

Features

- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Halogen free, RoHS compliant

Benefits

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

Applications

- Solar inverters
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies

Part Number	Package	Marking
GC3M0030090K	TO-247-4	GC3M0030090

Maximum Ratings ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	900	V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+19	V	AC ($f > 1\text{ Hz}$)	Note: 1
V_{GSop}	Gate - Source Voltage (static)	-4/+15	V	Static	Note: 2
I_D	Continuous Drain Current	73	A	$V_{GS} = 15\text{ V}, T_c = 25^\circ\text{C}$	Fig. 19
		48		$V_{GS} = 15\text{ V}, T_c = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	200	A	Pulse width t_p limited by T_{jmax}	Fig. 22
P_D	Power Dissipation	240	W	$T_c = 25^\circ\text{C}, T_j = 150^\circ\text{C}$	Fig. 20
T_J, T_{stg}	Operating Junction and Storage Temperature	-40 to +150	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$	1.6mm (0.063") from case for 10s	
M_d	Mounting Torque, (M3 or 6-32 screw)	1	Nm		
		8.8	lbf-in		

Note (1): When using MOSFET Body Diode $V_{GSmax} = -4\text{V}/+19\text{V}$

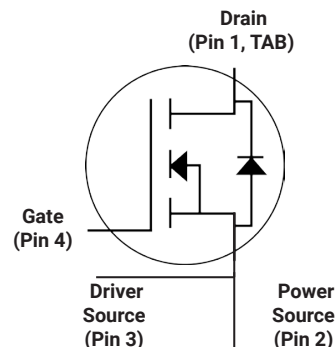
Note (2): MOSFET can also safely operate at $0/+15\text{ V}$

V_{DS} 900 V
 $I_D @ 25^\circ\text{C}$ 73 A
 $R_{DS(on)}$ 30 m Ω



TO-247-4

Package



Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	900			V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	1.7	2.4	3.5	V	$V_{DS} = V_{GS}, I_D = 11\text{ mA}$	Fig. 11
			2.1		V	$V_{DS} = V_{GS}, I_D = 11\text{ mA}, T_J = 150^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	$V_{DS} = 900\text{ V}, V_{GS} = 0\text{ V}$	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	$V_{GS} = 15\text{ V}, V_{DS} = 0\text{ V}$	
$R_{DS(on)}$	Drain-Source On-State Resistance		30	39	m Ω	$V_{GS} = 15\text{ V}, I_D = 35\text{ A}$	Fig. 4, 5, 6
			41			$V_{GS} = 15\text{ V}, I_D = 35\text{ A}, T_J = 150^\circ\text{C}$	
g_{fs}	Transconductance		23		S	$V_{DS} = 20\text{ V}, I_{DS} = 35\text{ A}$	Fig. 7
			22			$V_{DS} = 20\text{ V}, I_{DS} = 35\text{ A}, T_J = 150^\circ\text{C}$	
C_{iss}	Input Capacitance		1503		pF	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}$ $f = 1\text{ MHz}$ $V_{AC} = 25\text{ mV}$	Fig. 17, 18
C_{oss}	Output Capacitance		144				
C_{rss}	Reverse Transfer Capacitance		5				
E_{oss}	C_{oss} Stored Energy		30		μJ		Fig. 16
E_{ON}	Turn-On Switching Energy (SiC Diode FWD)		133		μJ	$V_{DS} = 600\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}, I_D = 35\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 59\text{ }\mu\text{H}, T_J = 150^\circ\text{C}$	Fig. 26, 29b
E_{OFF}	Turn Off Switching Energy (SiC Diode FWD)		111				
E_{ON}	Turn-On Switching Energy (Body Diode FWD)		246		μJ	$V_{DS} = 600\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}, I_D = 35\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 59\text{ }\mu\text{H}, T_J = 150^\circ\text{C}$	Fig. 26, 29a
E_{OFF}	Turn Off Switching Energy (Body Diode FWD)		99				
$t_{d(on)}$	Turn-On Delay Time		9		ns	$V_{DD} = 600\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$ $I_D = 35\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega,$ Timing relative to V_{DS} Inductive load	Fig. 27
t_r	Rise Time		15				
$t_{d(off)}$	Turn-Off Delay Time		24				
t_f	Fall Time		9				
$R_{G(int)}$	Internal Gate Resistance		3		Ω	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	
Q_{gs}	Gate to Source Charge		20		nC	$V_{DS} = 600\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$ $I_D = 35\text{ A}$ Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		26				
Q_g	Total Gate Charge		74				

Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.5		V	$V_{GS} = -4\text{ V}, I_{SD} = 17.5\text{ A}$	Fig. 8, 9, 10
		4.0		V	$V_{GS} = -4\text{ V}, I_{SD} = 17.5\text{ A}, T_J = 150^\circ\text{C}$	
I_S	Continuous Diode Forward Current		48	A	$V_{GS} = -4\text{ V}, T_c = 25^\circ\text{C}$	Note 1
$I_{S, pulse}$	Diode pulse Current		200	A	$V_{GS} = -4\text{ V},$ pulse width t_p limited by T_{jmax}	Note 1
t_{rr}	Reverse Recover time	24		ns	$V_{GS} = -4\text{ V}, I_{SD} = 35\text{ A}, V_R = 600\text{ V}$ $\text{dif}/\text{dt} = 3075\text{ A}/\mu\text{s}, T_J = 150^\circ\text{C}$	Note 1
Q_{rr}	Reverse Recovery Charge	536		nC		
I_{rrm}	Peak Reverse Recovery Current	35		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.48	0.52	$^\circ\text{C}/\text{W}$		Fig. 21
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient		40			

