ACR020B12MC

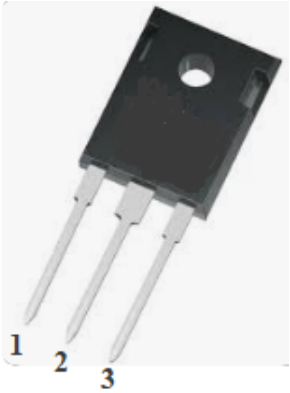
1200V / 20mΩ N-channel SiC Power MOSFET

ACTRON TECHNOLOGY CORP.

Features

- Best thermal conductivity and behavior
- High speed switching
- High robustness of dv/dt
- Low capacitances and low gate charge
- Low gate resistance for high-frequency switching
- Easy to parallel

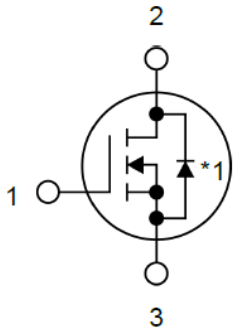
Outline (TO247-3L)



Applications

- Switching mode power supply
- PV inverter
- Uninterruptible Power Supply
- Motor Drives
- DC/DC converters
- EV charging

Circuit Diagram

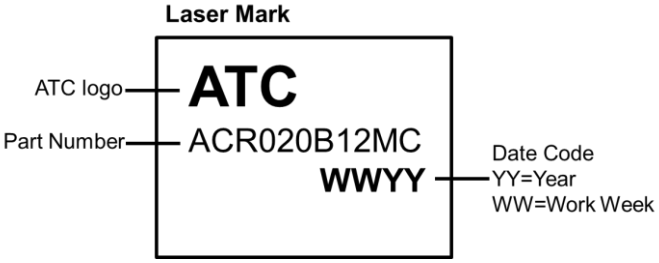


1: Gate
2: Drain
3: Source
*1: Body Diode

Mechanical Characteristics

- TO247-3L package
- Halogen Free
- Pb free lead plating ; RoHS compliant
- Packaging: Tube

Marking Diagram



Absolute Maximum Rating (Ta = 25°C)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source voltage	1200	V
V_{GSS}	Gate-Source voltage (DC)	-4 to 20	V
I_D	Continuous Drain Current	95	A
I_{DP}	Pulse Drain Current	190	A
T_j	Junction temperature	175	°C
T_{STG}	Storage temperature	-55/+175	°C
P_D	Power dissipation	465	W

Thermal characteristics

Parameter	Symbol	Condition	Typ.	Unit
Thermal resistance	θ jc	Junction - Case	0.2	℃ / W

Electrical Characteristics (Ta = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Condition
$V_{(BR)DSS}$	Drain-Source breakdown voltage	1200	-	-	V	V_{GS} = 0V, I_D=250uA
I_{DSS}	Zero gate voltage drain current	- -	6.0 12	60 -	uA	V_{DS}=1200V, V_{GS} = 0V,T_j= 25 °C V_{DS}=1200V, V_{GS} = 0V,T_j=150 °C
$R_{DS(on)}$	Drain-Source on-state resistance	- -	20 40	26 -	mΩ	V_{GS} = 18V, I_D = 47.5A, T_j=25 °C V_{GS} = 18V, I_D = 47.5A, T_j=125°C
$V_{GS(th)}$	Gate threshold voltage	2.0	-	3.0	V	V_{DS} = 10V, I_D = 10mA
I_{GSS+}	Gate-Source leakage current	-	-	100	nA	V_{GD} = 20V, V_{DS} = 0V
I_{GSS-}	Gate-Source leakage current	-	-	-100	nA	V_{GD} = -4V, V_{DS} = 0V
R_G	Gate resistance	-	2.0	-	Ω	f = 1MHz, open drain

