



LGE3M20120Q

Silicon Carbide Power MOSFET



Features

- High Blocking Voltage
- High Frequency Operation
- Low on-resistance
- Fast intrinsic diode with low reverse recovery

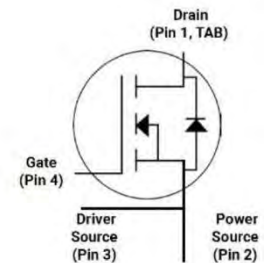
$V_{DS} = 1200\text{ V}$
 $I_D@25^\circ\text{C} = 100\text{ A}$
 $R_{DS(ON)} = 20\text{ m}\Omega$

Benefits

- Higher System Efficiency
- Parallel Device Convenience without thermal runaway
- High Temperature Application
- Hard Switching & Higher Reliability
- Easy to drive

Applications

- Motor Drives
- Solar / Wind Inverters
- EV Charging Station
- AC/DC converters
- DC/DC converters
- Uninterruptable power supplies



TO-247-4L
Pin definition

Key performance parameters

Type	V_{DS}	I_D $T_C=25^\circ\text{C}$	$R_{DS(ON)}$
LGE3M20120Q	1200V	100A	20m Ω

Caution: This device is sensitive to electrostatic discharge .Users should follow ESD handing procedures.



Maximum Ratings

$T_C=25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Test conditions	Value	Unit
Drain - Source Voltage	V_{DSmax}	$V_{GS}=0\text{V}$, $I_D=100\mu\text{A}$	1200	V
Gate - Source Voltage (dynamic)	V_{GSmax}	AC ($f>1\text{ Hz}$)	-10/+25	V
Gate - Source Voltage (static)	V_{GSop}	static	-5/+20	V

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Maximum Ratings

$T_C=25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous Drain Current: $V_{GS} = 20\text{V}$ $T_C = 25^{\circ}\text{C}$ $TC = 100^{\circ}\text{C}$	I_D	100 71	A
Pulsed Drain Current: $T_C = 25^{\circ}\text{C}$	$I_{D(pulse)}$	200	A
Short Circuit Capability : $V_{DD} = 800\text{V}$ $V_{GS} = 20\text{V}$	t_{sc}	TBD	μS
Short Circuit Capability : $V_{DD} = 800\text{V}$ $V_{GS} = 20\text{V}$	I_{DS}	TBD	A
Total power dissipation : $T_C = 25^{\circ}\text{C}$	P_D	428	W
Operating Junction Temperature :	T_j	-55 to 175	$^{\circ}\text{C}$
Storage Temperature :	T_{stg}	-55 to 175	$^{\circ}\text{C}$

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Parameter	Symbol	Condition	Typ	Max	Unit
Thermal Resistance (per device)	$R_{th(j-c)}$	junction-case	0.27	0.35	°C/W

Electrical Characteristic

$T_C = 25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Value			Unit	Test Condition
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200			V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.9	2.8 2.05 1.95	3.8	V	$V_{DS} = V_{GS}$ $I_D = 20mA$ $T_J = 150^{\circ}\text{C}$ $T_J = 175^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	0	5	100	μA	$V_{DS} = 1200V$, $V_{GS} = 0V$
Gate-Source Leakag Current	I_{GSS}	0 -200	10 -10	200 0	nA	$V_{GS} = 20V$ $V_{DS} = 0V$ $V_{GS} = -5V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$		20 35 39	29	m Ω	$V_{GS} = 20V$, $I_D = 50 A$ $T_J = 150^{\circ}\text{C}$ $T_J = 175^{\circ}\text{C}$
Transconductance	gfs		36 30 29.5		S	$V_{GS} = 20V$, $I_D = 50 A$ $T_J = 150^{\circ}\text{C}$ $T_J = 175^{\circ}\text{C}$
Input capacitance	C_{iss}		4900		pF	$V_{DS} = 1000V$ $V_{GS} = 0V$ $f = 1MHz$
Output capacitance	C_{oss}		248			
Reverse transfer capacitance	C_{rss}		14			
Coss Stored Energy	E_{oss}		146		μJ	

