



LGE3M80120B

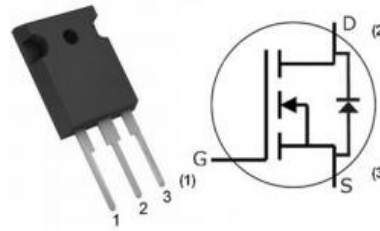
Silicon Carbide Power MOSFET



$V_{DS} = 1200\text{ V}$
 $I_D@25^\circ\text{C} = 40\text{ A}$
 $R_{DS(ON)} = 80\text{ m}\Omega$

Features

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



TO-247-3L

Pin definition

Benefits

- Motor Drives
- Solar / Wind Inverters
- EV Charging Station
- AC/DC converters
- DC/DC converters
- Uninterruptable power supplies
- Higher System Efficiency
- Parallel Device Convenience without thermal runaway
- High Temperature Application
- Hard Switching & Higher Reliability
- Easy to drive

Key performance parameters

Type	V_{DS}	I_D $T_C=25^\circ\text{C}$	$R_{DS(ON)}$
LGE3M80120B	1200V	40A	80m Ω

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



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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

Maximum Ratings

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

Parameter	Symbol	Value	Unit
Continuous Drain Current: $V_{GS} = 20\text{V}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	I_D	40 28	A
Pulsed Drain Current: $T_C = 25^{\circ}\text{C}$	$I_{D(pulse)}$	80	A
Short Circuit Capability : $V_{DD} = 800\text{V}$ $V_{GS} = 20\text{V}$	t_{sc}	3.5	μS
Short Circuit Capability : $V_{DD} = 800\text{V}$ $V_{GS} = 20\text{V}$	I_{DS}	260	A
Total power dissipation : $T_C = 25^{\circ}\text{C}$	P_D	208	W
Operating Junction Temperature :	T_j	-55 to 175	$^{\circ}\text{C}$
Storage Temperature :	T_{stg}	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Condition	Typ	Max	Unit
Thermal Resistance (per device)	$R_{th(j-c)}$	junction-case	0.55	0.72	$^{\circ}\text{C/W}$

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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	$V_{GS(th)}$	1.8	3.0 2.2 2.1	3.7	V	$V_{DS} = V_{GS}$ $I_D = 5mA$ $T_J = 150^\circ\text{C}$ $T_J = 175^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	0	5	100	μA	$V_{DS} = 1200V$ $V_{GS} = 0V$
Gate-Source Leakage 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	$R_{DS(on)}$		78 116 129	98	m Ω	$V_{GS} = 20V$ $I_D = 20 A$ $T_J = 150^\circ\text{C}$ $T_J = 175^\circ\text{C}$
Transconductance	g_{fs}		9.3 9 8.9		S	$V_{GS} = 20V$ $I_D = 20 A$ $T_J = 150^\circ\text{C}$ $T_J = 175^\circ\text{C}$
Input capacitance	C_{iss}		1390		pF	$V_{DS} = 1000V$ $V_{GS} = 0V$ $f = 1MHz$
Output capacitance	C_{iss}		70			
Reverse transfer capacitance	C_{rss}		7			
Coss Stored Energy	E_{oss}		45		μJ	
Total gate charge	Q_g		76		nC	$V_{DS} = 800V$ $V_{GS} = -5V / 20V$ $I_D = 20 A$
Gate-source charge	Q_{gs}		10			
Gate-drain charge	Q_{gd}		36			
Internal gate input resistance	$R_{g(int)}$		2.2		Ω	$f = 1MHz$ $I_D = 0A$
Turn-On Switching Energy	E_{ON}		380		μJ	$V_{DS}=800V$ $V_{GS} = -5V/20V$ $I_D = 20A$ $R_{G(ext)}=1 \Omega$ $L=450\mu H$
Turn-Off Switching Energy	E_{OFF}		220			

