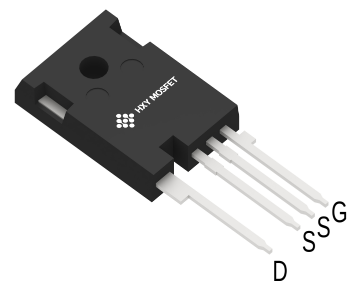
SCT3080KRC14

SiC Power MOSFET N-Channel Enhancement Mode

Features

- 3rd generation SiC MOSFET technology
- 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



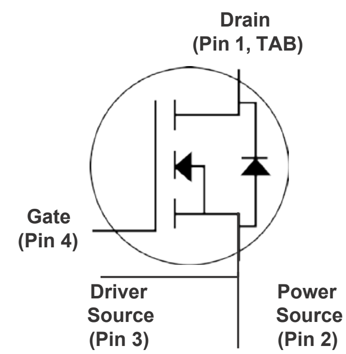
TO-247H-4L
(TO-247H-4)

Benefits

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

Applications

- Renewable energy
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies



Ordering Part Number	Package	Qty(PCS)	T_J , T_{stg} Range
SCT3080KRC14	TO-247H-4L (TO-247H-4)	30	-55 - 150 ˚C

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	V_{GS} = 0 V, I_D = 100 µA	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+19	V	AC (f >1 Hz)	Note: 1
V_{GSop}	Gate - Source Voltage (static)	-4/+15	V	Static	Note: 2
I_D	Continuous Drain Current	32	A	V_{GS} = 15 V, T_C = 25˚C	Fig. 19
		23		V_{GS} = 15 V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_P limited by T_{jmax}	Fig. 22
P_D	Power Dissipation	136	W	T_C=25˚C, T_J = 175 ˚C	Fig. 20
T_J , T_{stg}	Operating Junction and Storage Temperature	-40 to +175	˚C		
T_L	Solder Temperature	260	˚C	1.6mm (0.063”) from case for 10s	

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

Note (2): MOSFET can also safely operate at 0/+15 V

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	V_{GS} = 0 V, I_D = 100 μA	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.5	3.6	V	V_{DS} = V_{GS}, I_D = 5 mA	Fig. 11
			2.2		V	V_{DS} = V_{GS}, I_D = 5 mA, T_J = 175ºC	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	V_{DS} = 1200 V, V_{GS} = 0 V	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	V_{GS} = 15 V, V_{DS} = 0 V	
$R_{DS(on)}$	Drain-Source On-State Resistance		75	90	mΩ	V_{GS} = 15 V, I_D = 20 A	Fig. 4, 5, 6
			120			V_{GS} = 15 V, I_D = 20A, T_J = 175ºC	
g_{fs}	Transconductance		12		S	V_{DS}= 20 V, I_{DS}= 20 A	Fig. 7
			13			V_{DS}= 20 V, I_{DS}= 20 A, T_J = 175ºC	
C_{iss}	Input Capacitance		1390		pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 1 MHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		58				
C_{rss}	Reverse Transfer Capacitance		2				
E_{oss}	C_{oss} Stored Energy		33		μJ		Fig. 16
E_{ON}	Turn-On Switching Energy (Body Diode FWD)		270		μJ	V_{DS} = 800 V, V_{GS} = -4 V/15 V, I_D = 20A, $R_{G(ext)}$ = 0 Ω, L= 156 μH, T_J = 150ºC	Fig. 26, 29
E_{OFF}	Turn-Off Switching Energy (Body Diode FWD)		77				
$t_{d(on)}$	Turn-On Delay Time		30		ns	V_{DD} = 800 V, V_{GS} = -4 V/15 V I_D = 20 A, $R_{G(ext)}$ = 0 Ω, Timing relative to V_{DS} Inductive load	Fig. 27, 28
t_r	Rise Time		14				
$t_{d(off)}$	Turn-Off Delay Time		38				
t_f	Fall Time		10				
$R_{G(int)}$	Internal Gate Resistance		9.0		Ω	f = 1 MHz, V_{AC} = 25 mV	
Q_{gs}	Gate to Source Charge		17		nC	V_{DS} = 800 V, V_{GS} = -4 V/15 V I_D = 20 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		18				
Q_g	Total Gate Charge		53				

Reverse Diode Characteristics (T_C = 25˚C unles1s otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.5		V	V_{GS} = -4 V, I_{SD} = 10 A	Fig. 8, 9, 10
		4.0		V	V_{GS} = -4 V, I_{SD} = 10 A, T_J = 175 °C	
I_S	Continuous Diode Forward Current		26	A	V_{GS} = -4 V, T_J = 25 ˚C	Note 1
$I_{S, pulse}$	Diode pulse Current	80		A	V_{GS} = -4 V, pulse width t_P limited by T_{jmax}	Note 1
t_{rr}	Reverse Recover time	20		ns	V_{GS} = -4 V, I_{SD} = 20 A, V_R = 800 V dif/dt = 3600 A/µs, T_J = 150 °C	Note 1
Q_{rr}	Reverse Recovery Charge	254		nC		
I_{rrm}	Peak Reverse Recovery Current	18		A		

Thermal Characteristics

Symbol	Parameter	Max.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	1.1	°C/W		Fig. 21
$R_{θJA}$	Thermal Resistance From Junction to Ambient	40			