Typical Performance

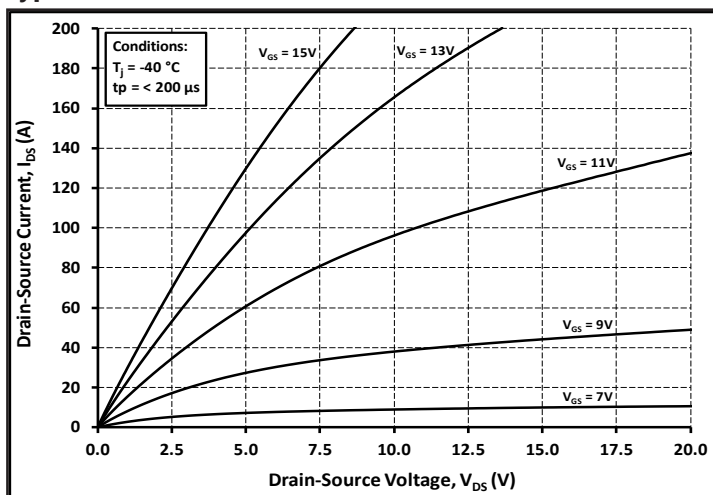


Figure 1. Output Characteristics $T_J = -40\text{ }^{\circ}\text{C}$

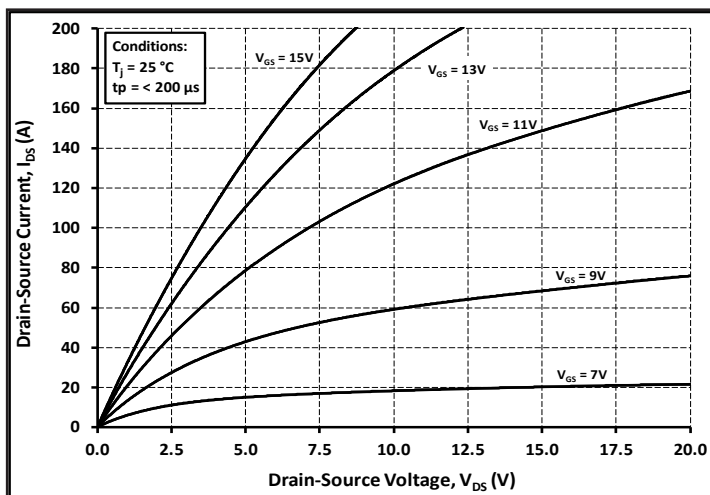


Figure 2. Output Characteristics $T_J = 25\text{ }^{\circ}\text{C}$

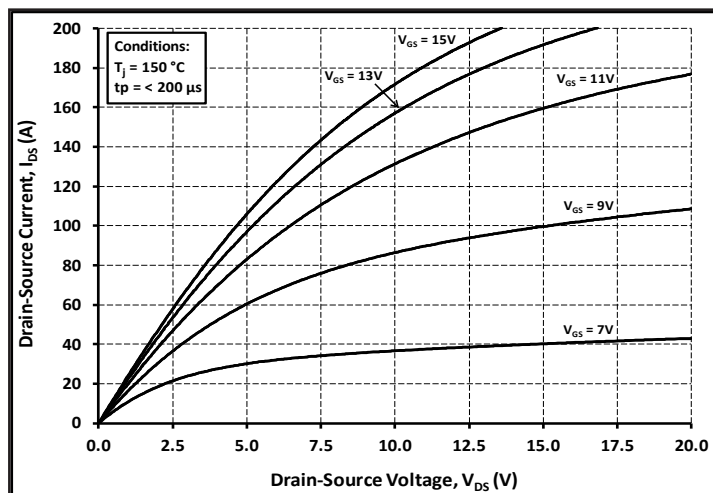


Figure 3. Output Characteristics $T_J = 150\text{ }^{\circ}\text{C}$

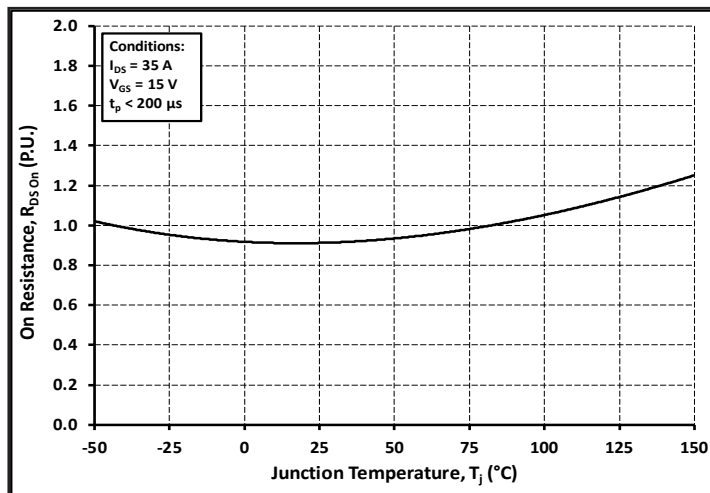


Figure 4. Normalized On-Resistance vs. Temperature

