G3R75MT12K

SiC Power MOSFET N-Channel Enhancement Mode

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

D SSG

TO247-4L

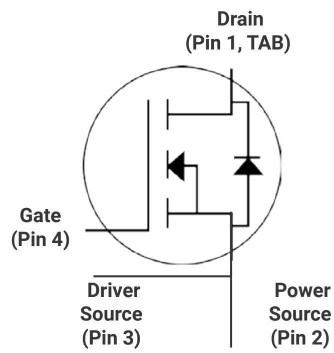
Package

Benefits

- 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)
G3R75MT12K	TO247-4L	30

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}=0V, I_D=100μA	
V_{GSmax}	Gate-Source Voltage	-10/+25	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-5/+20	V	Recommended operational values	
I_D	Continuous Drain Current	36	A	V_{GS}=20V, T_c=25℃	Fig. 19
		24		V_{GS}=20V, T_c=100℃	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	192	W	T_c=25℃, T_J=150℃	Fig. 20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +150	℃		
T_L	Solder Temperature, 1.6mm from case for 10s	260	℃		
M_d	Mounting Torque, (M3 or 6-32 screw)	1	Nm		
		8.8	lbf-in		

Electrical Characteristics (T$_C$ = 25˚C unless other

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	/	/	V	V_{GS}=0V, I_D=100µA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.4	4.0	V	V_{DS}=V_{GS}, I_D=5mA	Fig. 11
		/	1.8	/		V_{DS}=V_{GS}, I_D=5mA, T_J=150℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	µA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS+}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=25V	
I_{GSS-}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=-10V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	80	98	mΩ	V_{GS}=20V, I_D=20A	Fig. 4,5,6
		/	140	/		V_{GS}=20V, I_D=20A, T_J=150℃	
g_{fs}	Transconductance	/	11.2	/	S	V_{DS}=20V, I_{DS}=20A	Fig. 7
		/	11.3	/		V_{DS}=20V, I_{DS}=20A, T_J=150℃	
C_{iss}	Input Capacitance	/	1475	/	pF	V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV	Fig. 17,18
C_{oss}	Output Capacitance	/	94	/			
C_{rss}	Reverse Transfer Capacitance	/	11	/			
E_{oss}	C_{oss} Stored Energy	/	52	/	µJ		Fig. 16
E_{ON}	Turn-On Switching Energy	/	564	/	mJ	V_{DS}=800V, V_{GS}=-5V/20V, I_D=20A, $R_{G(ext)}$=2.5Ω, L=200µH	
E_{OFF}	Turn-Off Switching Energy	/	260	/			
$t_{d(on)}$	Turn-On Delay Time	/	9.3	/	ns	V_{DS}=800V, V_{GS}=-5V/20V, I_D=20A, $R_{G(ext)}$=2.5Ω, R_L=40Ω	
t_r	Rise Time	/	9.5	/			
$t_{d(off)}$	Turn-Off Delay Time	/	18	/			
t_f	Fall Time	/	7.6	/			
$R_{G(int)}$	Internal Gate Resistance	1	3.1	5.5	Ω	f=1MHz, V_{AC}=25mV	
Q_{GS}	Gate to Source Charge	/	24	/	nC	V_{DS}=800V, V_{GS}=-5V/20V, I_D=20A	Fig. 12
Q_{GD}	Gate to Drain Charge	/	15	/			
Q_G	Total Gate Charge	/	79	/			

Reverse Diode Characteristics (T$_C$ = 25˚C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.6	/	V	V_{GS}=-5V, I_{SD}=10A	Fig. 8,9,10
		3.3	/		V_{GS}=-5V, I_{SD}=10A, T_J=150℃	
I_S	Continuous Diode Forward Current	/	44	A	T_C=25℃	
t_{rr}	Reverse Recover Time	35	/	ns	V_R=800V, I_{SD}=20A	
Q_{rr}	Reverse Recovery Charge	91	/	nC		
I_{rrm}	Peak Reverse Recovery Current	4.5	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.6	/	℃/W		Fig. 21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