Typical Performance

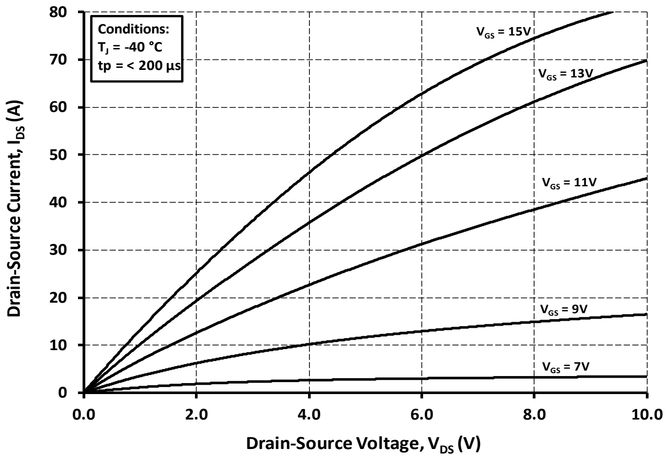


Figure 1. Output Characteristics T_J = -40 °C

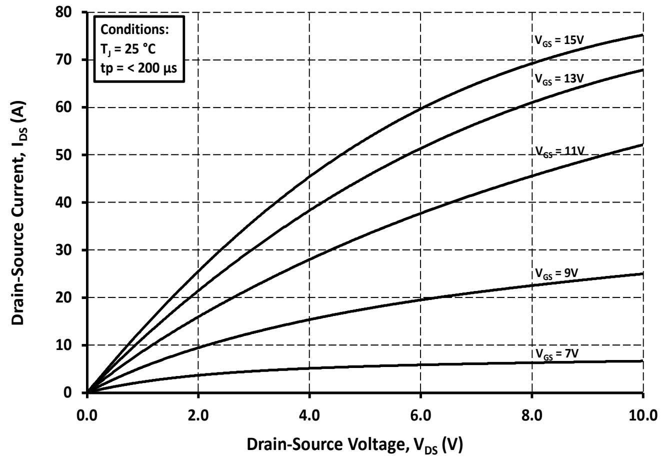


Figure 2. Output Characteristics T_J = 25 °C

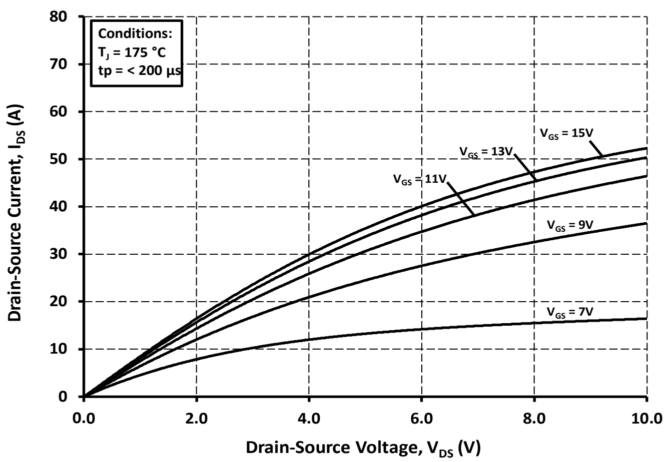


Figure 3. Output Characteristics T_J = 175 °C

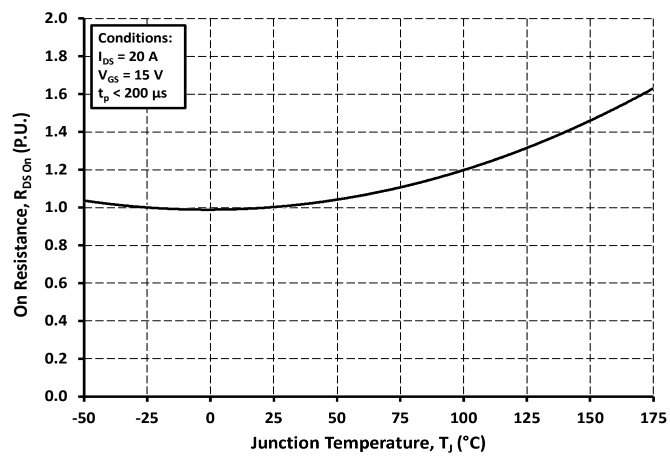


Figure 4. Normalized On-Resistance vs. Temperature

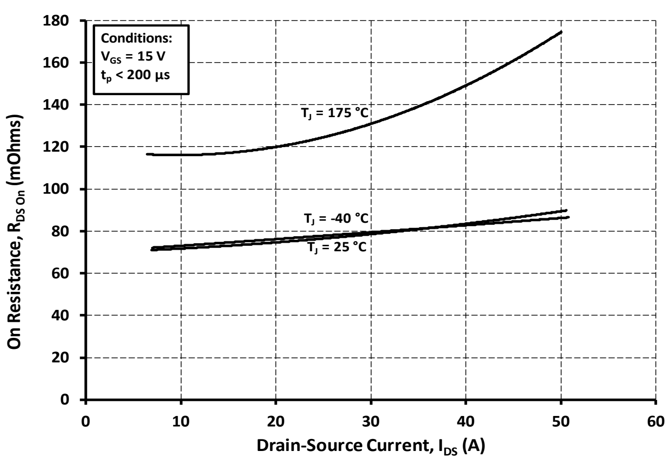


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