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Total gate charge	Q_g		254		nC	$V_{DS} = 800V$ $V_{GS} = -5V / 20V$ $I_D = 50 A$
Gate-source charge	Q_{gs}		71			
Gate-drain charge	Q_{gd}		109			
Internal gate input resistance	$R_{g(int)}$		2.0		Ω	$f = 1MHz \quad I_D = 0A$
Turn-On Switching Energy	E_{ON}		1250		μJ	$V_{DS} = 800V, \quad V_{GS} = -5V/20V$ $I_D = 50A$ $R_{G(ext)} = 1 \Omega$ $L = 450\mu H$
Turn-Off Switching Energy	E_{OFF}		126			
Turn-On Delay Time	$t_{d(on)}$		28		ns	$V_{DS} = 800V$ $V_{GS} = -5V/20V$ $I_D = 50A, \quad R_{G(ext)} = 1 \Omega$ $L = 450\mu H$
Rise Time	t_r		46			
Turn-Off Delay Time	$t_{d(off)}$		56			
Fall Time	t_f		12			
Avalanche Capability	E_{AS}		1.36		mJ	$V_{DD} = 100V$ $V_{GS} = 20V$ $L = 2mH$
	I_{Av}		37		A	

Reverse Diode Characteristics

$T_C = 25^\circ C$, unless otherwise specified

Parameter	Symbol	Value			Unit	Test Condition
		Min.	Typ.	Max.		
Diode Forward Voltage	V_{SD}		3.8 3.5 3.4		V	$V_{GS} = -5V$ $I_{SD} = 25A$ $T_J = 150^\circ C$ $T_J = 175^\circ C$
Continuous Diode Forward Current	I_S		85		A	$V_{GS} = -5V$
Reverse Recovery time	t_{rr}		34		ns	$V_{GS} = -5V$ $I_{SD} = 50A$ $V_R = 800V$ $dif/dt = 2100 A/\mu s$
Reverse Recovery Charge	Q_{rr}		450		nC	
Peak Reverse Recovery Current	I_{rrm}		24		A	

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Typical Performanc

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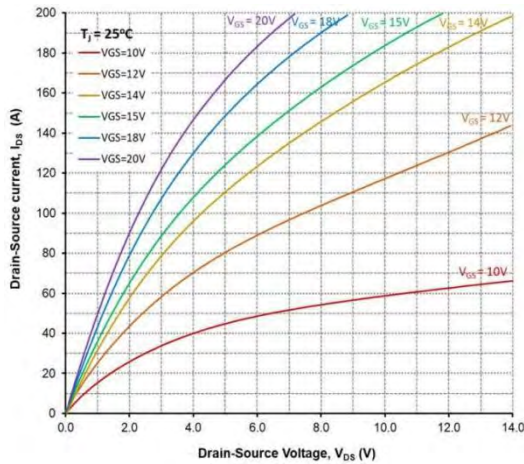