Electrical Characteristics (Ta = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Condition
C_{iss}	Input capacitance	-	5600	-	pF	V_{GS} = 0V V_{DS} = 800V f = 1MHz
C_{oss}	Output capacitance	-	210	-	pF	
C_{rss}	Reverse capacitance	-	30	-	pF	
Q_g	Total gate charge	-	280	-	nC	V_{DS} = 800V I_D = 47.5A V_{GS} = 18V
Q_{gs}	Gate to source charge	-	45	-	nC	
Q_{gd}	Gate to drain charge	-	110	-	nC	
$t_{d(on)}$	Turn - on delay time	-	31	-	ns	V_{DS}=800V V_{GS}=0V/+18V R_{GS}=2Ω
t_r	Rise time	-	34	-	ns	
$t_{d(off)}$	Turn - off delay time	-	70	-	ns	
t_f	Fall time	-	14	-	ns	

Body diode Electrical Characteristics (Ta = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Condition
I_S	Body diode continuous, forward current	-	-	95	A	
V_{SD}	Diode forward voltage	-	4	-	V	V_{GS} = 0V, I_S = 47.5A
t_{rr}	Reverse recovery time		36		ns	I_{SD}=47.5A V_R=800V di/dt=1000A/us
I_{rrm}	Peak reverse recovery current		20		A	

Typical Output Characteristics (I)

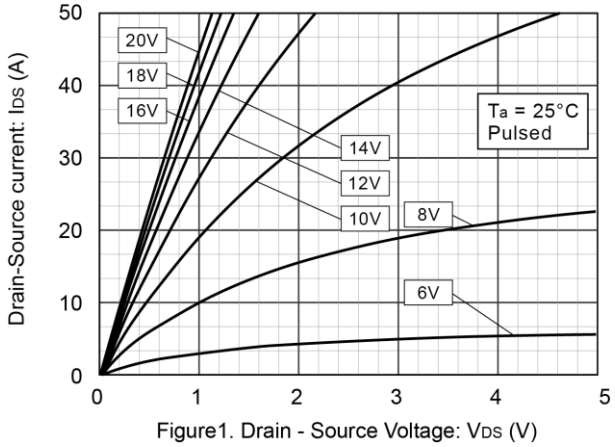


Figure1. Drain - Source Voltage: VDS (V)

Typical Output Characteristics (II)

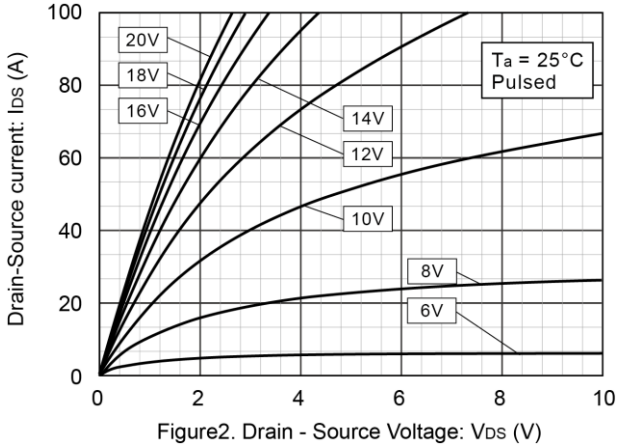


Figure2. Drain - Source Voltage: VDS (V)

Typical Output Characteristics (III) Ta =150ºC

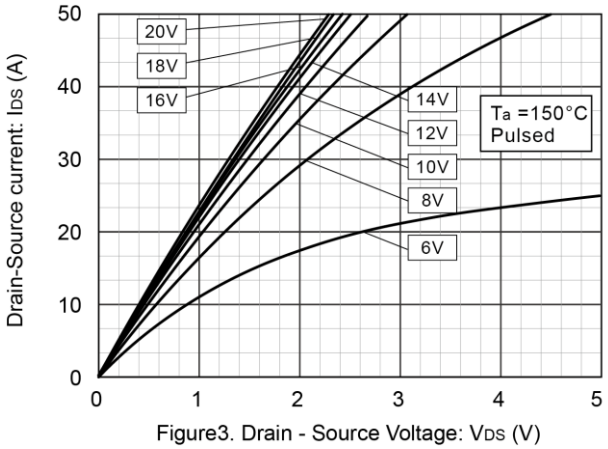


Figure3. Drain - Source Voltage: VDS (V)