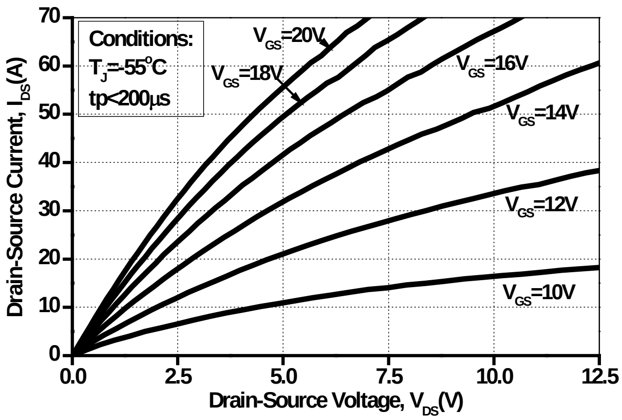


Figure 1. Output Characteristics T_J = -55 °C

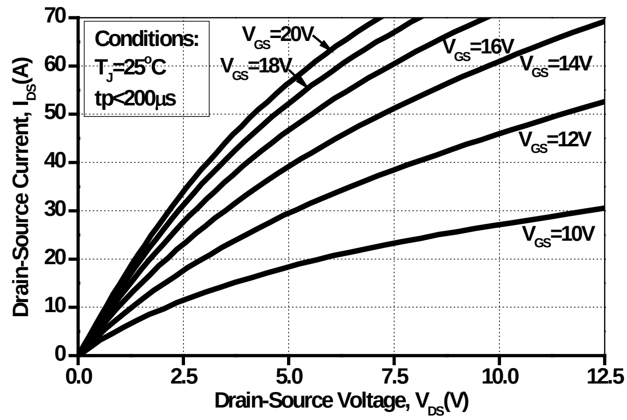


Figure 2. Output Characteristics T_J = 25 °C

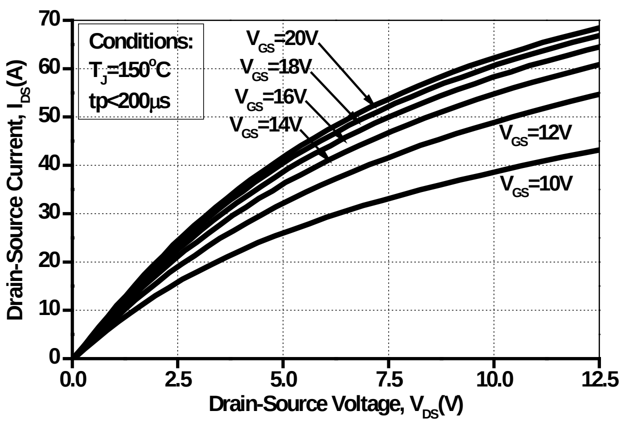


Figure 3. Output Characteristics T_J = 150 °C

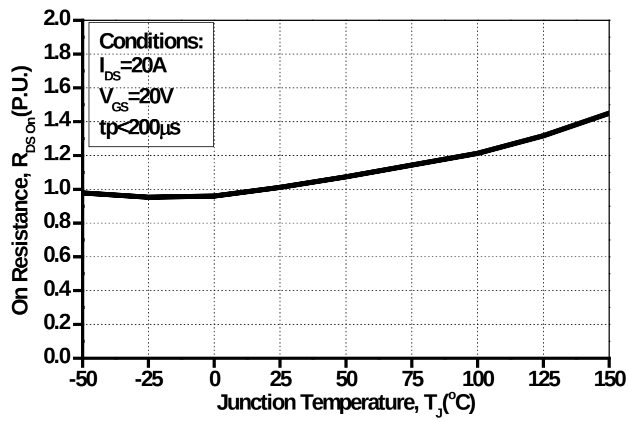


Figure 4. Normalized On-Resistance vs. Temperature

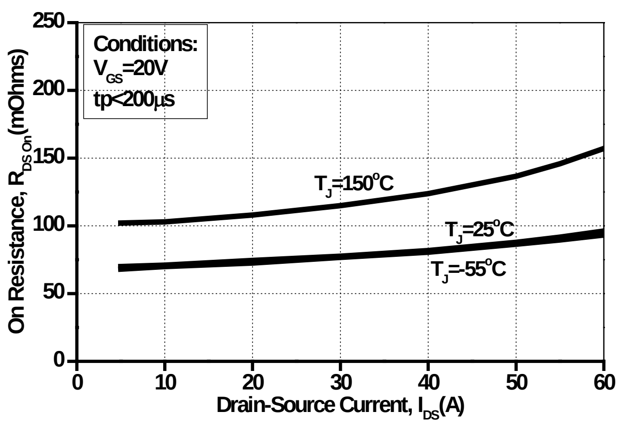


