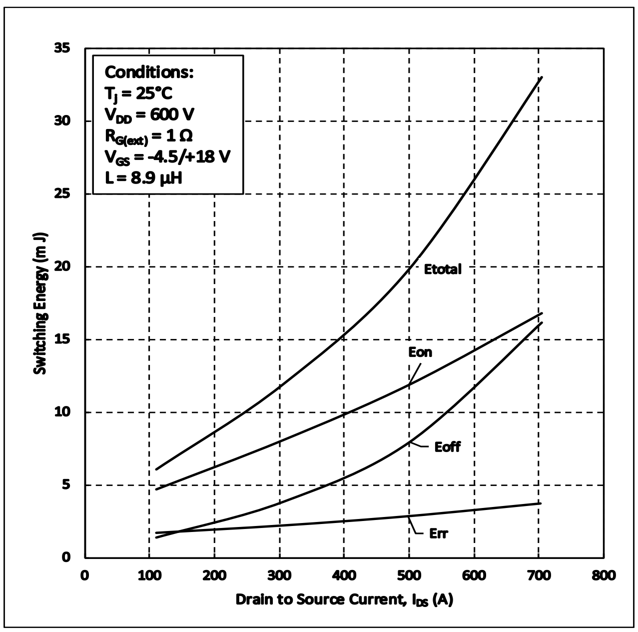


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (600V)

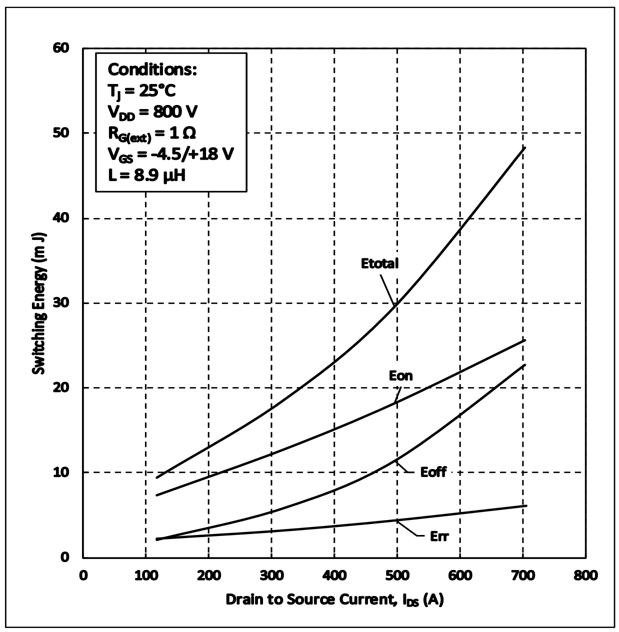


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (800V)