Typical Output Characteristics (IV) Ta =150ºC

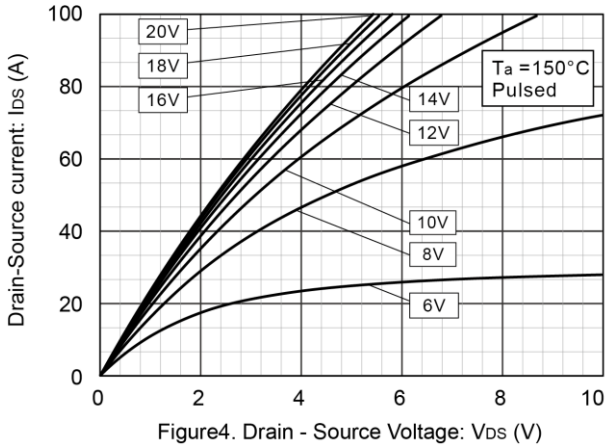


Figure4. Drain - Source Voltage: VDS (V)

Typical Transfer Characteristics (I)

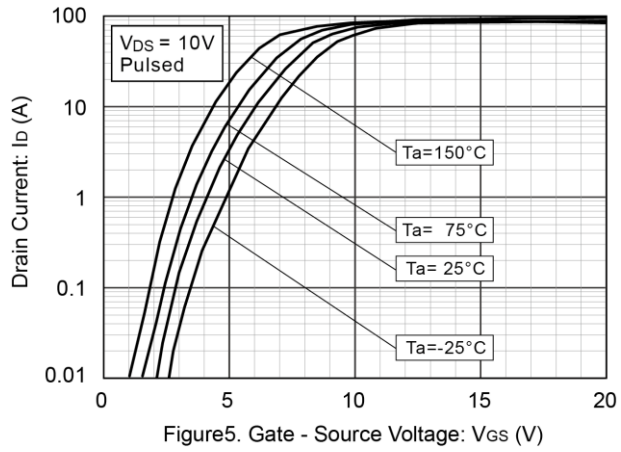


Figure5. Gate - Source Voltage: VGS (V)

Typical Transfer Characteristics (II)

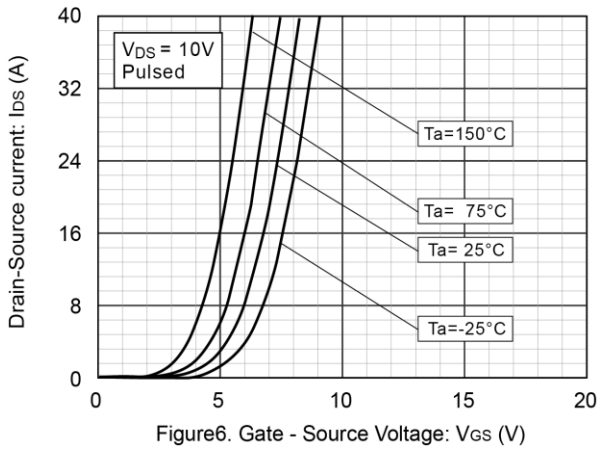


Figure6. Gate - Source Voltage: VGS (V)

Drain – Source Voltage vs. Source - Drain current

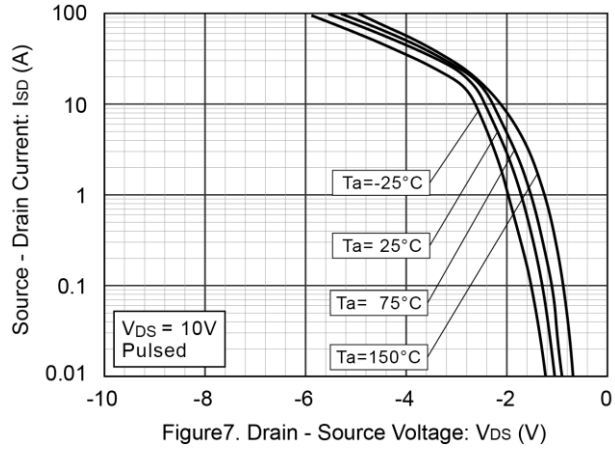


Figure7. Drain - Source Voltage: VDS (V)