Figure 5. On-Resistance vs. Drain Current

For Various Temperatures

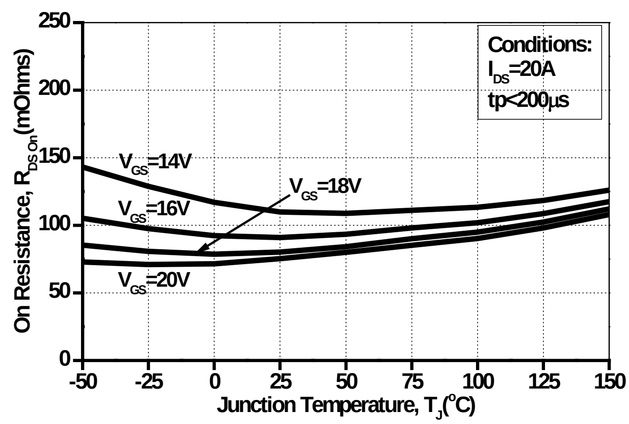


Figure 6. On-Resistance vs. Temperature

For Various Gate Voltage

Typical Performance

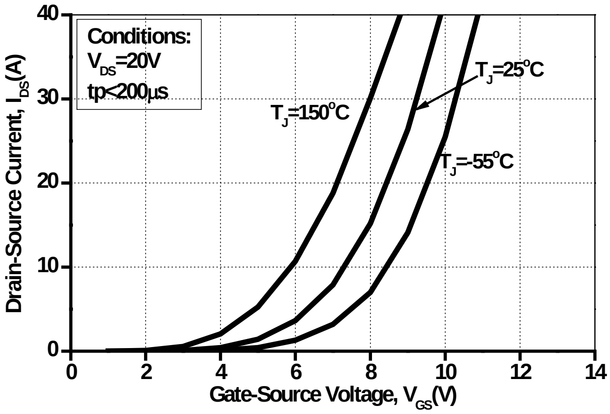


Figure 7. Transfer Characteristic for Various Junction Temperatures

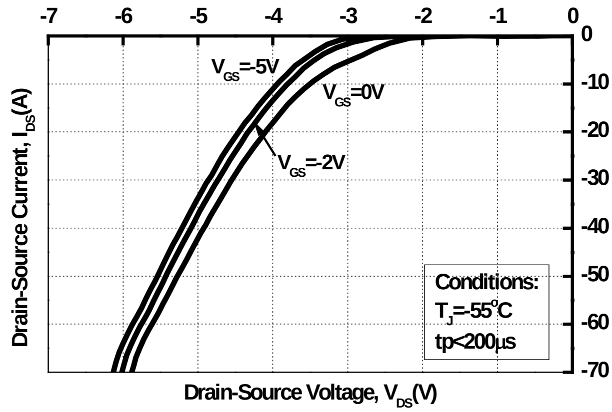


Figure 8. Body Diode Characteristic at -55 °C