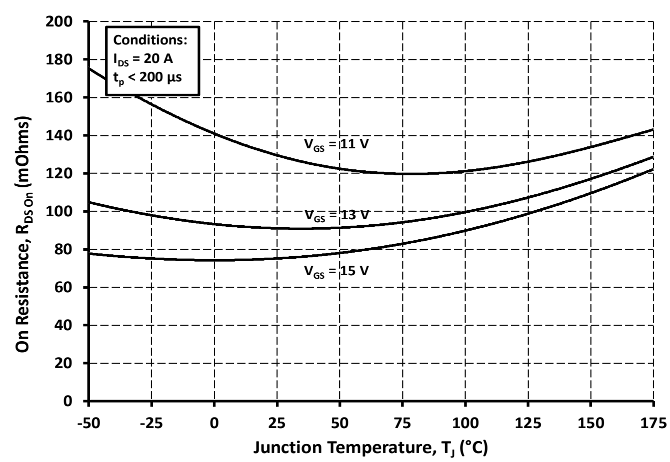


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

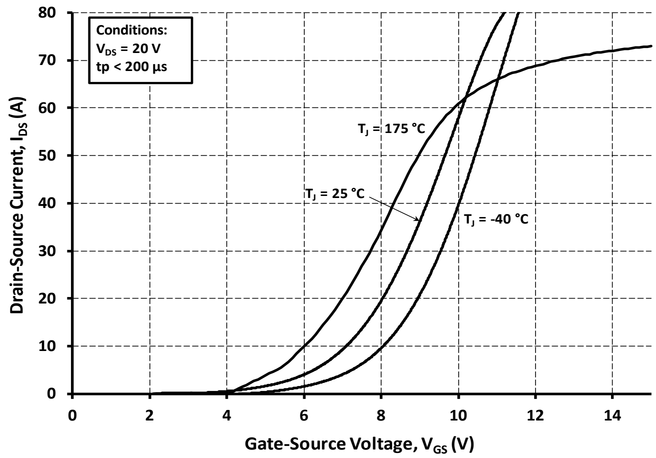


Figure 7. Transfer Characteristic for Various Junction Temperatures

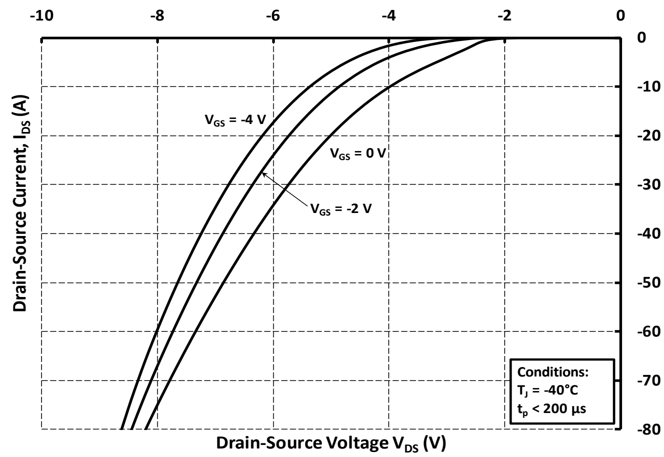


Figure 8. Body Diode Characteristic at -40 °C

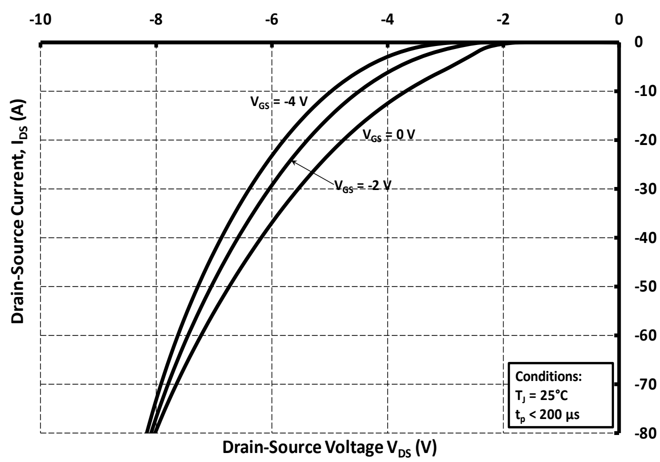


Figure 9. Body Diode Characteristic at 25 °C

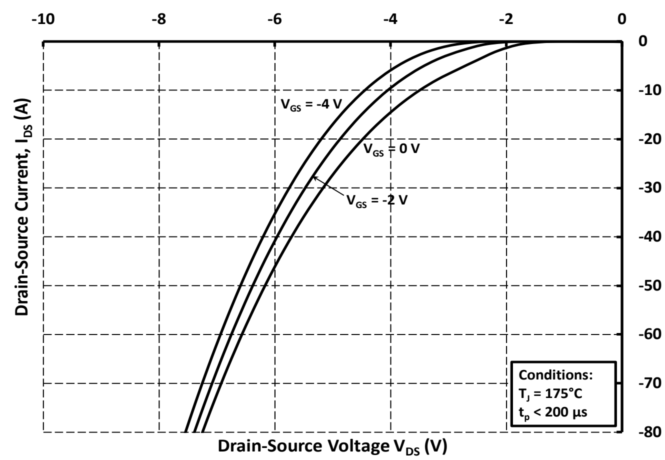


Figure 10. Body Diode Characteristic at 175 °C

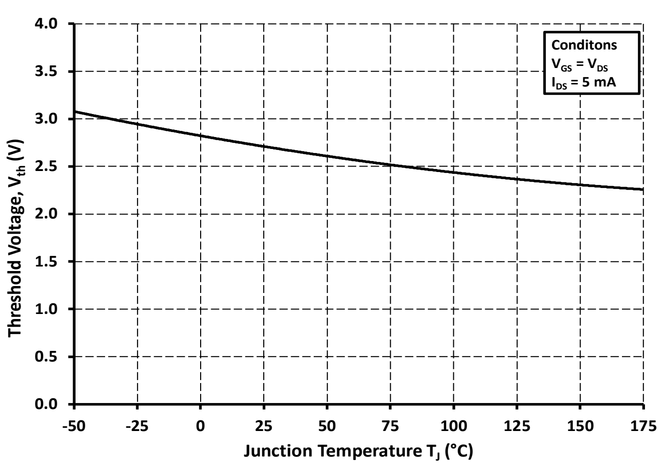