Figure 1. Output Characteristics, $T_J = 25^\circ\text{C}$

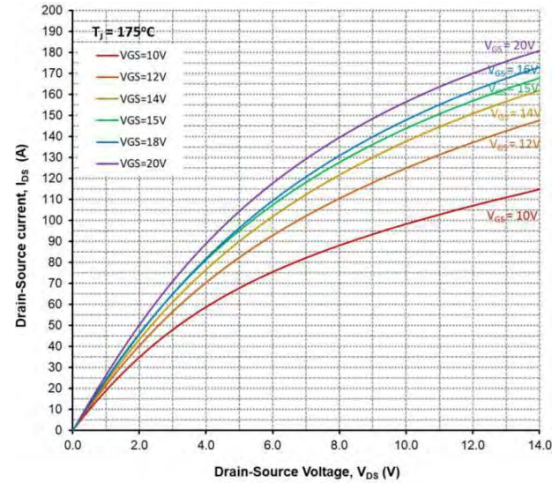


Figure 2. Output Characteristics, $T_J = 175^\circ\text{C}$

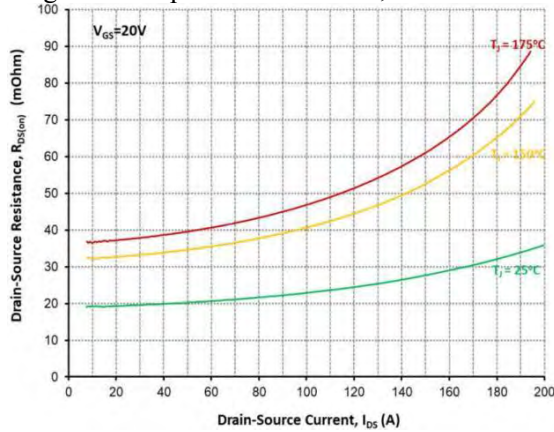


Figure 3. On-Resistance vs. Drain Current For Various Temperatures

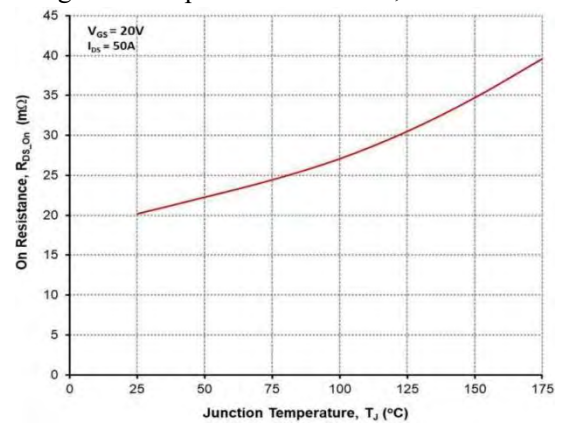


Figure 4. On-Resistance vs. Temperature

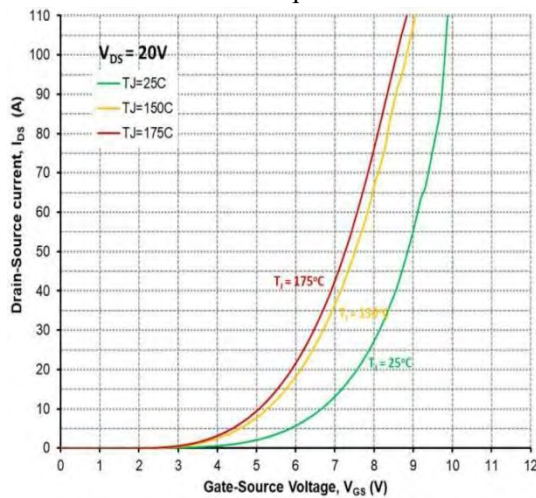


Figure 5. Transfer Characteristic For Various Junction Temperatures