3rd Quadrant Characteristic Ta =25ºC

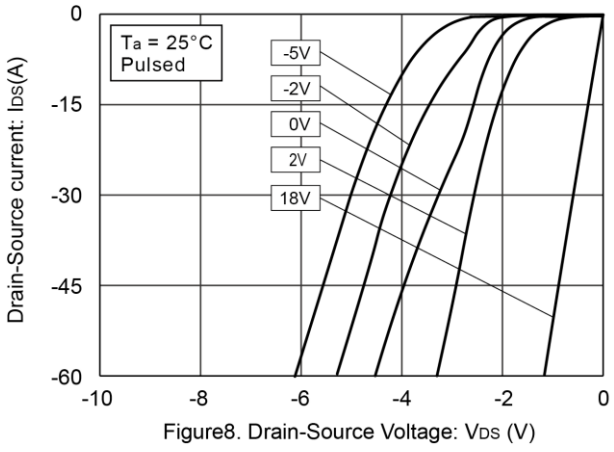


Figure8. Drain-Source Voltage: VDS (V)

Gate Threshold Voltage vs. Junction Temperature

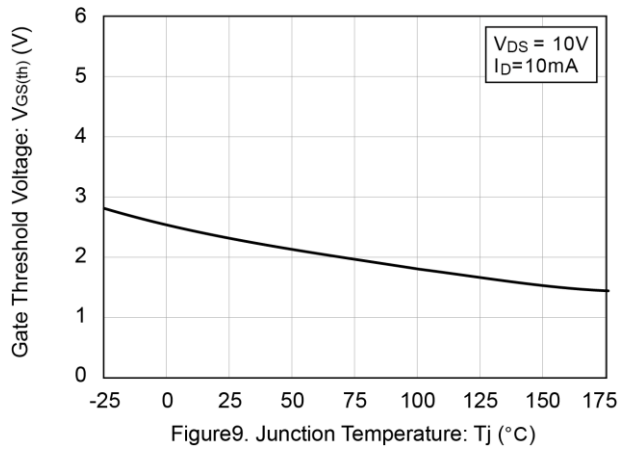


Figure9. Junction Temperature: Tj (°C)

Static Drain - Source On - State Resistance vs. Gate - Source Voltage

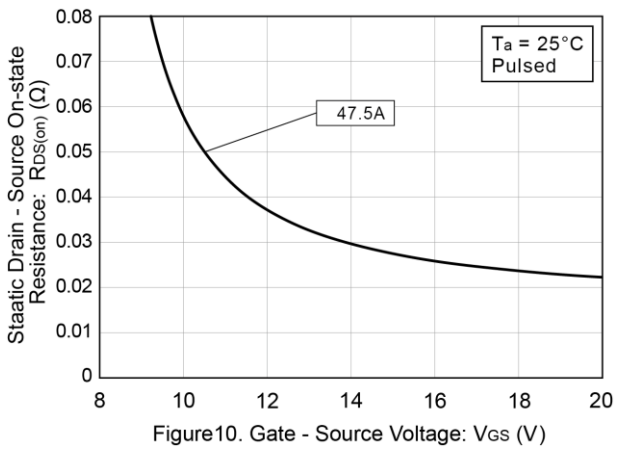


Figure10. Gate - Source Voltage: VGS (V)