Figure 11. Threshold Voltage vs. Temperature

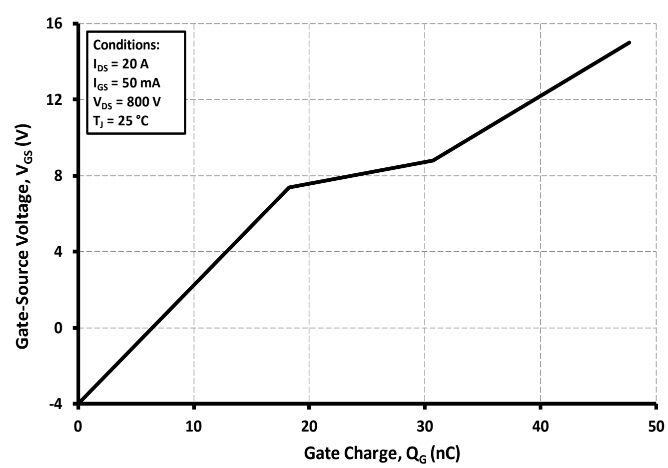


Figure 12. Gate Charge Characteristics

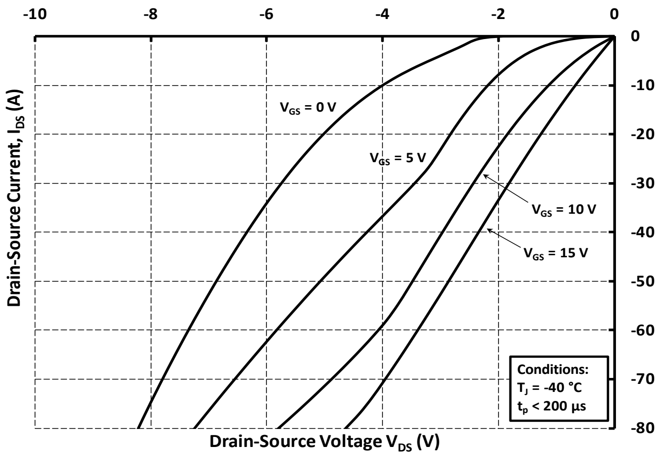


Figure 13. 3rd Quadrant Characteristic at -40 °C

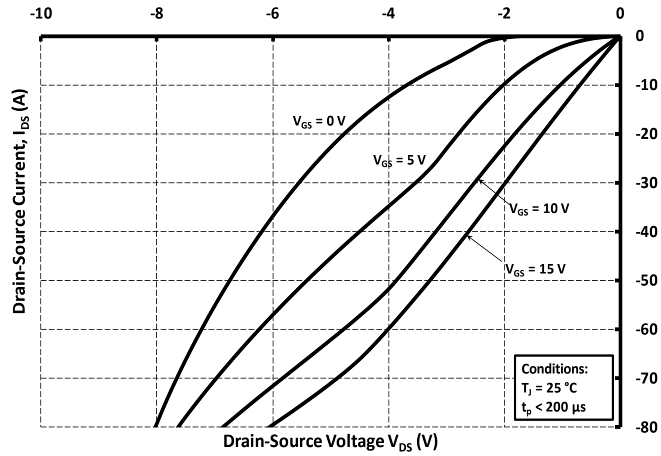


Figure 14. 3rd Quadrant Characteristic at 25 °C

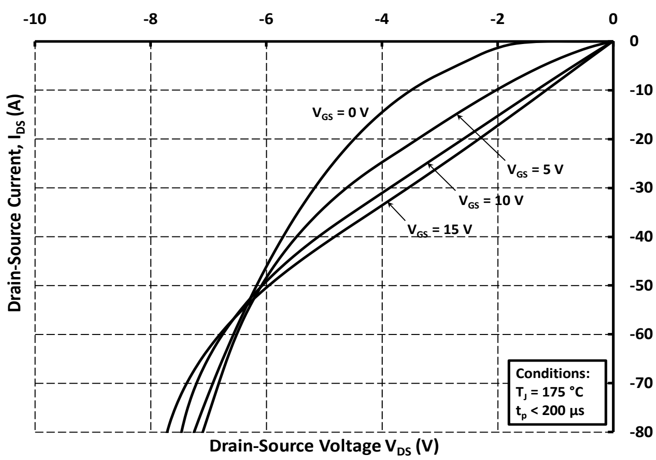


Figure 15. 3rd Quadrant Characteristic at 175 °C

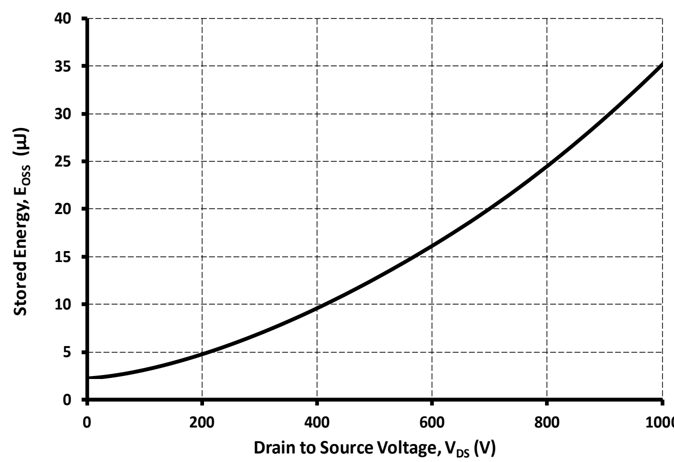


Figure 16. Output Capacitor Stored Energy