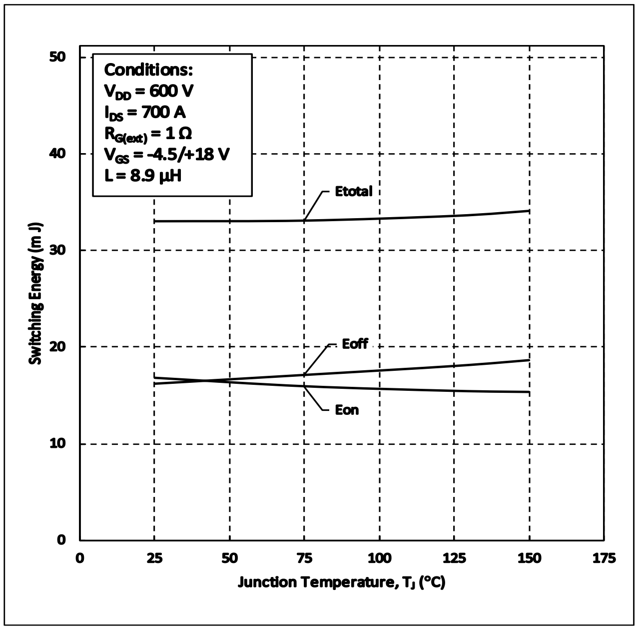


Figure 25. Clamped Inductive Switching Energy vs. Temperature

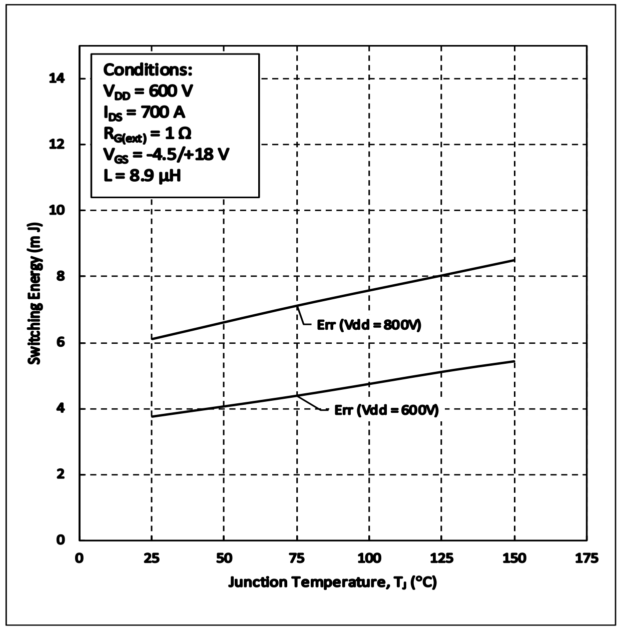


Figure 26. Reverse Recovery Energy vs. Temperature

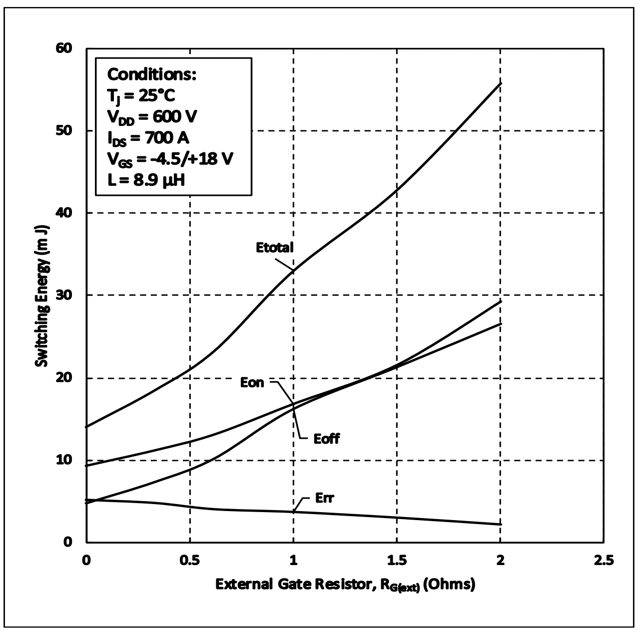


Figure 27. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

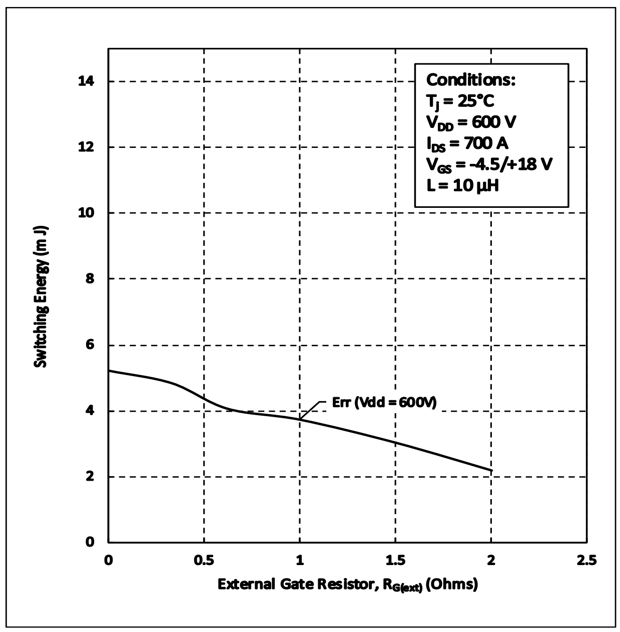


Figure 28. Reserve Recovery Energy vs. $R_{G(ext)}$

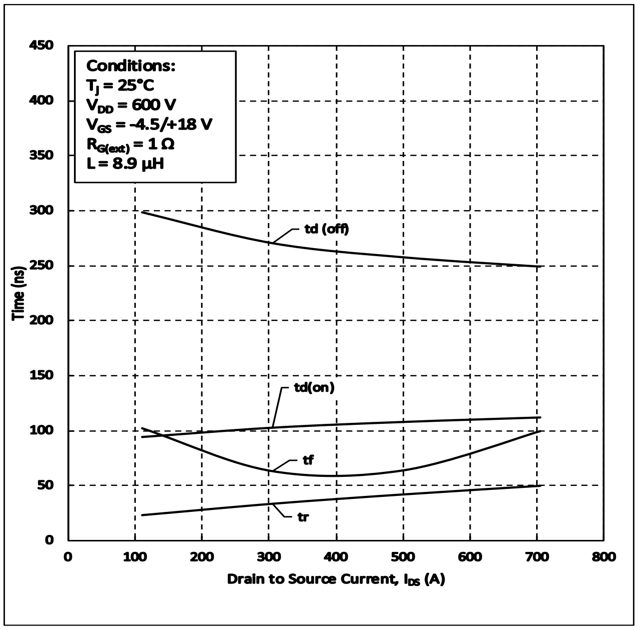


Figure 29. Switching Times vs. Drain Current