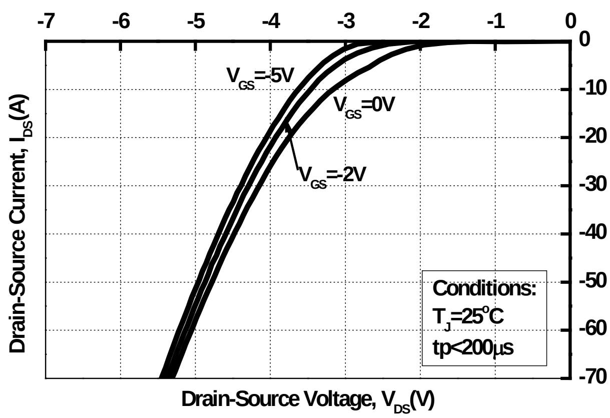


Figure 9. Body Diode Characteristic at 25 °C

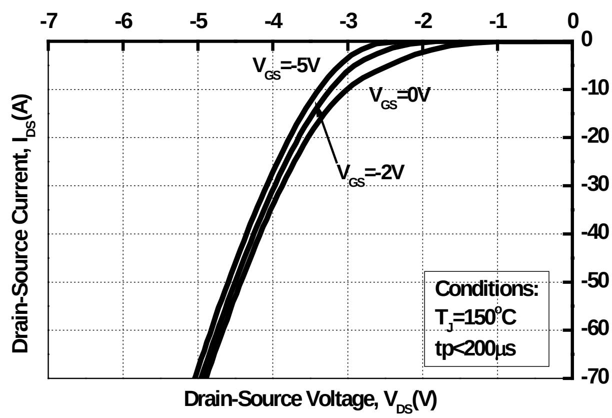


Figure 10. Body Diode Characteristic at 150 °C

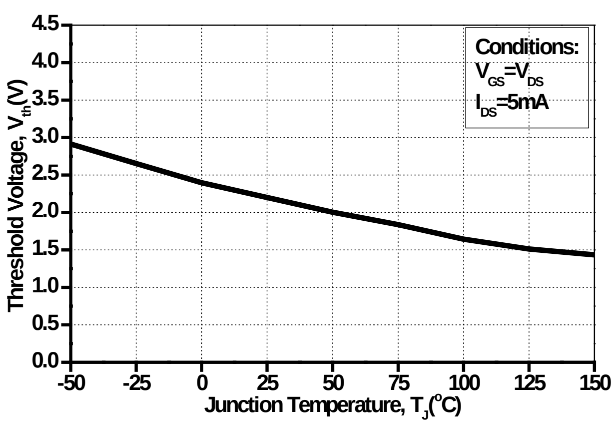


Figure 11. Threshold Voltage vs. Temperature

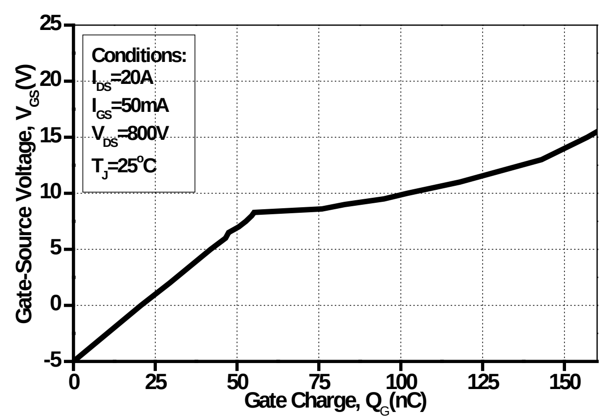


Figure 12. Gate Charge Characteristics

Typical Performance

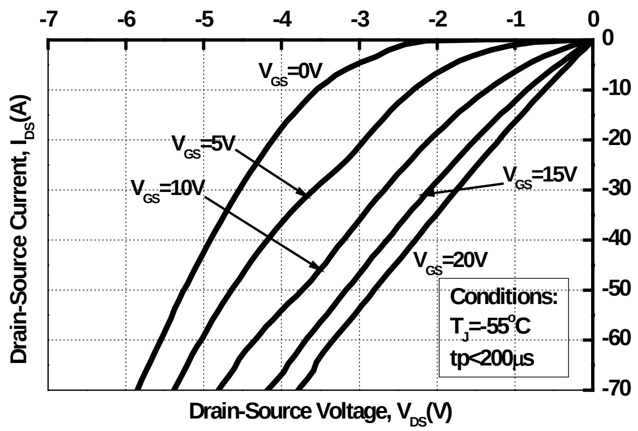