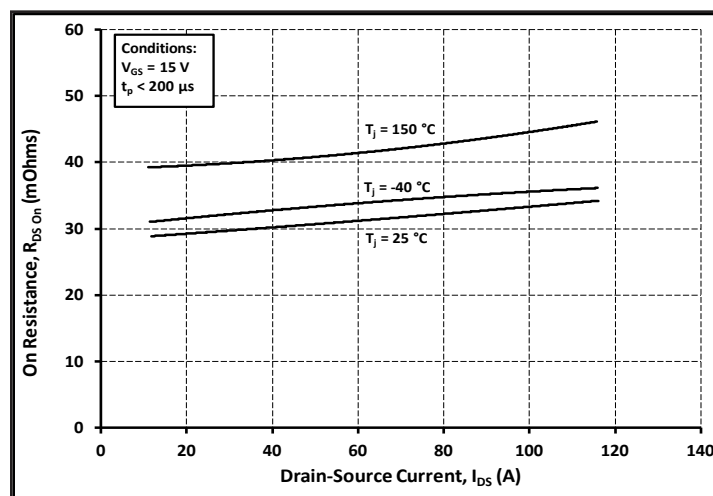


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

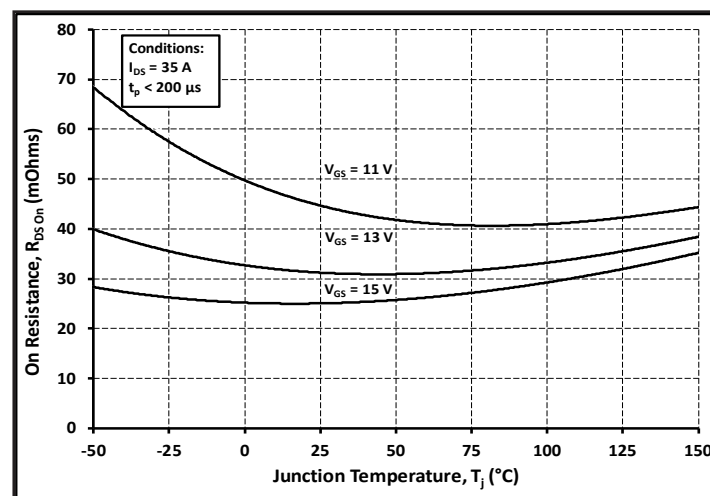


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

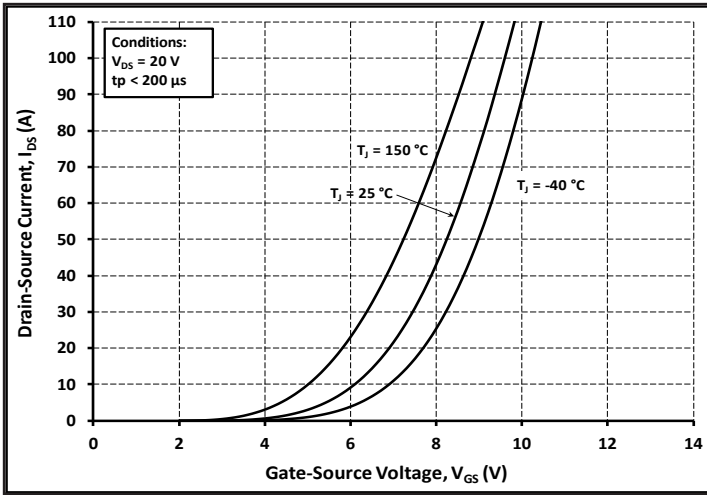


Figure 7. Transfer Characteristic for Various Junction Temperatures

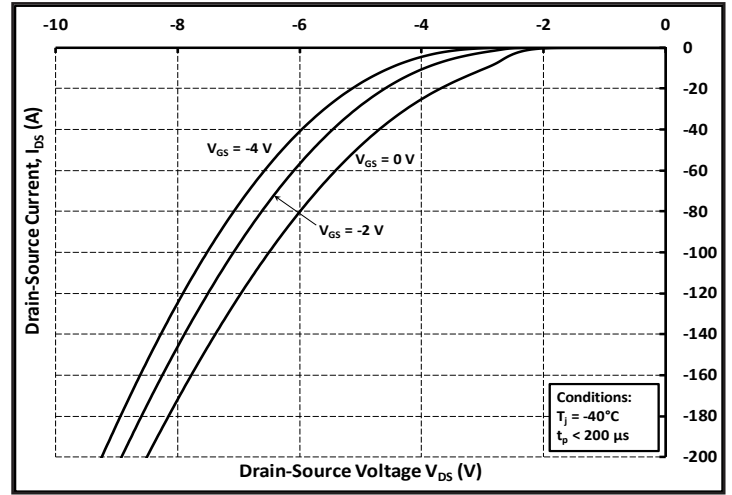


Figure 8. Body Diode Characteristic at -40 °C

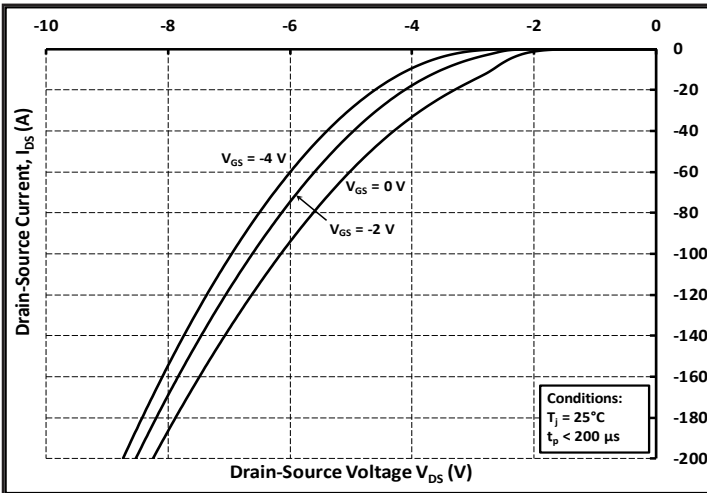