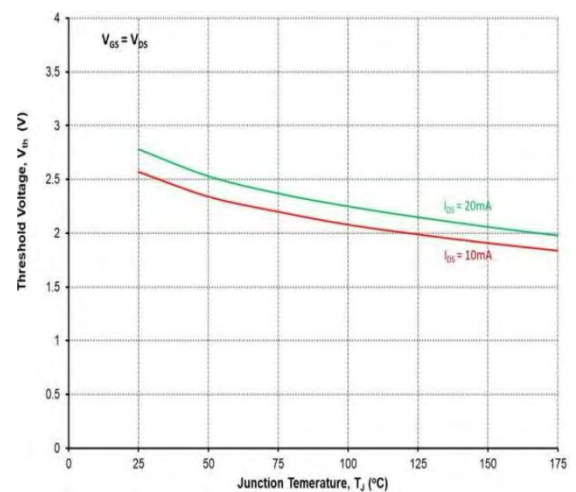


Figure 6. Threshold Voltage vs. Temperature

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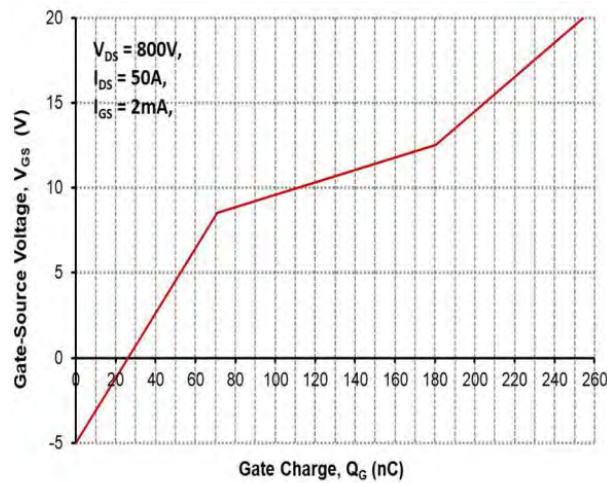


Figure 7. Gate Charge Characteristics

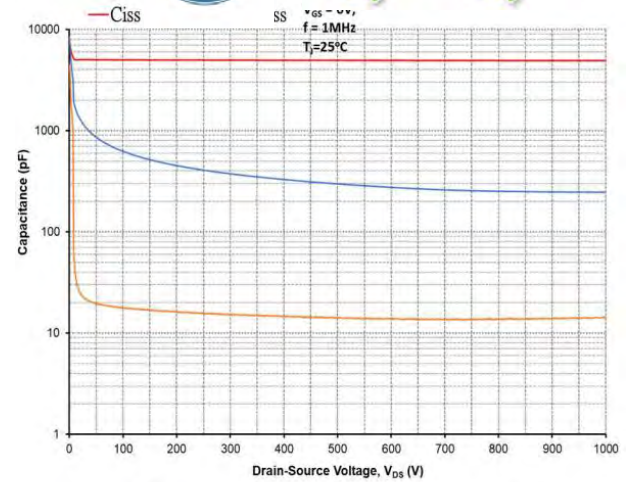


Figure 8. Capacitances vs. Drain-Source Voltage (0-1000V)

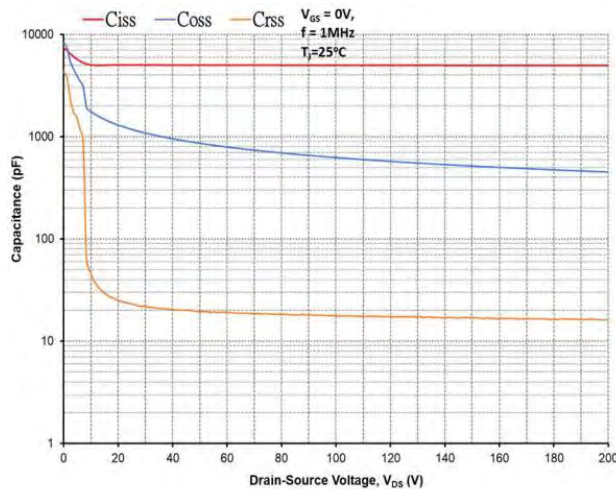


Figure 9. Capacitances vs. Drain-Source Voltage (0-200V)