Figure 13. 3rd Quadrant Characteristic at -55 ºC

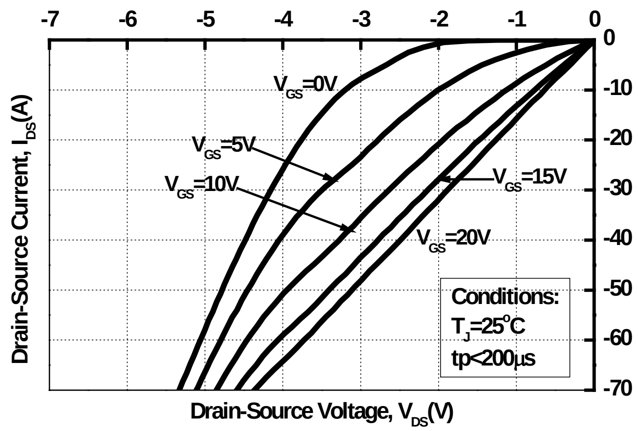


Figure 14. 3rd Quadrant Characteristic at 25 ºC

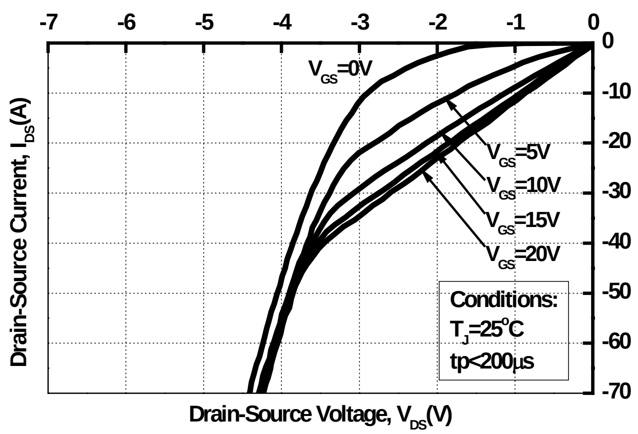


Figure 14. 3rd Quadrant Characteristic at 150 ºC

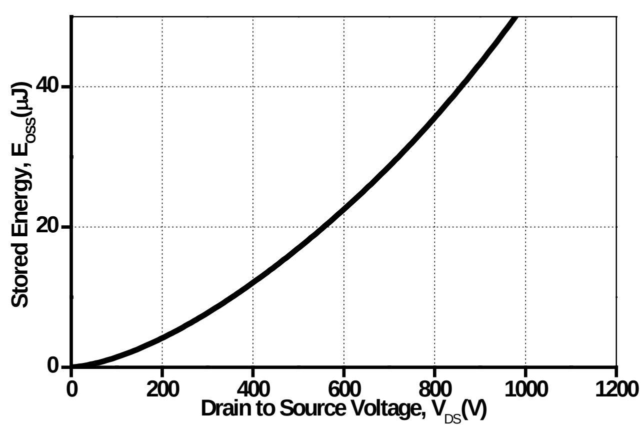


Figure16. Output Capacitor Stored Energy

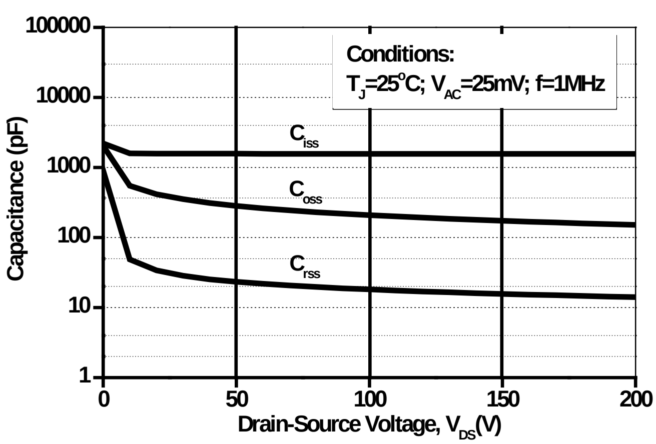


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