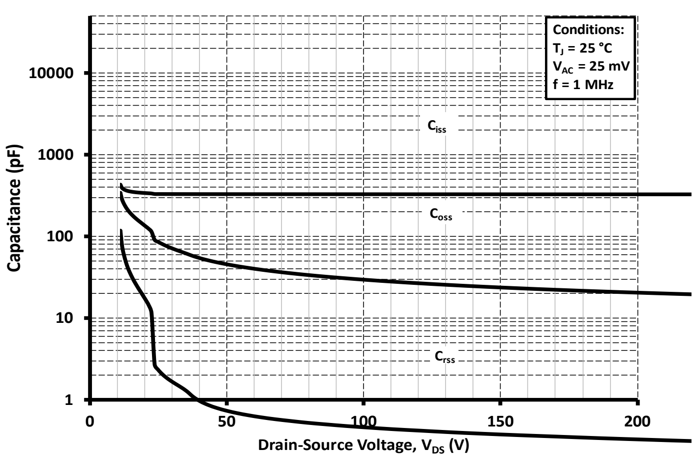


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

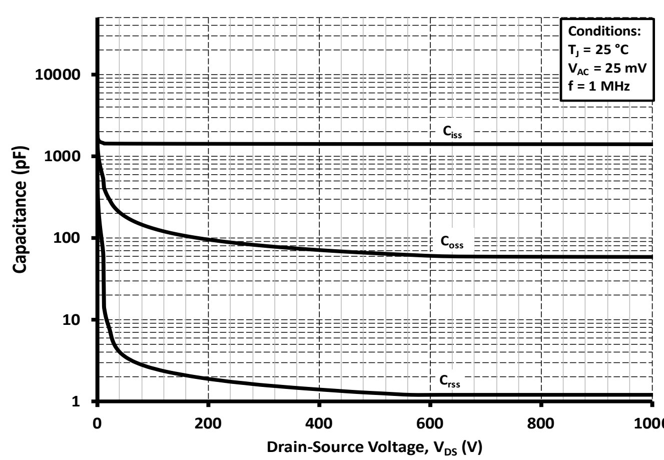


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

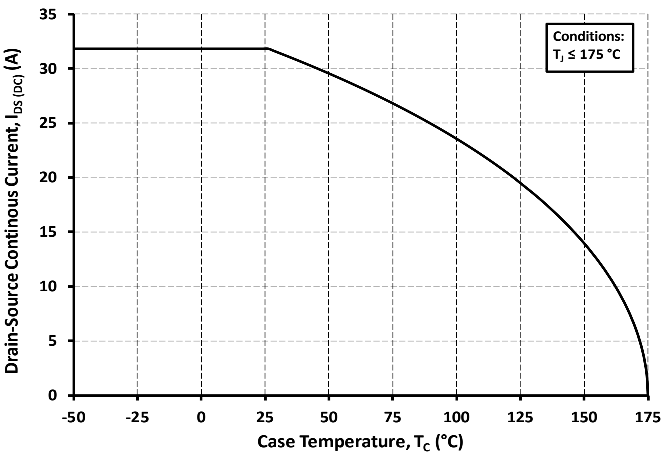


Figure 19. Continuous Drain Current Derating vs. Case Temperature

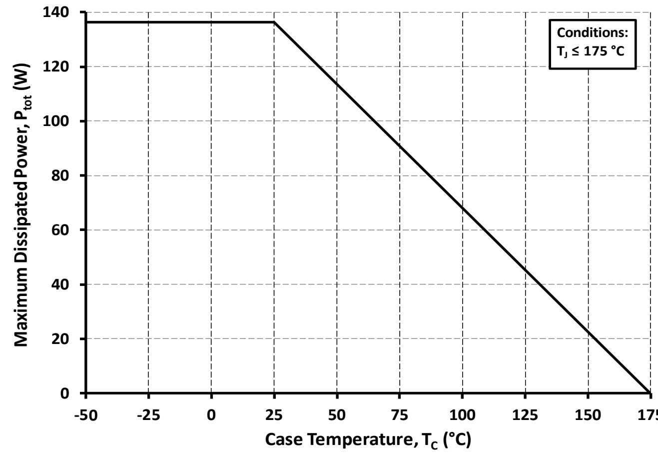


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

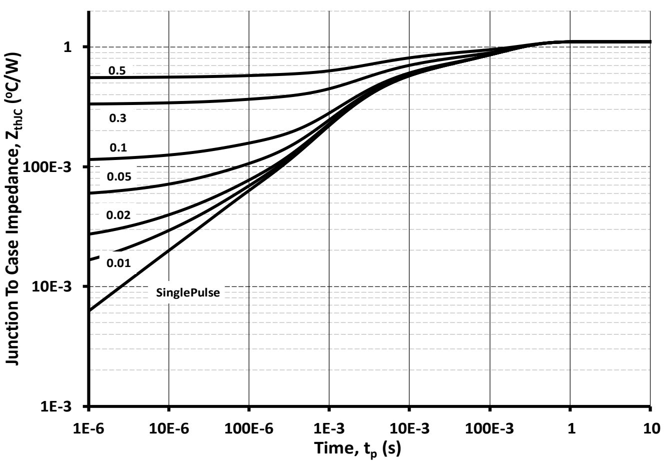


Figure 21. Transient Thermal Impedance (Junction - Case)