Figure 9. Body Diode Characteristic at 25 °C

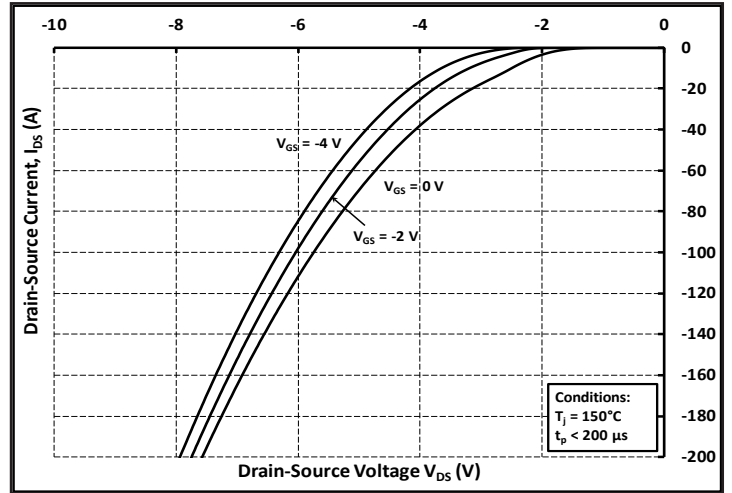


Figure 10. Body Diode Characteristic at 150 °C

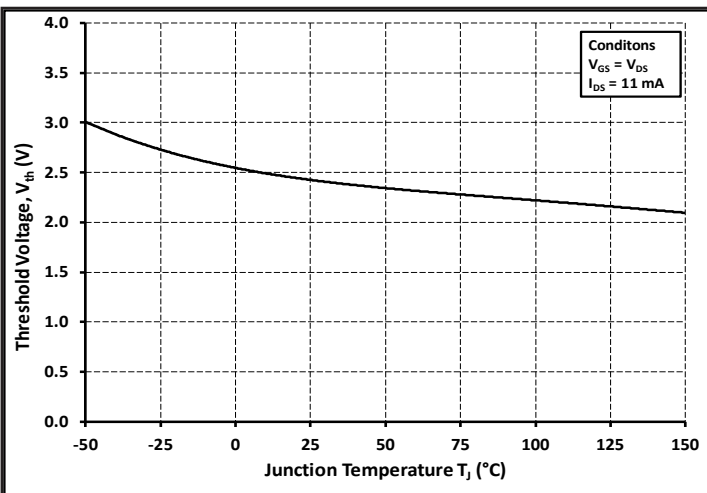


Figure 11. Threshold Voltage vs. Temperature

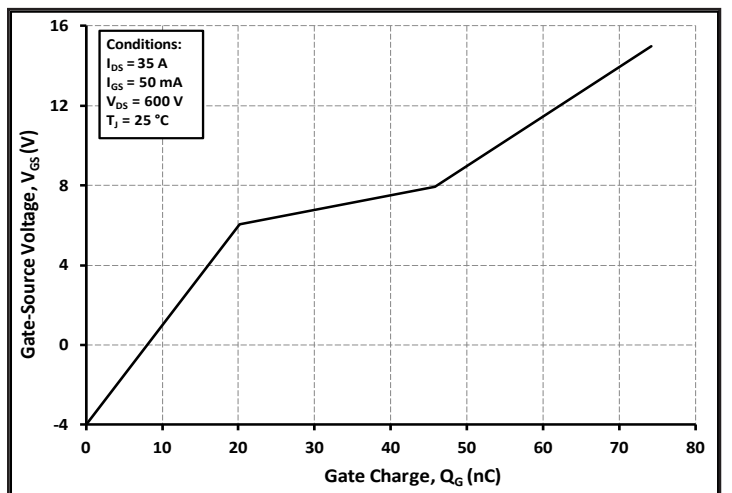


Figure 12. Gate Charge Characteristics

Typical Performance

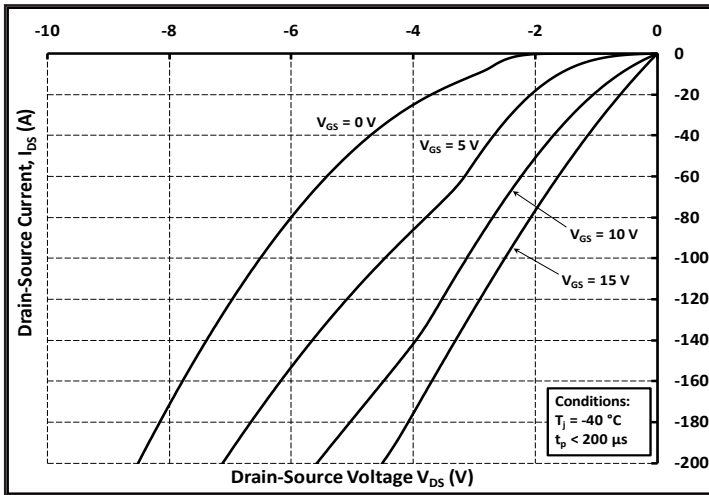


Figure 13. 3rd Quadrant Characteristic at -40 °C

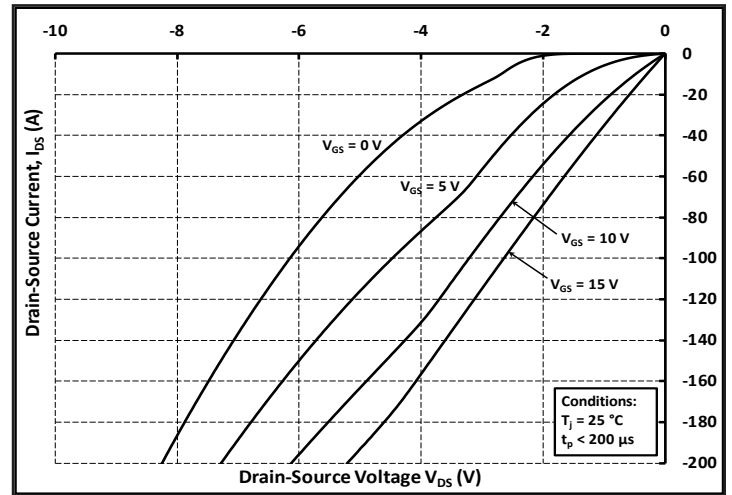