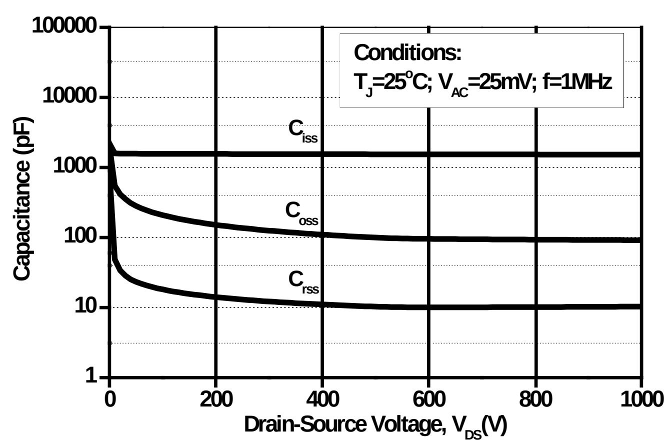


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

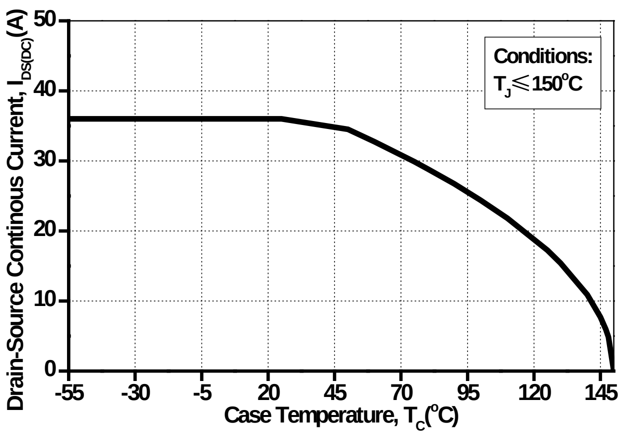


Figure 19. Continuous Drain Current Derating vs. Case Temperature

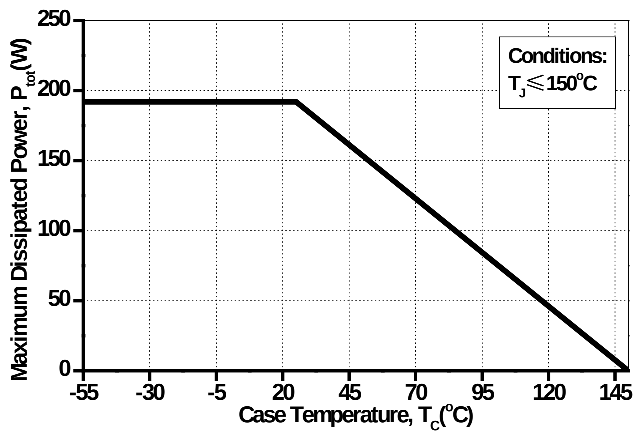


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

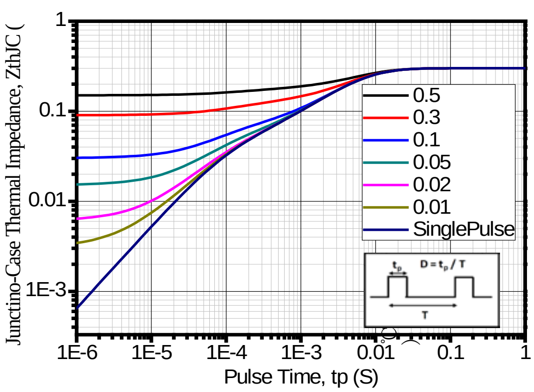


Figure 21. Transient Thermal Impedance (Junction - Case)