Static Drain - Source On - State Resistance vs. Junction Temperature

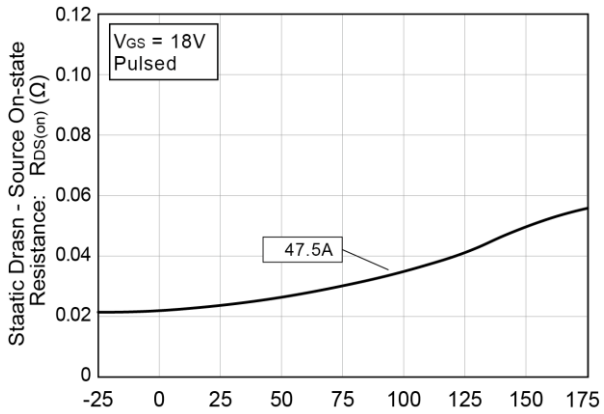


Figure11. Junction Temperature: T_J (°C)

Typical Capacitance vs. Drain – Source Voltage

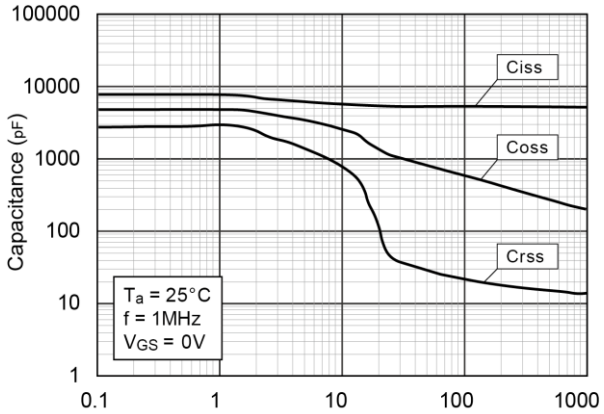


Figure12. Drain - Source Voltage: V_{DS} (V)

Typical Gate Charge

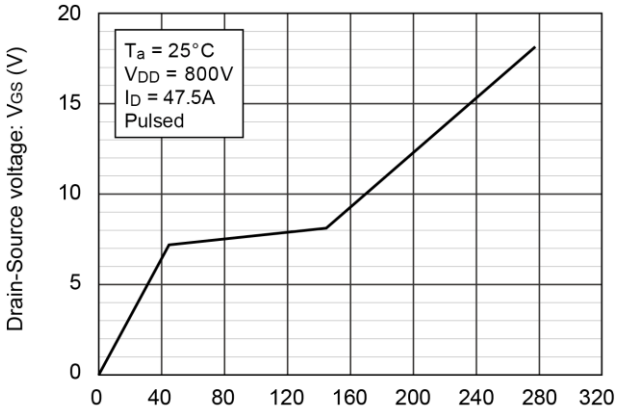


Figure13. Gate charege : Q_g (nC)

Maximum Safe Operating Area (SOA)

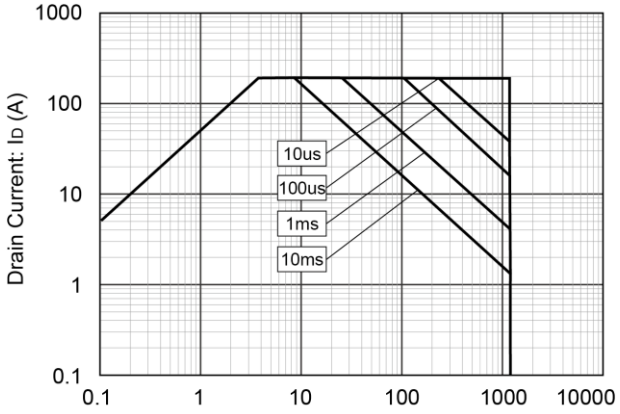


Figure16. Drain-Source Votlage: V_{DS} (V)

Reverse Bias Safe Operating Area (RBSOA)