Figure 14. 3rd Quadrant Characteristic at 25 °C

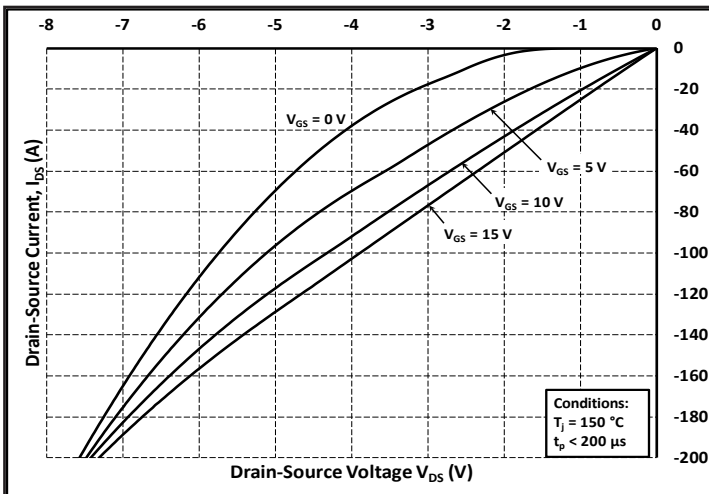


Figure 15. 3rd Quadrant Characteristic at 150 °C

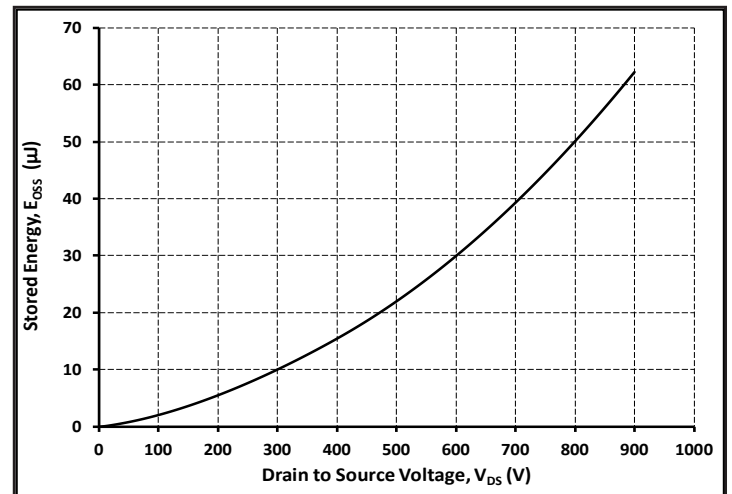


Figure 16. Output Capacitor Stored Energy

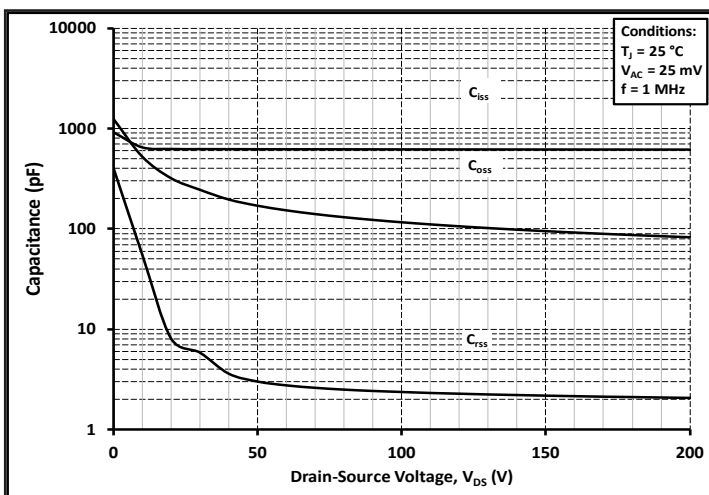


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

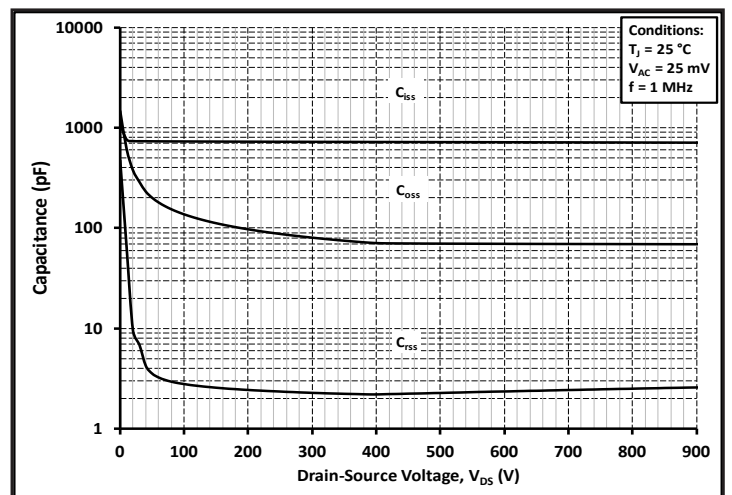


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 900V)