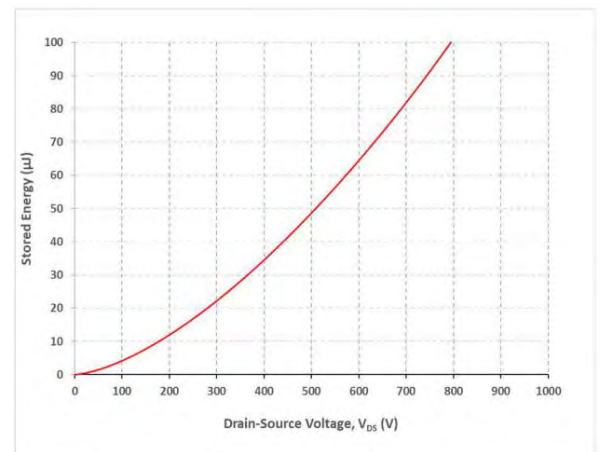


Figure 10. Output Capacitor Stored Energy

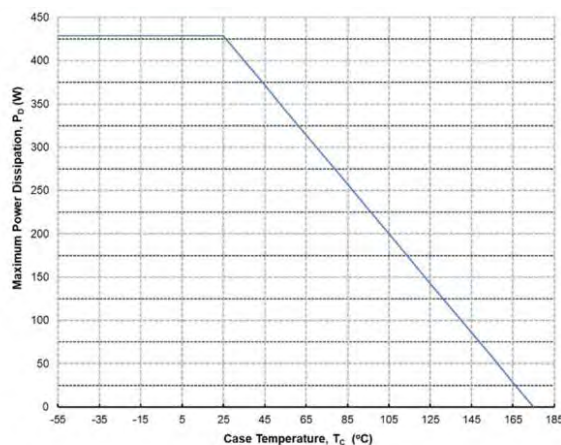


Figure 11. Maximum Power Dissipation Derating vs. Case Temperature

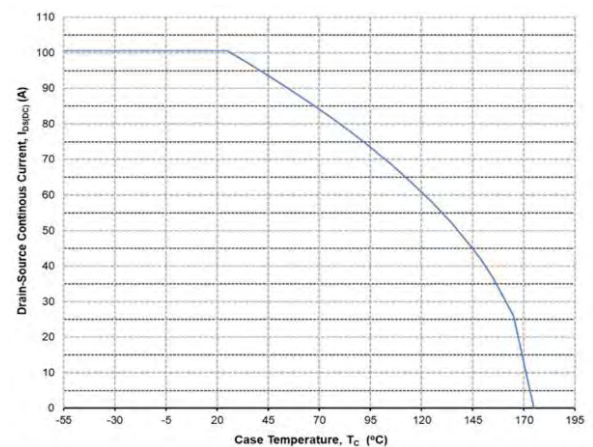


Figure 12. Continuous Drain Current Derating vs. Case Temperature

Caution: This device is sensitive to electrostatic discharge .Users should follow ESD handling procedures.