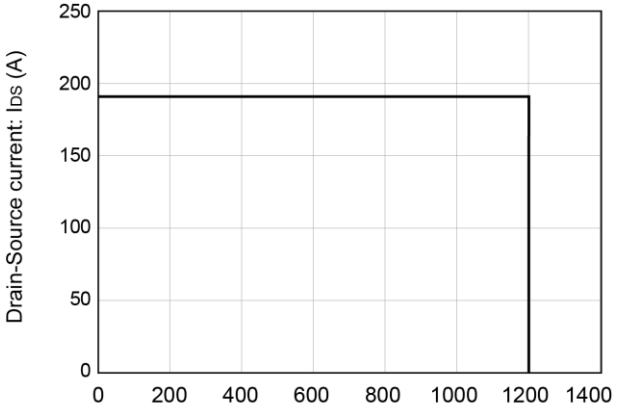


Figure17. Drain - Source Voltage: V_{DS} (V)

Typical Transient Thermal Resistance Vs. Pulse Width

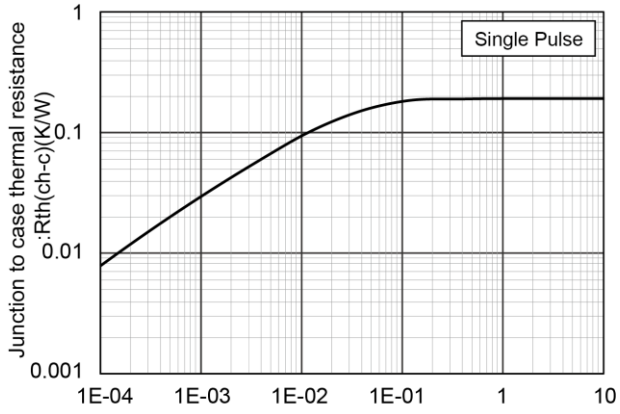


Figure18. Pulse Width: tw(S)

Power dissipation
vs. Junction Temperature

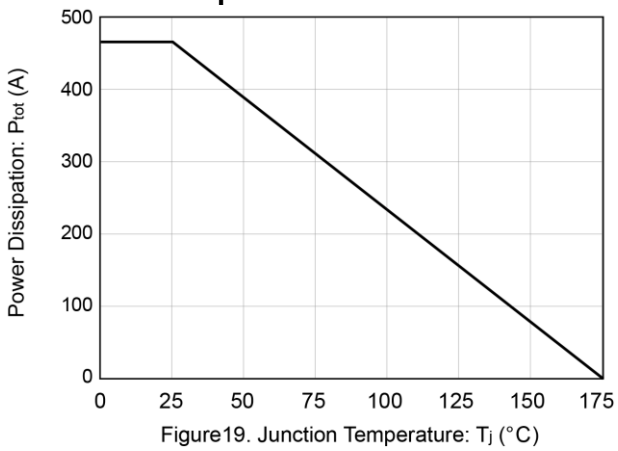
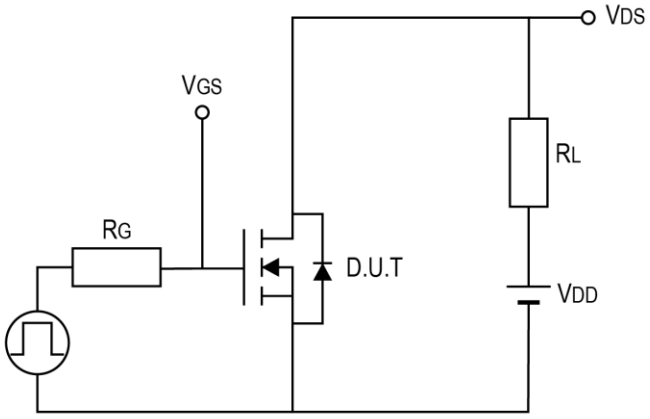
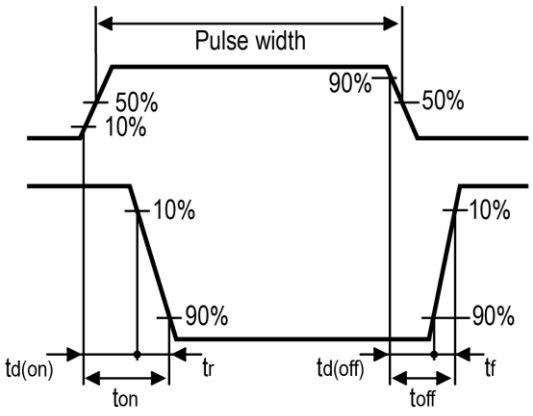