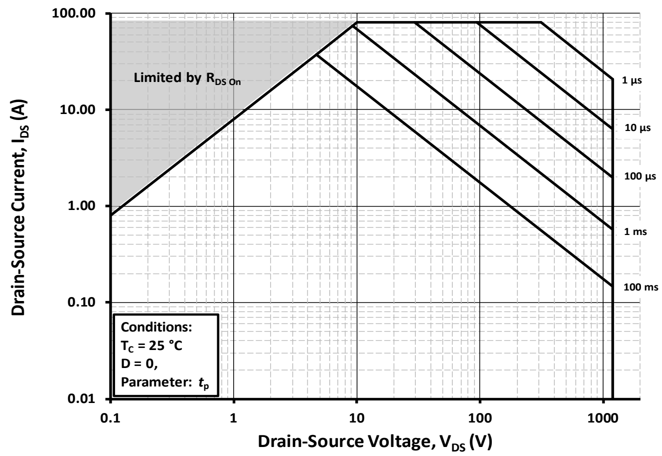


Figure 22. Safe Operating Area

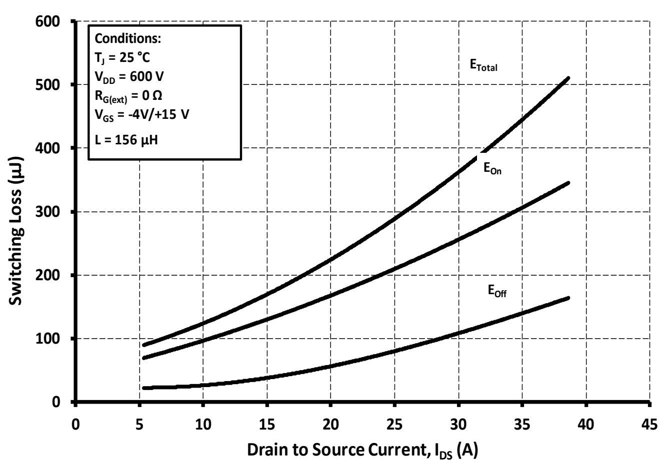


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

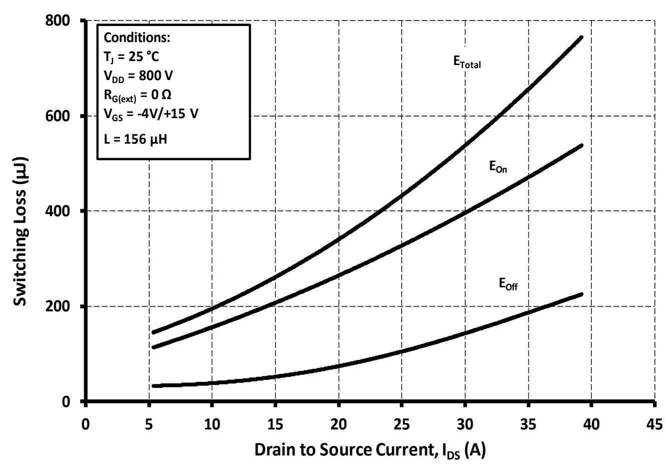


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

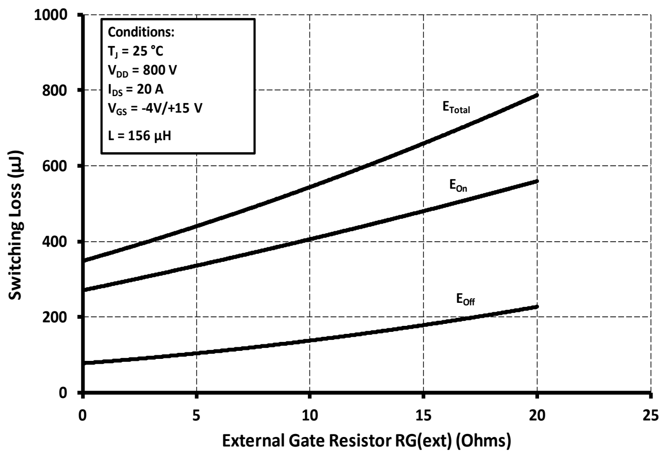


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

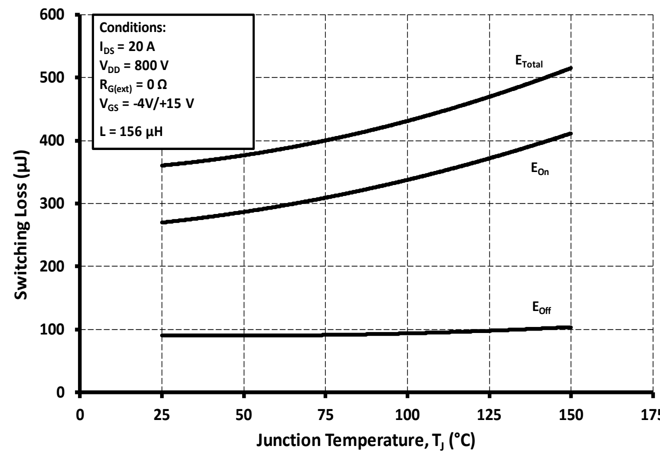


Figure 26. Clamped Inductive Switching Energy vs. Temperature