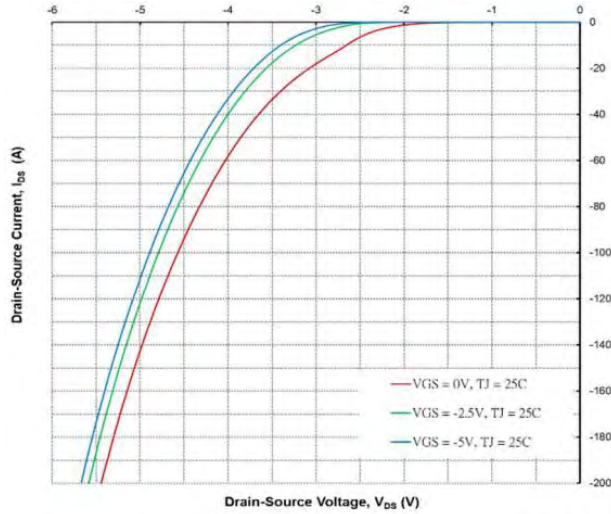


Figure 13. Body Diode Characteristics @ 25°C

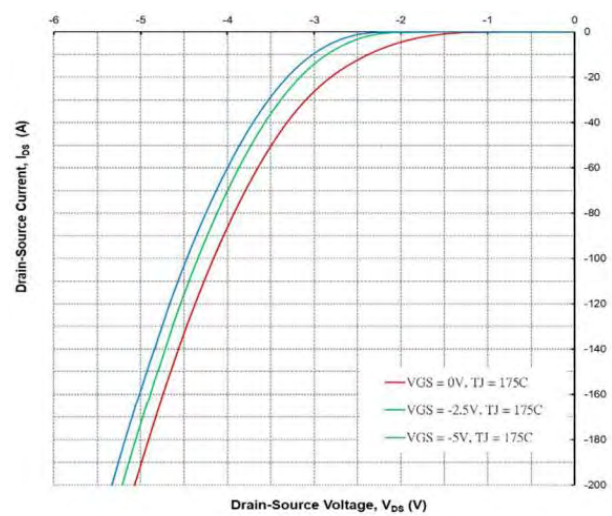


Figure 14. Body Diode Characteristics @ 175°C

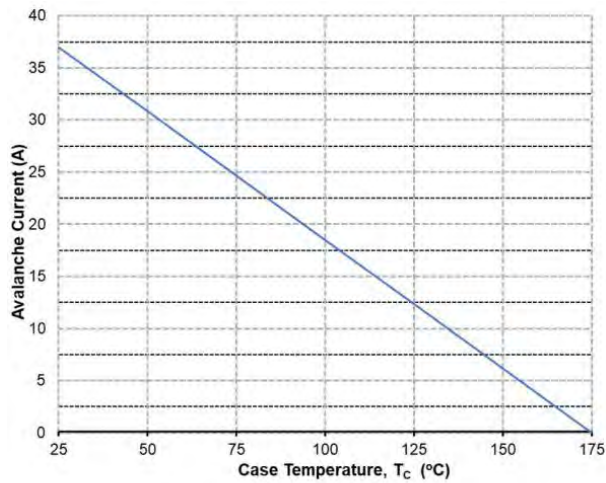


Figure 15. Single Avalanche vs. Temperature

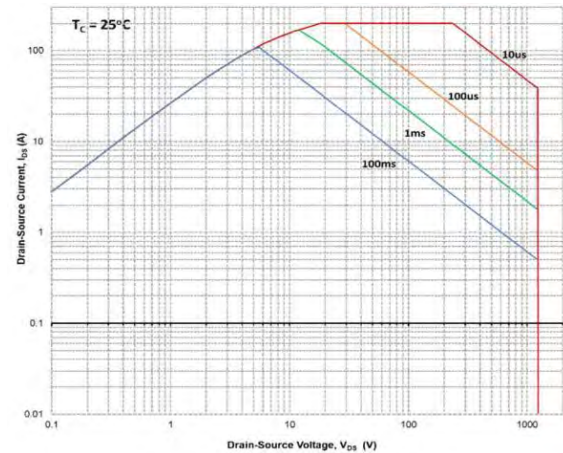
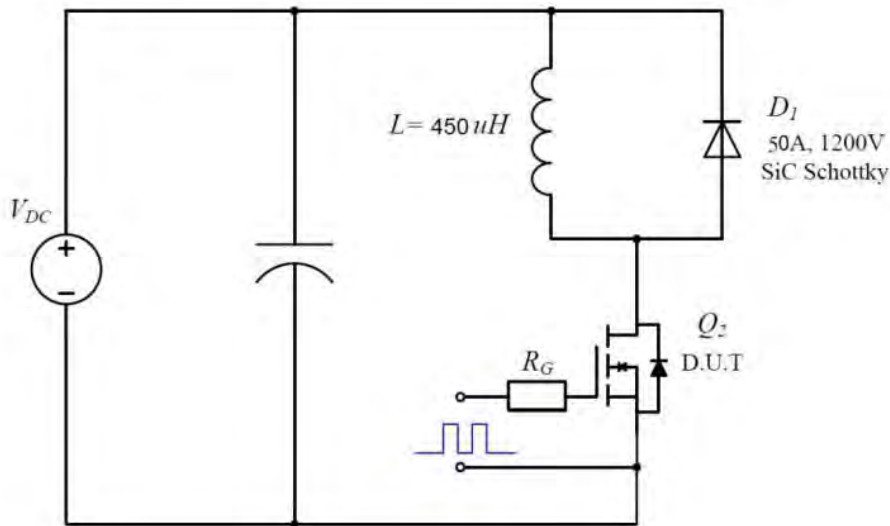
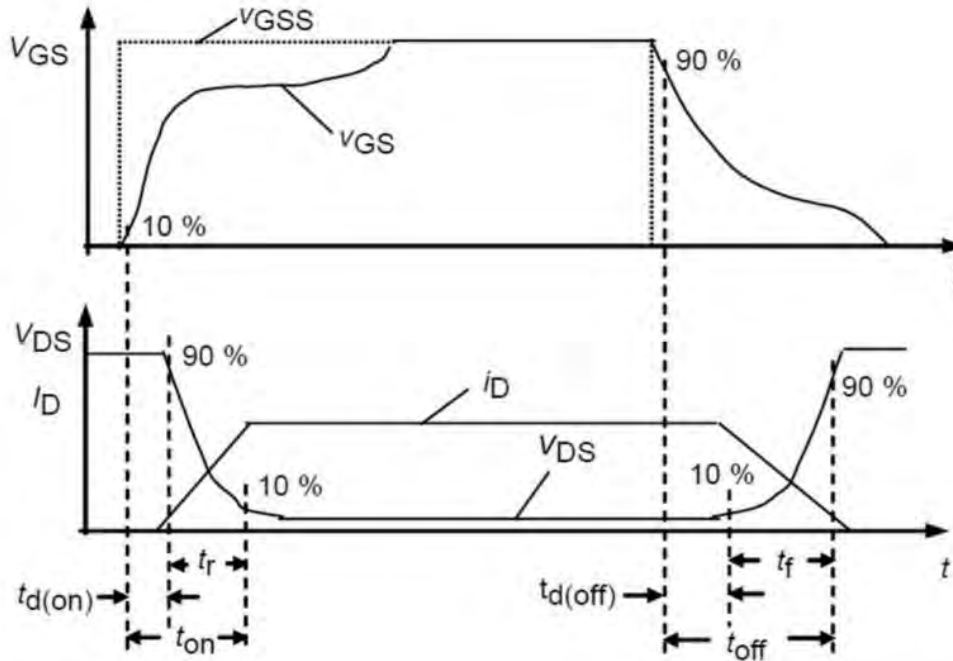