Typical Performance

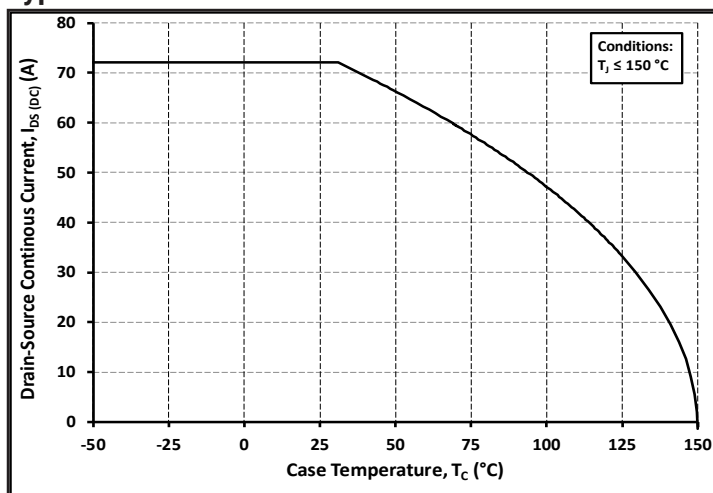


Figure 19. Continuous Drain Current Derating vs. Case Temperature

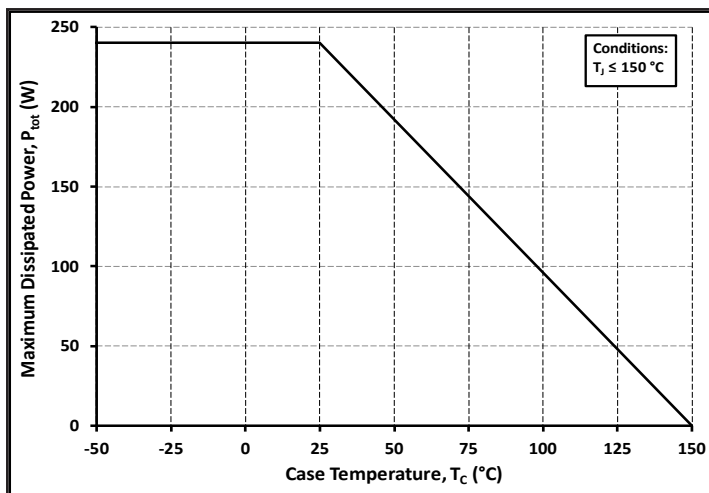


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

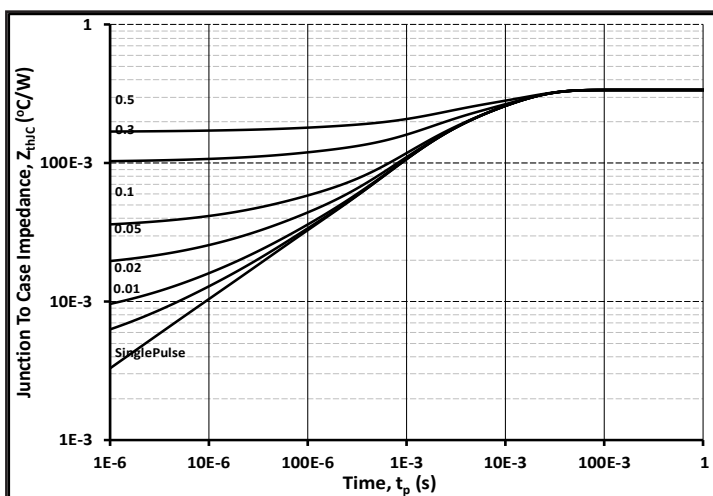


Figure 21. Transient Thermal Impedance (Junction - Case)

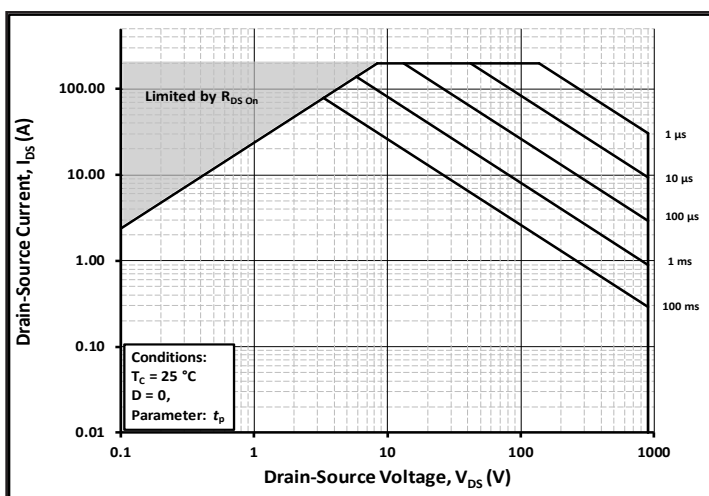


Figure 22. Safe Operating Area

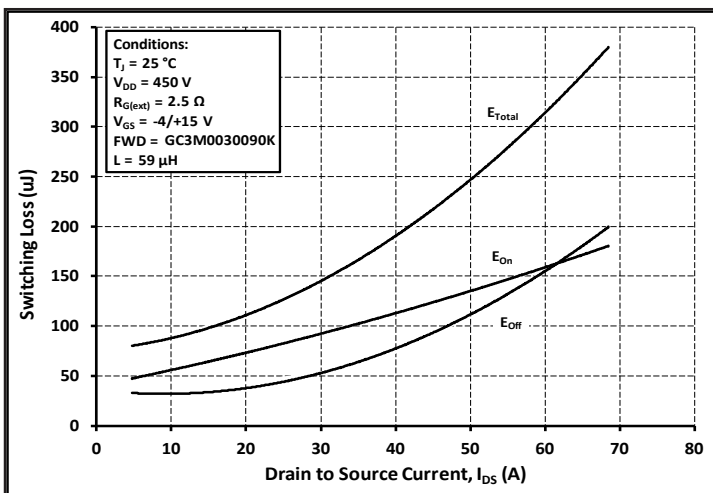


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 450V$)