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Turn-On Delay Time	$t_{d(on)}$		7		ns	$V_{DS} = 800V$ $V_{GS} = -5V/20V$ $I_D = 20A$ $R_{G(ext)} = 1 \Omega$ $L = 450\mu H$
Rise Time	t_r		33			
Turn-Off Delay Time	$t_{d(off)}$		21			
Fall Time	t_f		24			
Avalanche Capability	E_{AS}		670		mJ	$V_{DD} = 100V$ $V_{GS} = 20V$ $L = 2mH$
	I_A		26		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}		4.1 3.7 3.6		V	$V_{GS} = -5V$ $I_{SD} = 10A$ $T_J = 150^\circ C$ $T_J = 175^\circ C$
Continuous Diode Forward Current	I_S		35		A	$V_{GS} = -5V$
Reverse Recovery time	t_{rr}		30		ns	$V_{GS} = -5V$ $I_{SD} = 20A$ $V_R = 800V$ $di/dt = 2600 A/\mu s$
Reverse Recovery Charge	Q_{rr}		250		nC	
Peak Reverse Recovery Current	I_{rrm}		15		A	

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Typical Performance

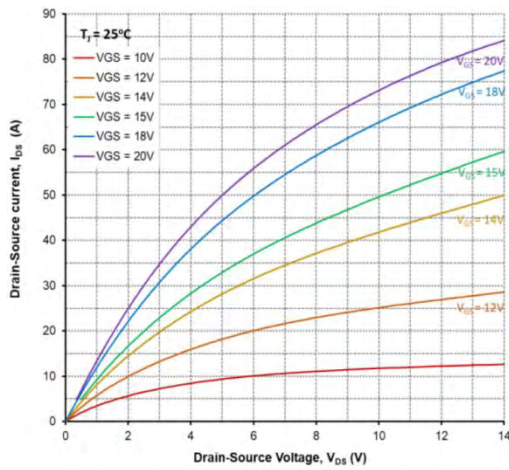


Figure 1. Output Characteristics, $T_J = 25^\circ\text{C}$

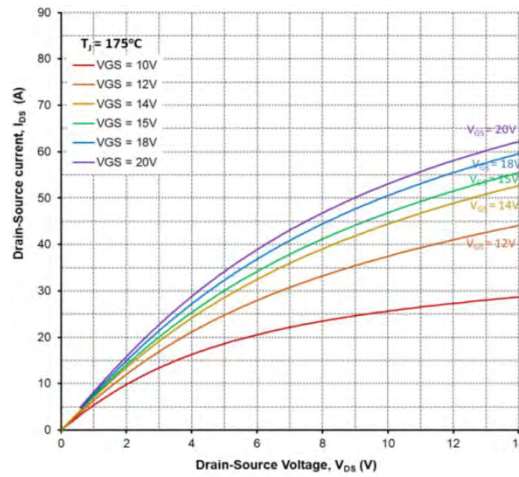


Figure 2. Output Characteristics, $T_J = 175^\circ\text{C}$

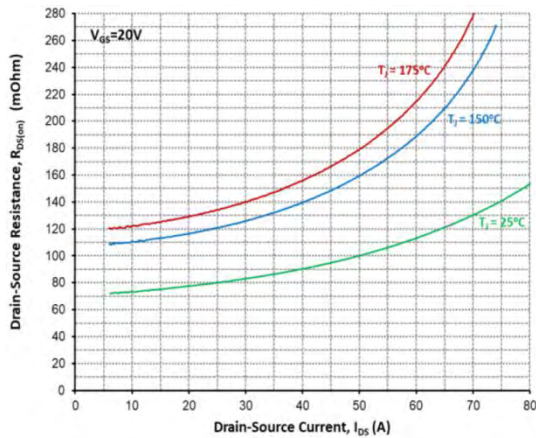


Figure 3. On-Resistance vs. Drain Current For Various Temperatures

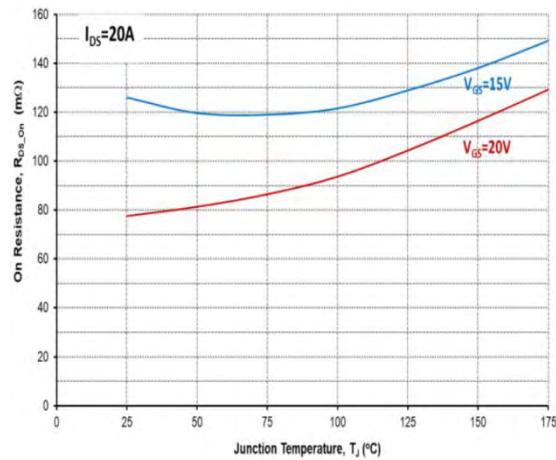


Figure 4. On-Resistance vs. Temperature

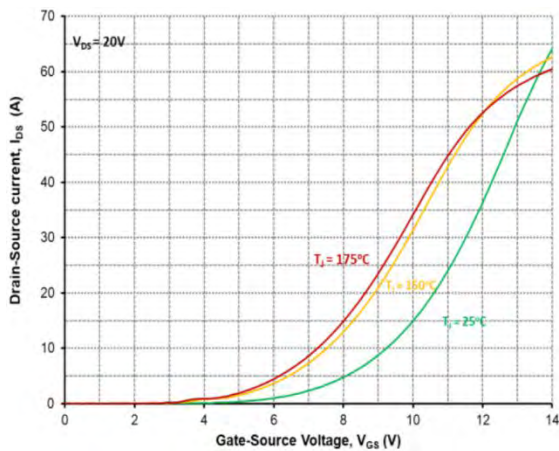


Figure 5. Transfer Characteristic For Various Junction Temperatures

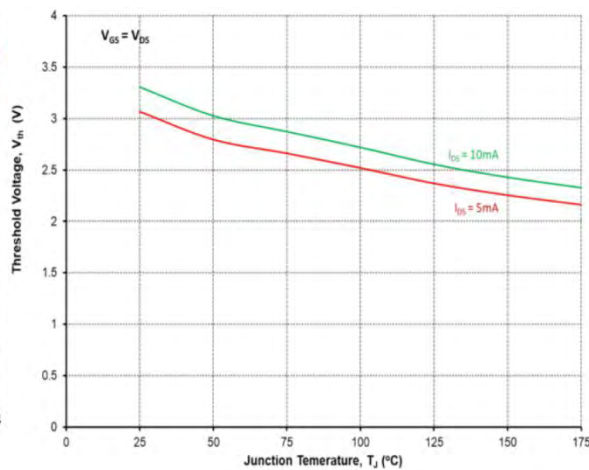


Figure 6. Threshold Voltage vs. Temperature

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

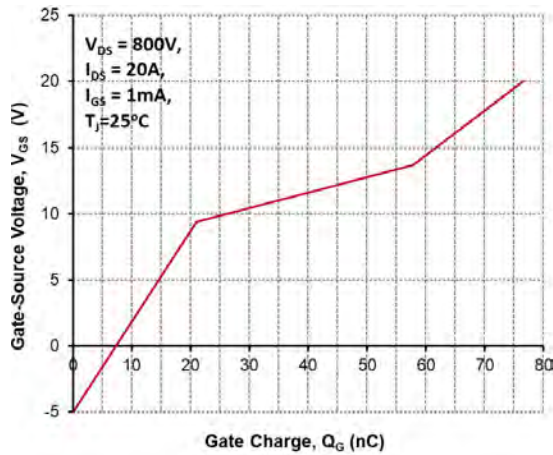


Figure 7. Gate Charge Characteristics

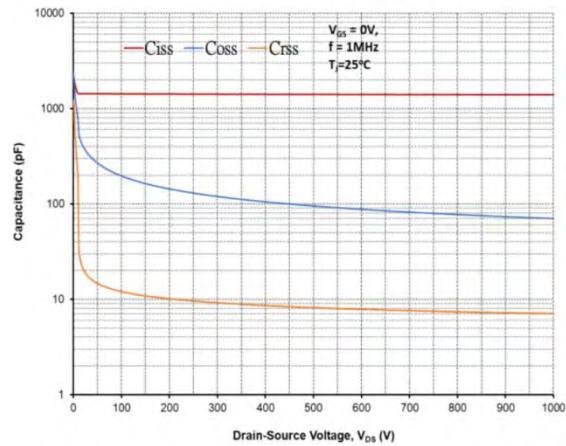


Figure 8. Capacitances vs. Drain-Source Voltage (0-1000V)