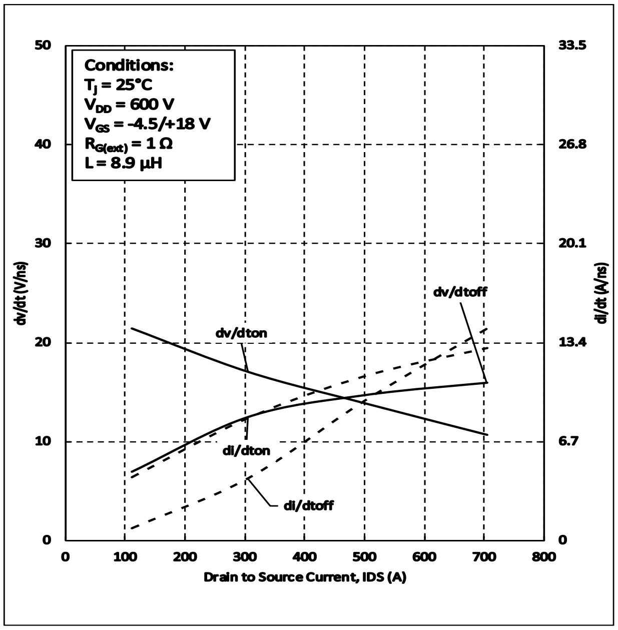


Figure 30. dv/dt and di/dt vs. Source Current

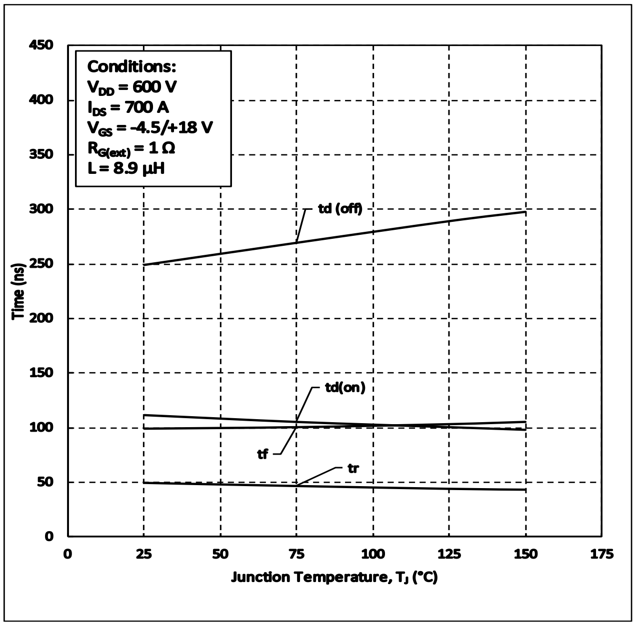


Figure 31. Switching Times vs. Temperature

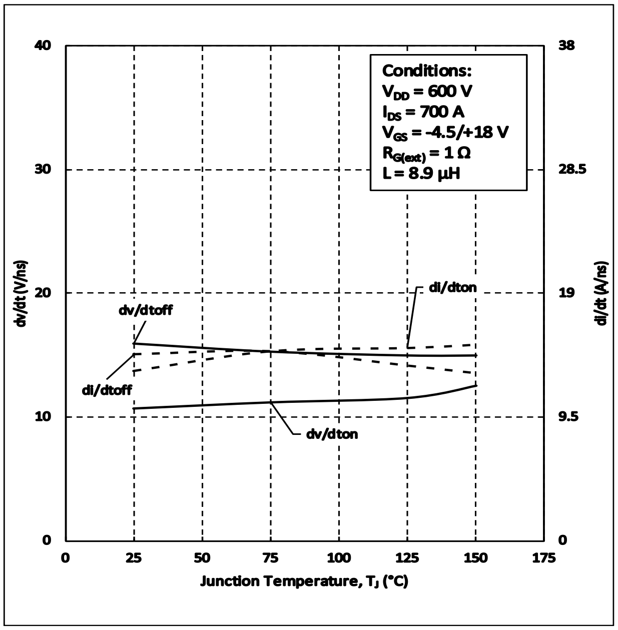


Figure 32. dv/dt and di/dt vs. Temperature

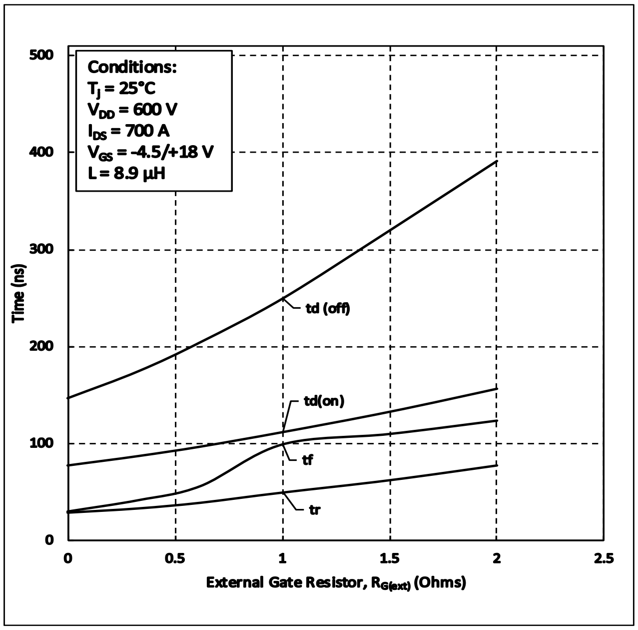


Figure 33. Switching Times vs. $R_{G(ext)}$

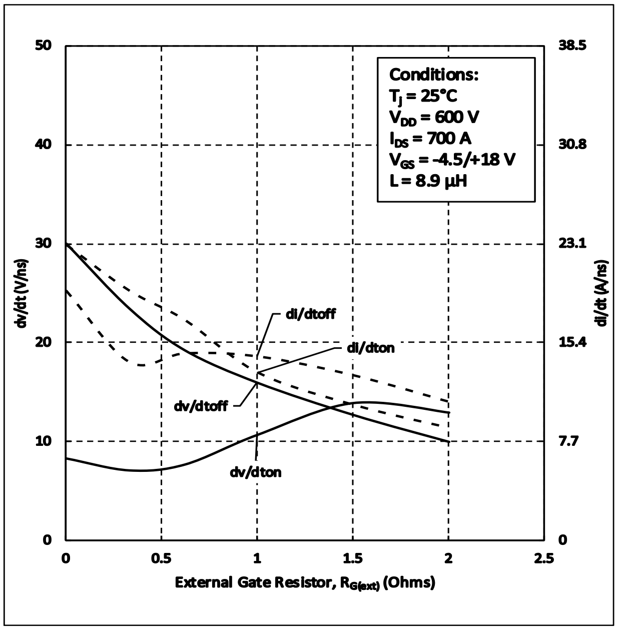


Figure 34. dv/dt and di/dt vs. $R_{G(ext)}$

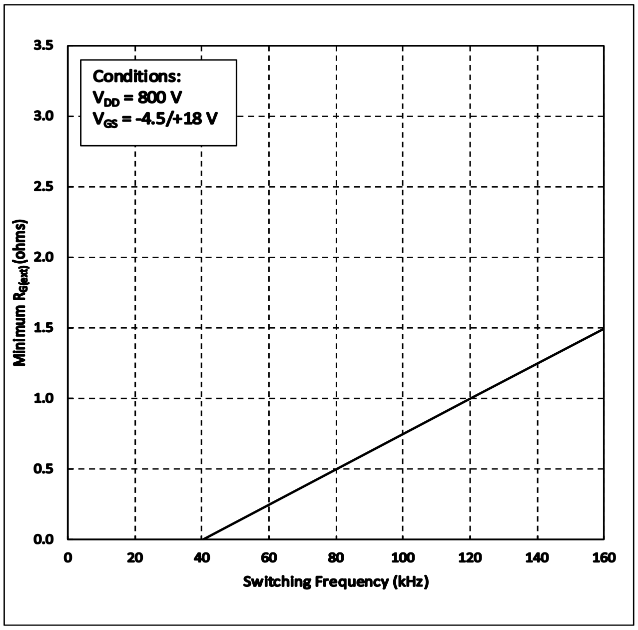