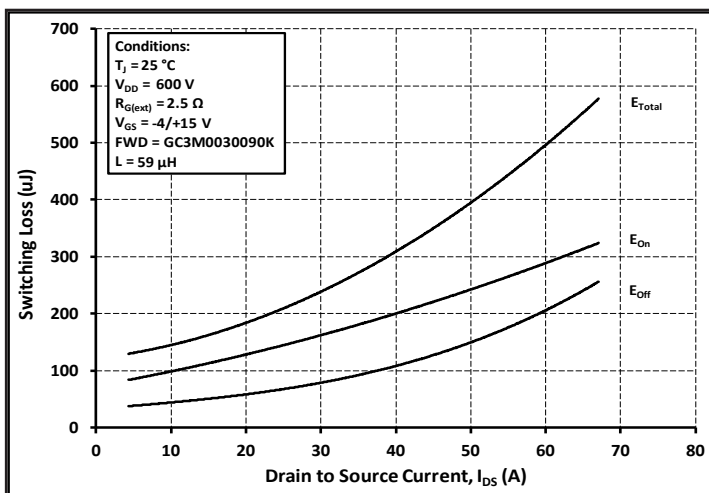


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

Typical Performance

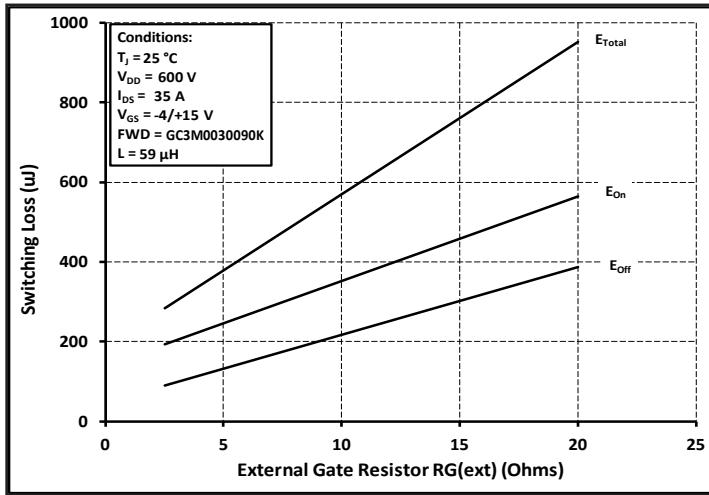


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

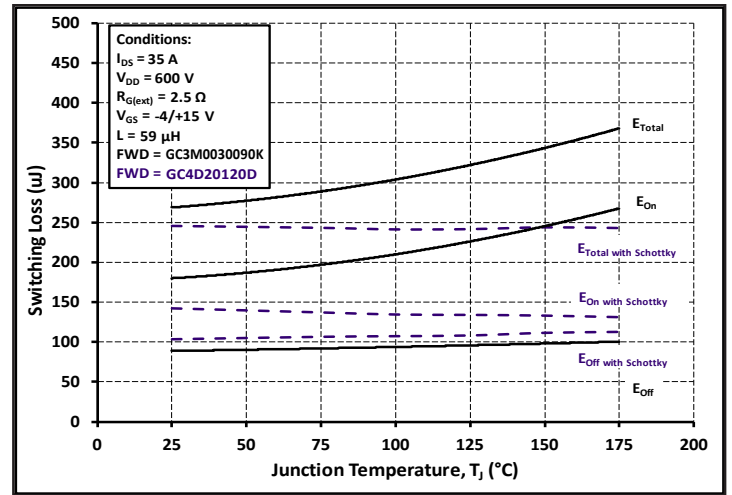


Figure 26. Clamped Inductive Switching Energy vs. Temperature

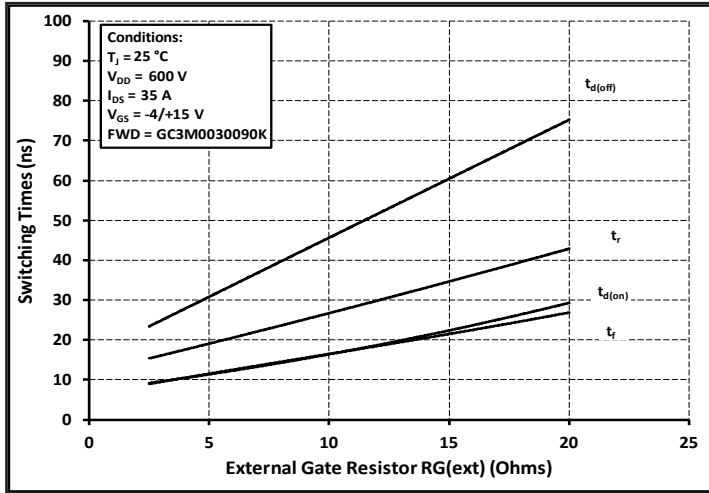


Figure 27. Switching Times vs. $R_{G(ext)}$

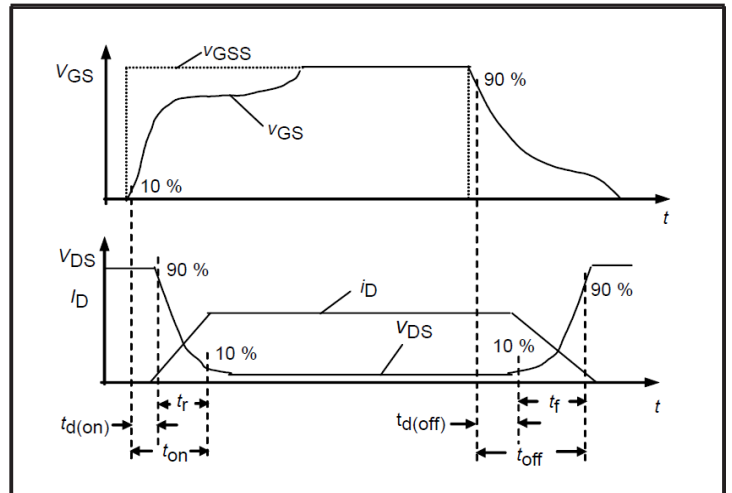


Figure 28. Switching Times Definition

Test Circuit Schematic

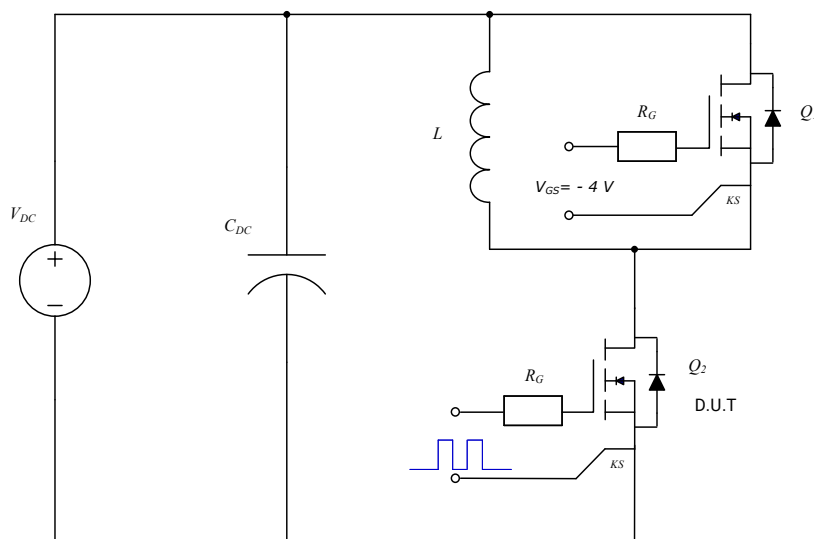


Figure 29a. Clamped Inductive Switching Test Circuit Using MOSFET Intrinsic Body Diode