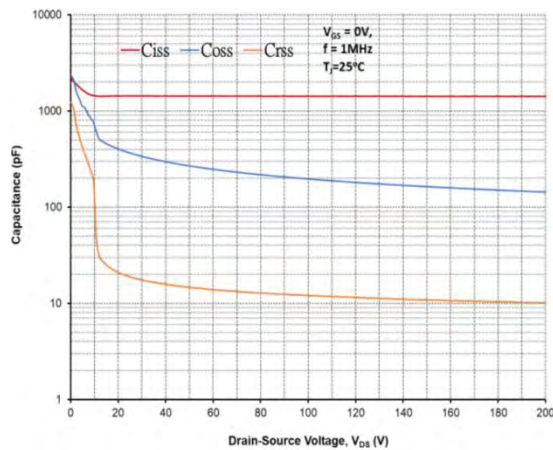


Figure 9. Capacitances vs. Drain-Source Voltage (0-200V)

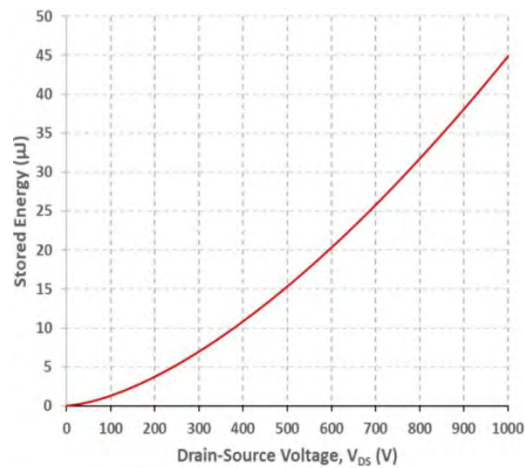


Figure 10. Output Capacitor Stored Energy

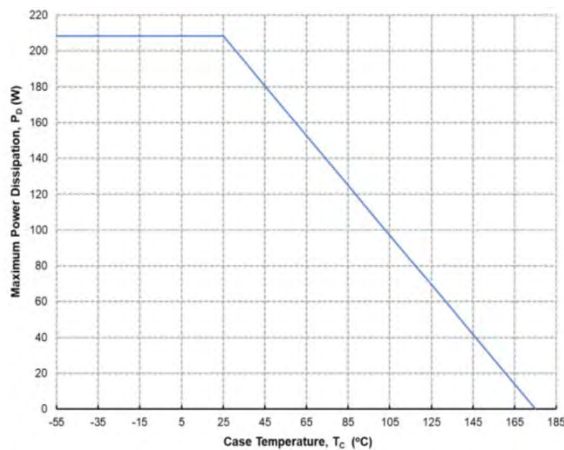


Figure 11. Maximum Power Dissipation Derating vs. Case Temperature

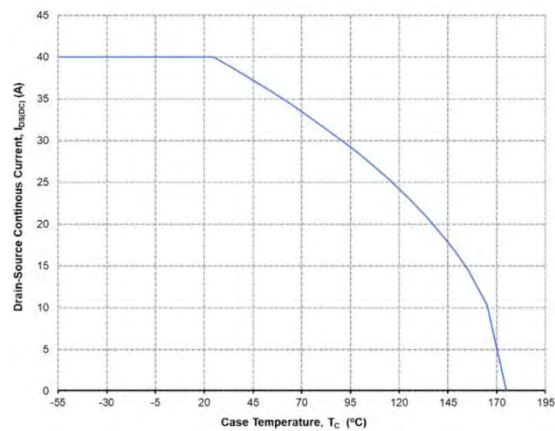


Figure 12. Continuous Drain Current Derating vs. Case Temperature

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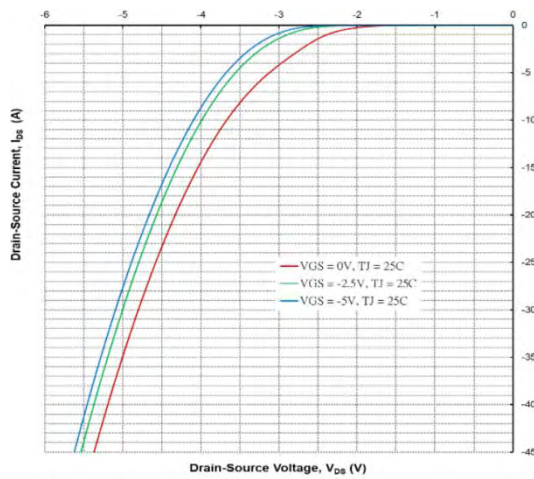