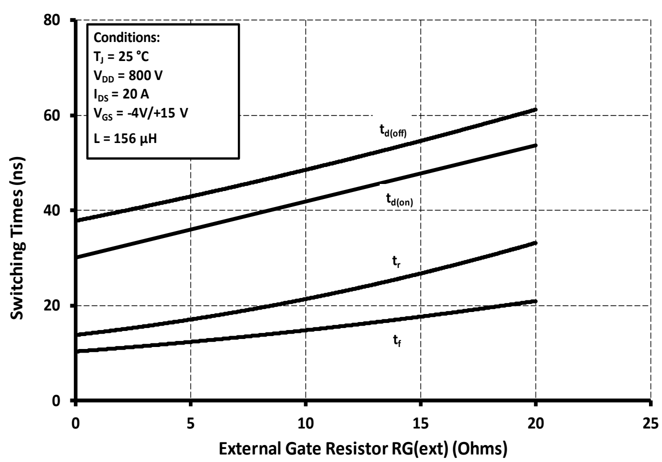


Figure 27. Switching Times vs. $R_{G(ext)}$

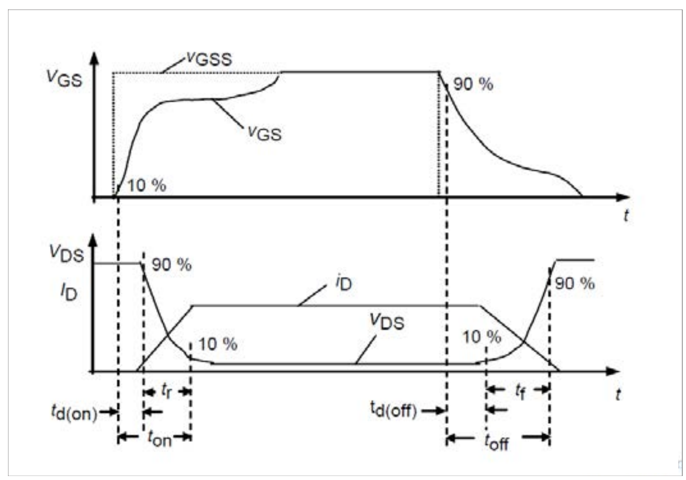


Figure 28. Switching Times Definition

Test Circuit Schematic

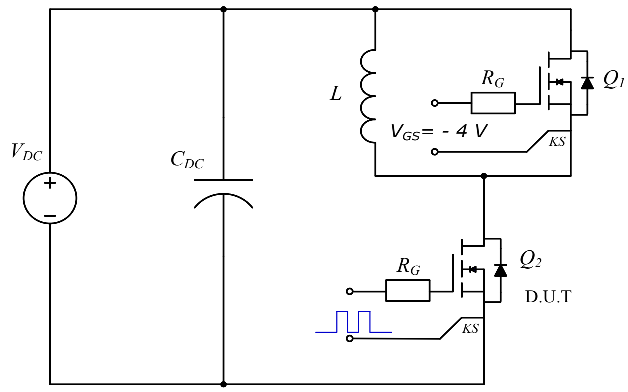
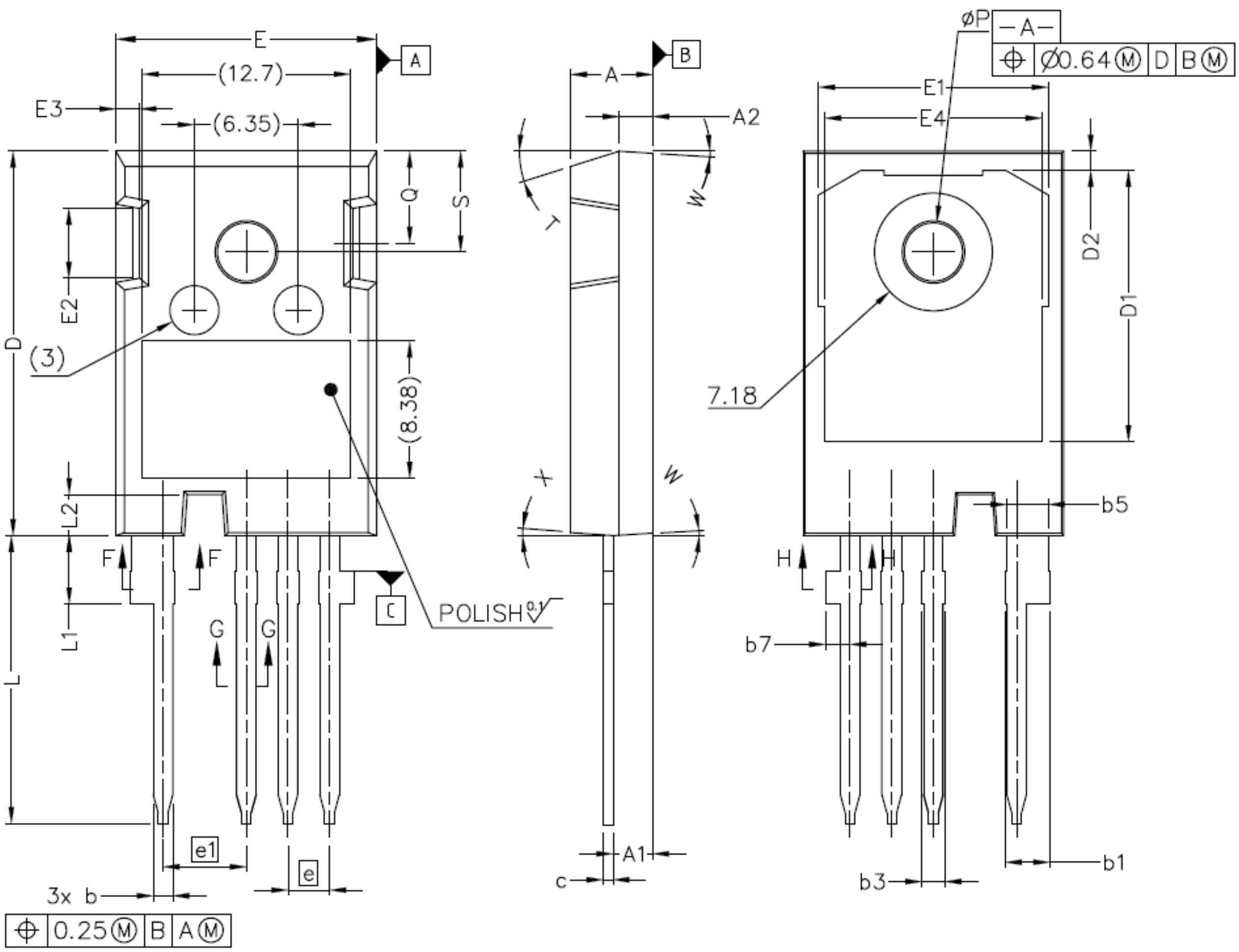


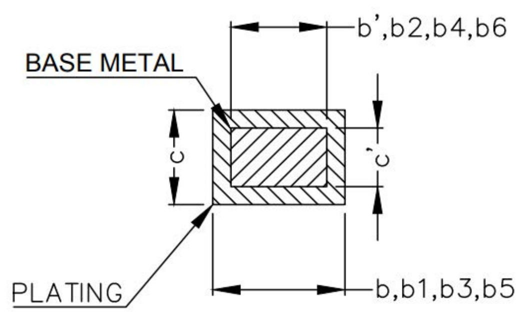
Figure 29. Clamped Inductive Switching
Waveform Test Circuit

Note (3): Turn-off and Turn-on switching energy and timing values measured using SiC MOSFET Body Diode as shown above.

Package Dimensions