Figure 16. Safe Operating Area

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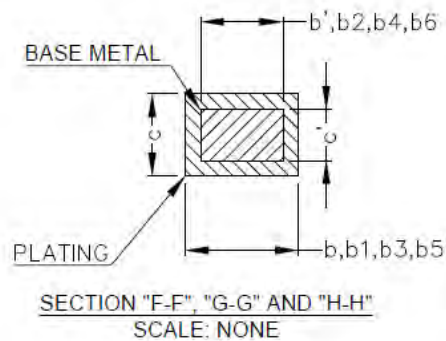
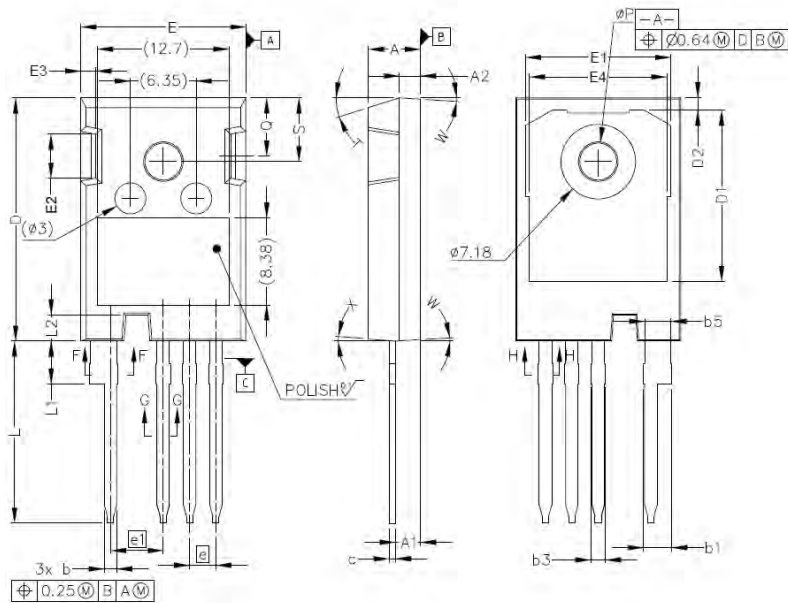


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Package Dimensions

(TO-247-4L Package)



SYMBOL	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
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
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
øP	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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