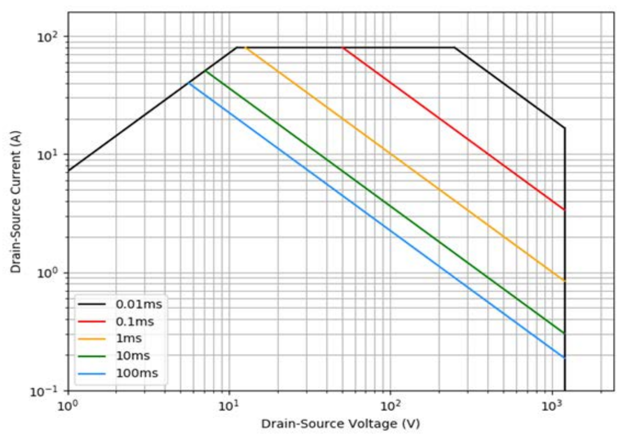


Figure22. Safe Operating Area

Test Circuit Schematic

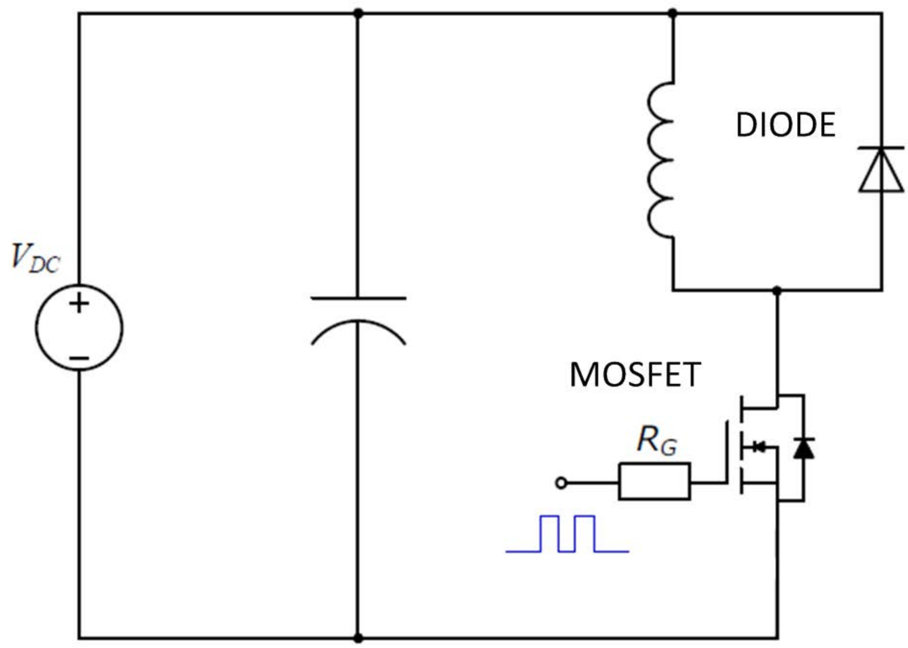
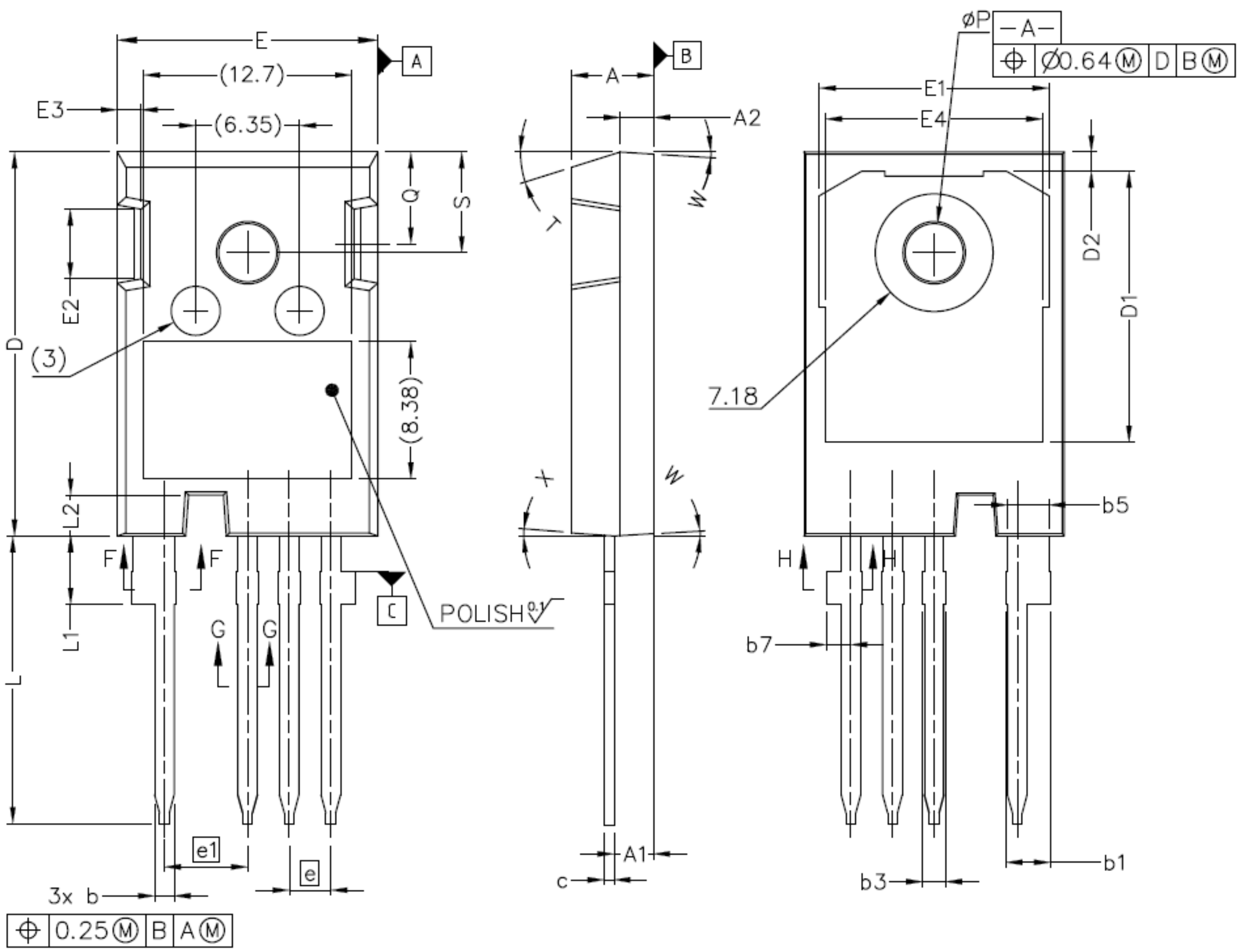
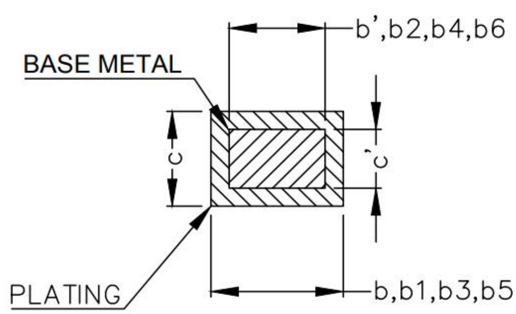