Figure 13. Body Diode Characteristics @ 25°C

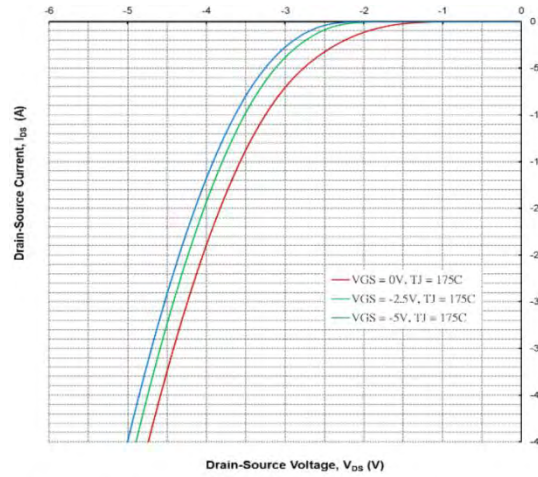


Figure 14. Body Diode Characteristics @ 175°C

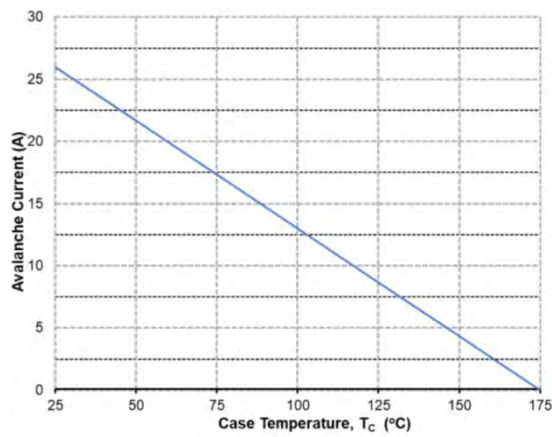


Figure 15. Single Avalanche vs. Temperature

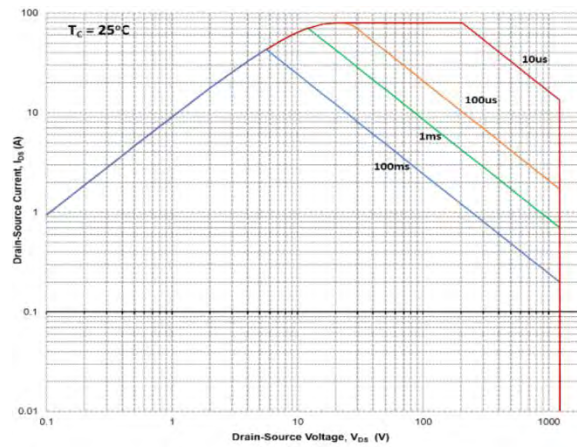
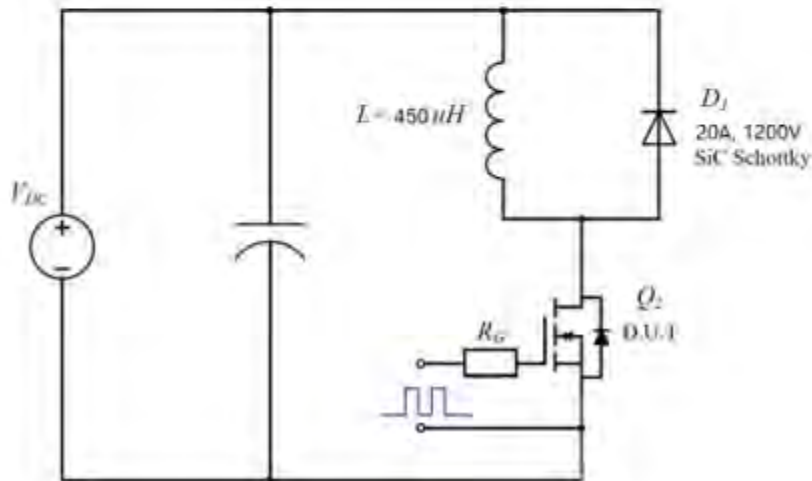
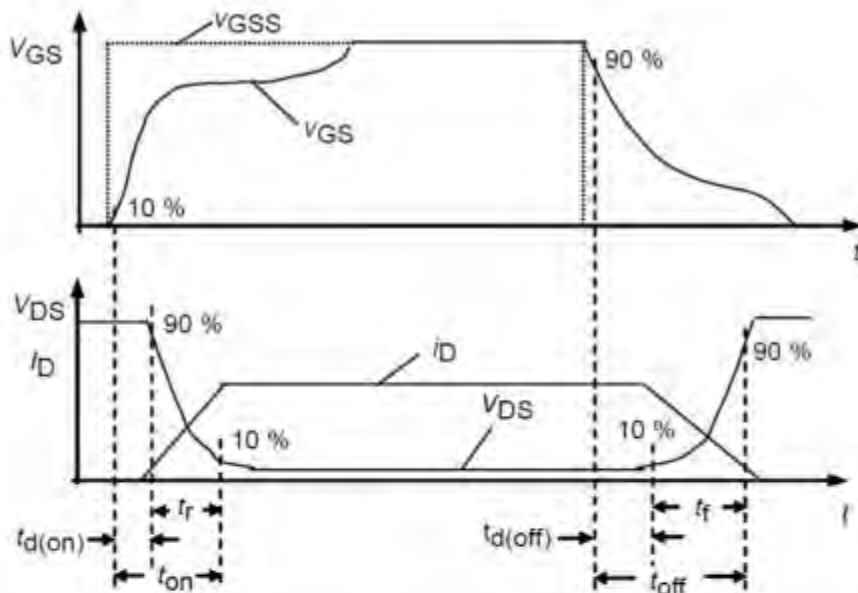


Figure 16. Safe Operating Area