Package TO-247H-4L(TO-247H-4)





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

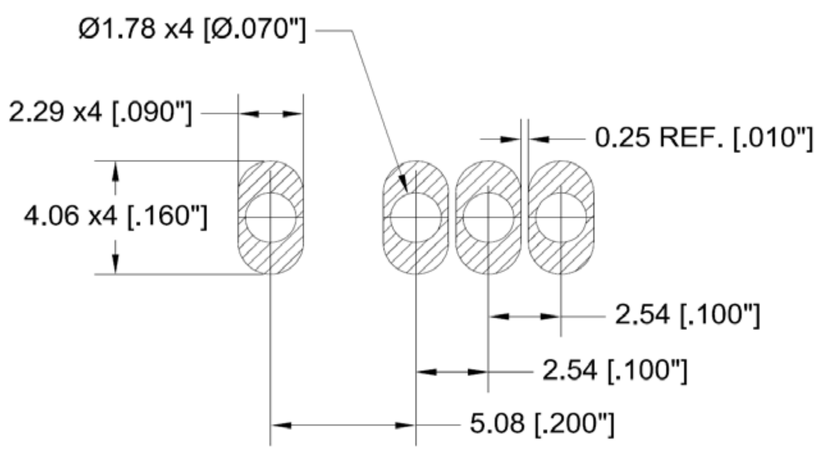
Package Dimensions

Package TO-247H-4L(TO-247H-4)

NOTE ;
1. ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO
   ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS.
   ANGLES ARE IN DEGREES.
4. ‘N’ IS THE NUMBER OF TERMINAL POSITIONS

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.	



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