Figure 35. Frequency vs Minimum $R_{G(ext)}$

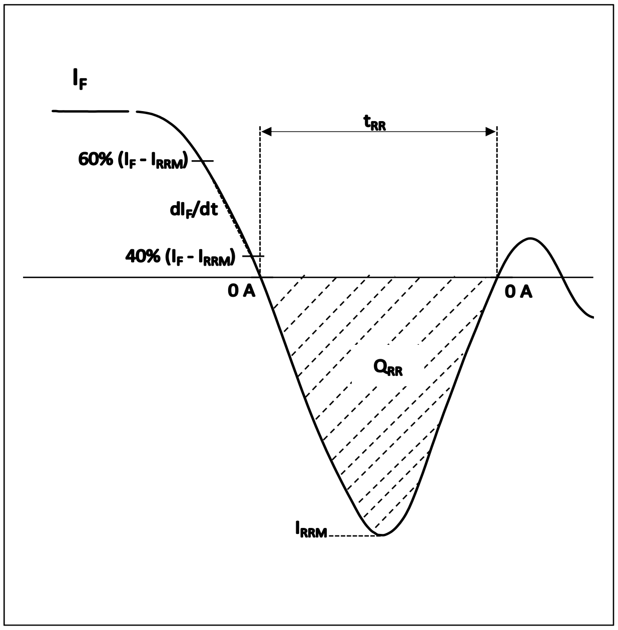


Figure 36. Reverse Recovery Definitions

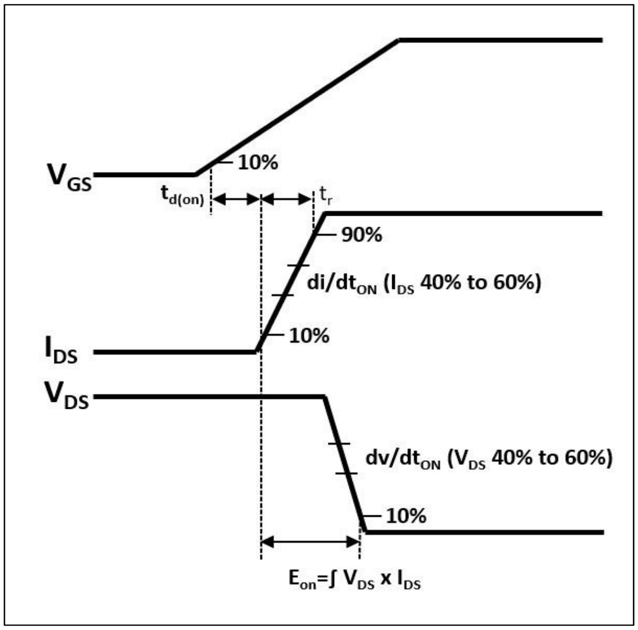


Figure 37. Turn-on Transient Definitions

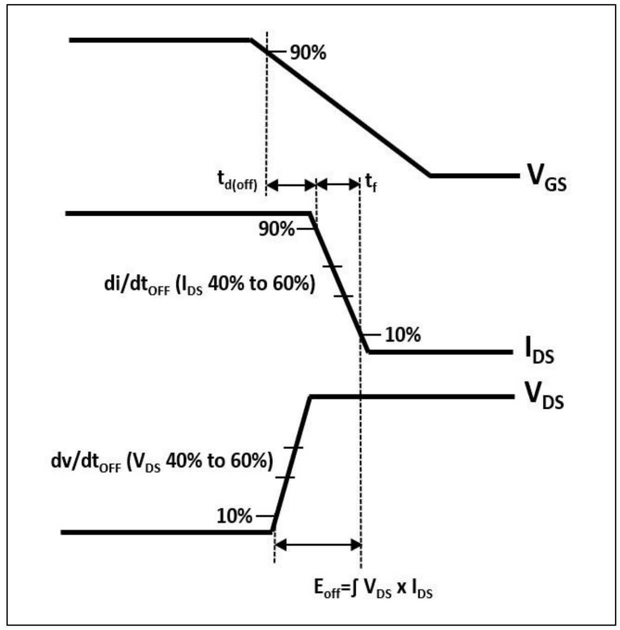
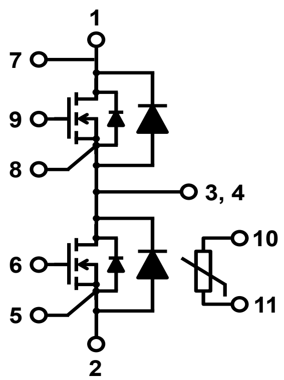
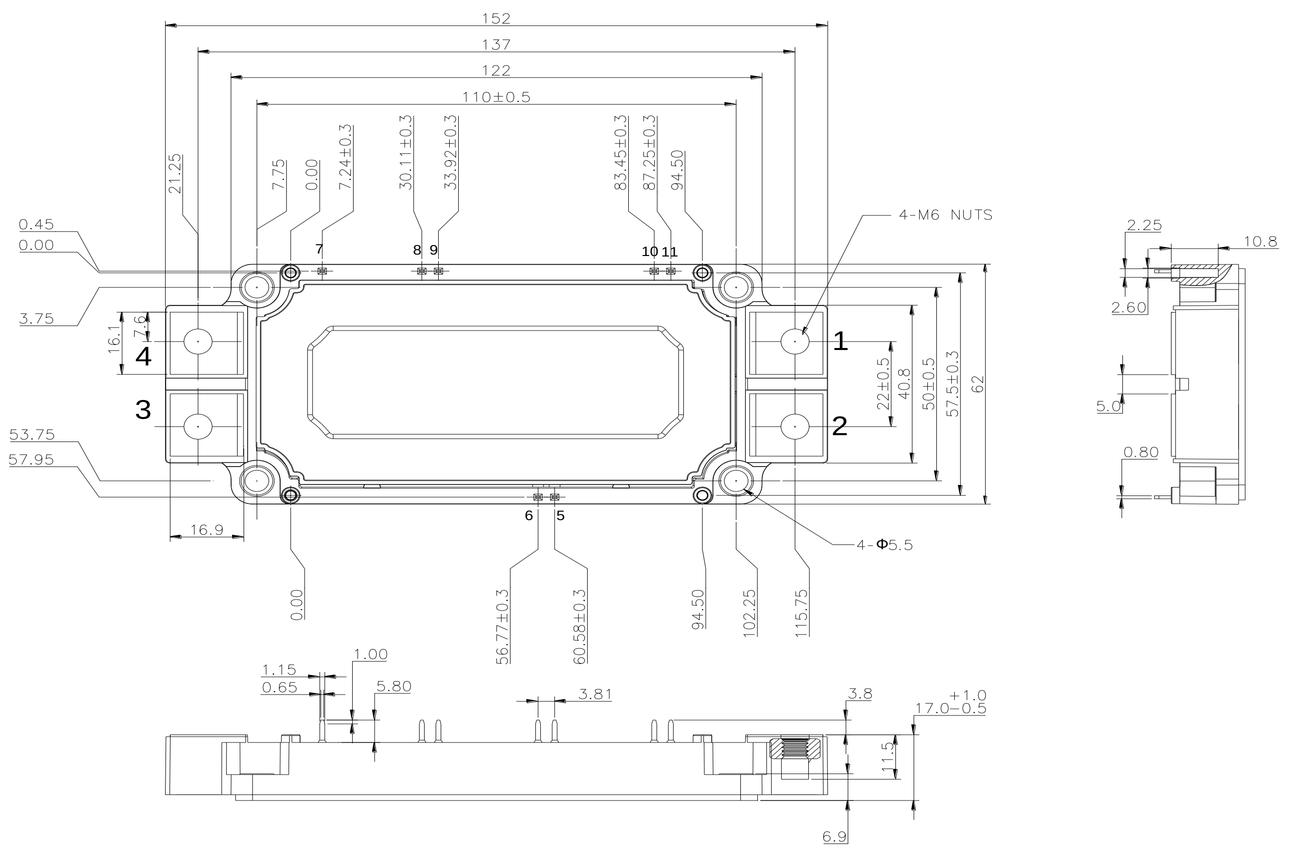


Figure 38. Turn-off Transient Definitions

Pinout and Circuit Diagram



Package Dimensions (mm)



Revision History		
Date	Revision	Notes
1/16/2026	0.1	Preliminary release

Notes

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 2015/863 (RoHS3), as implemented July, 2019. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.SemiQ.com.

REACh Compliance

REACh substances of high concern (SVHC) information is available for this product. Since the European Chemicals Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future,please contact our office at SemiQ Headquarters in Lake Forest, California to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request. SemiQ Inc., reserves the right to make changes to the product specifications and data in this document without notice. SemiQ products are sold pursuant to SemiQ's terms and conditions of sale in place at the time of order acknowledgement.

This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communi cation or control systems, or air traffic control.

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