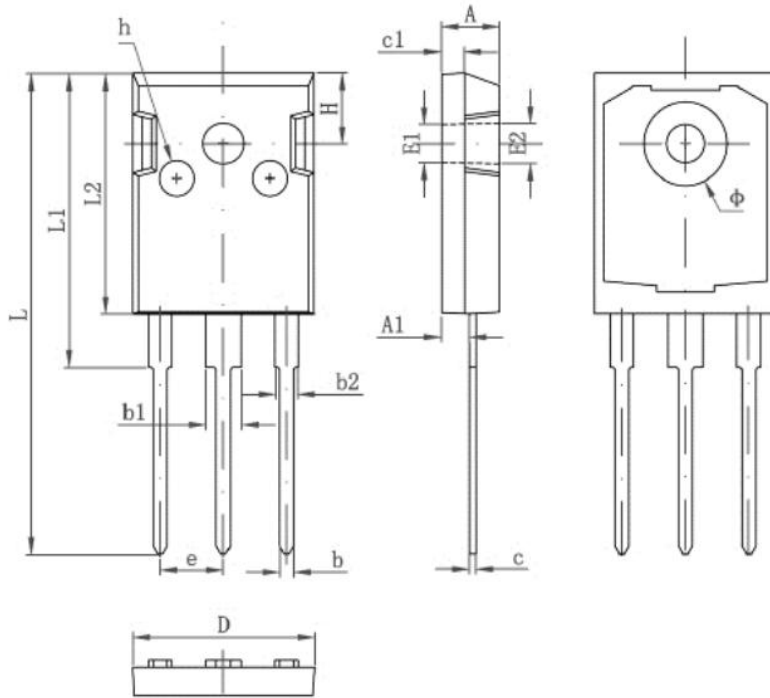
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Switching Times Definition and Test Circuit



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Package Outline:TO-247-3L


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	
h	0.000	0.300	0.000	0.012

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