Figure 23. Clamped Inductive Switching Waveform Test Circuit

Package Dimensions

Package TO247-4L





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

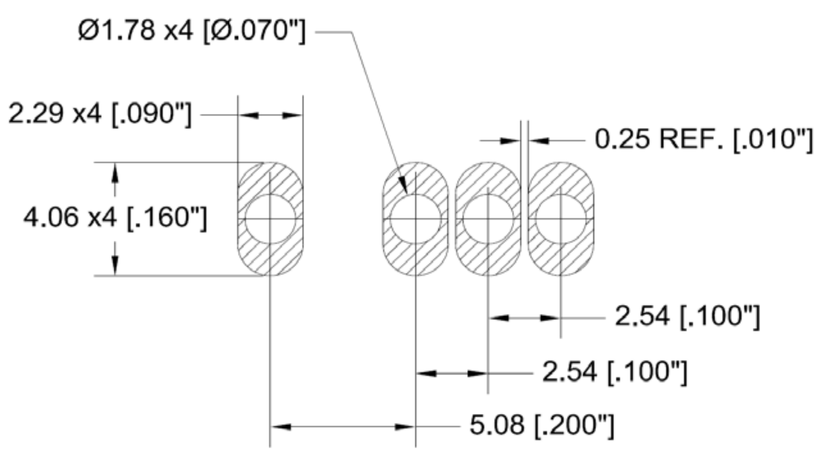
Package Dimensions

Package TO247-4L

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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