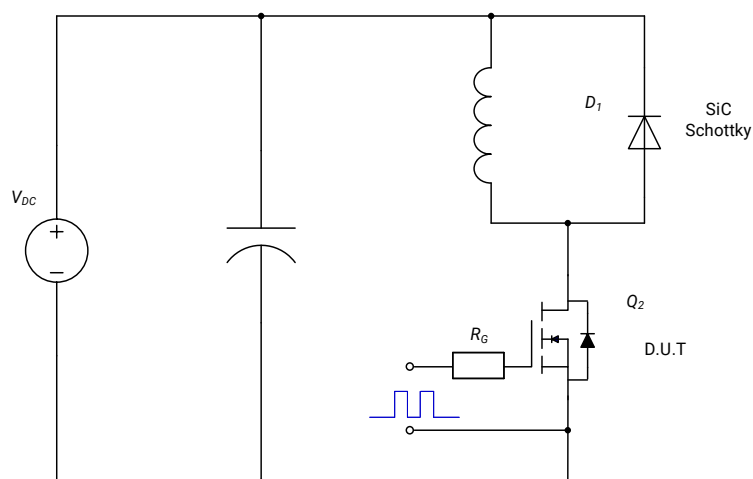
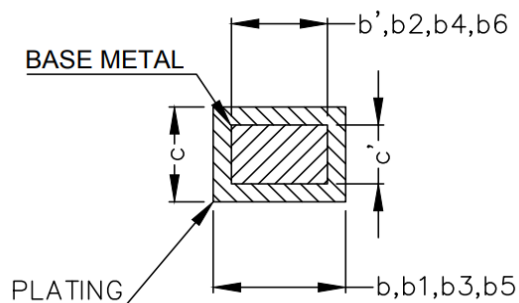
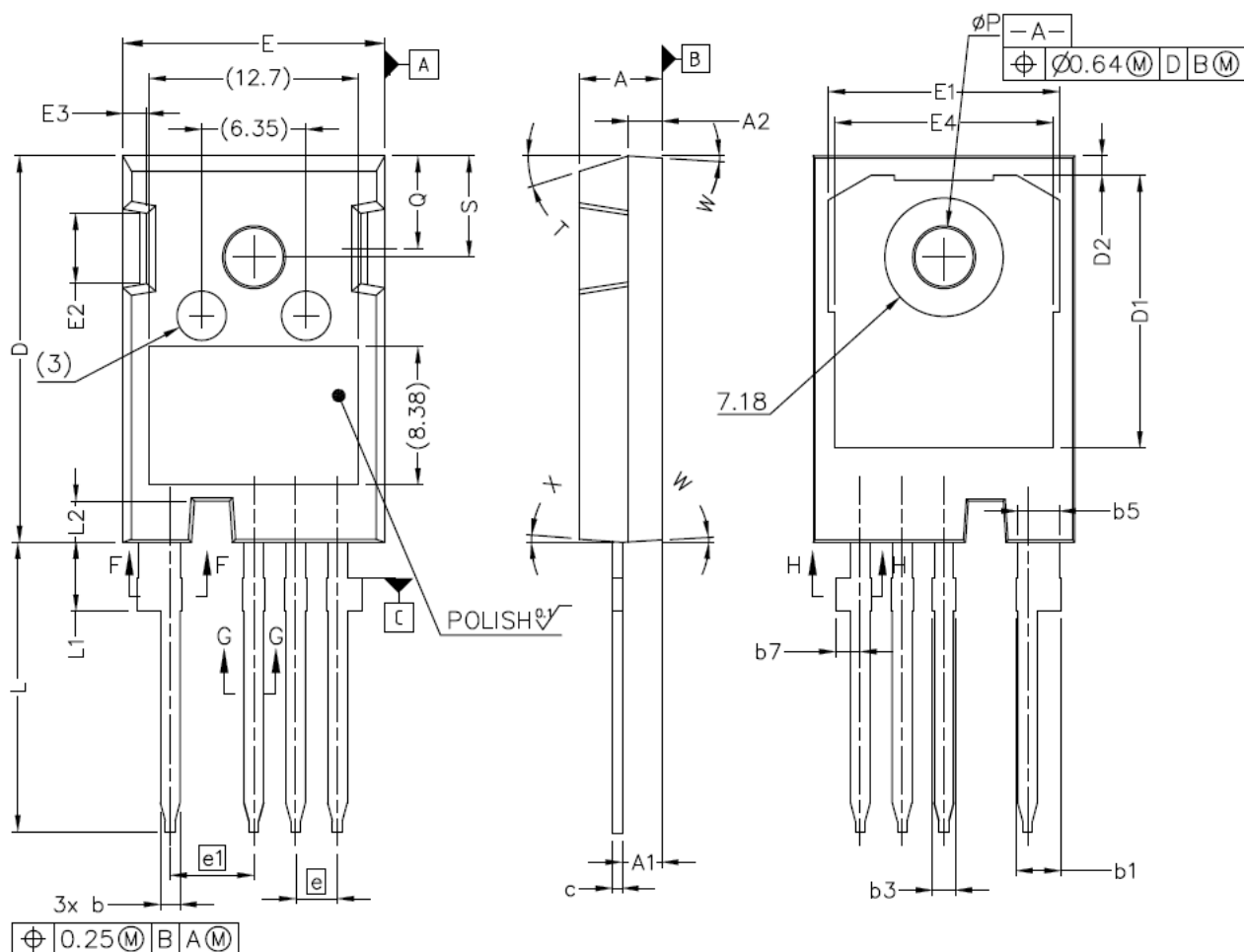


Figure 29b. Clamped Inductive Switching Test Circuit Using SiC Schottky Diode

Package Dimensions

Package TO-247-4L



SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

Package Dimensions

Package TO-247-4L

SYM	MILLIMETERS	
	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	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
b7	1.30	1.70
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

SYM	MILLIMETERS	
	MIN	MAX
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N*	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
Ø P	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.	