Figure19. Junction Temperature: Tj (°C)

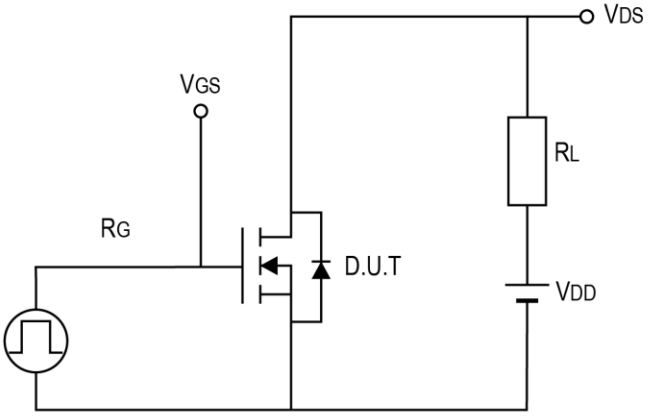
Switching Time Measurement Circuit



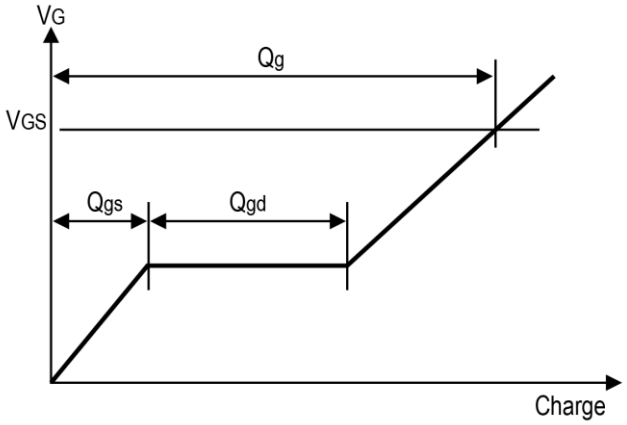
Switching Waveform



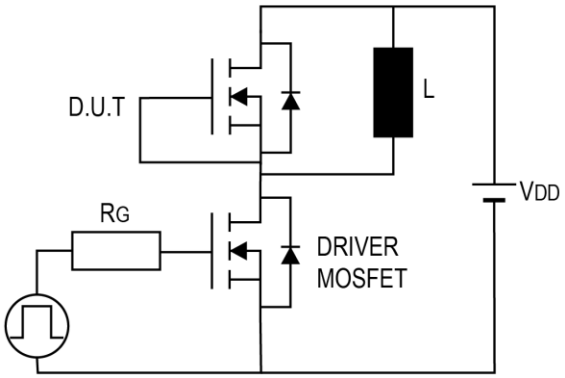
Gate Charge Measurement Circuit



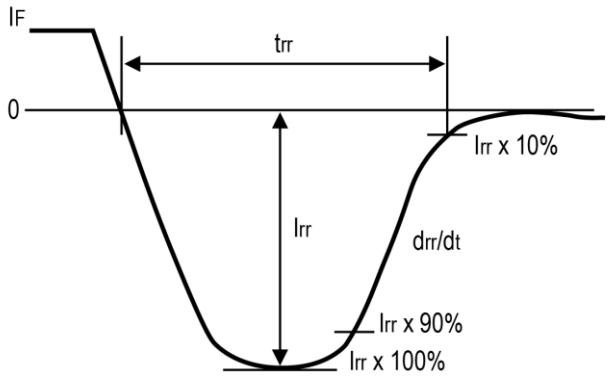
Gate Charge Waveform



Reverse Recovery Time Measurement Circuit

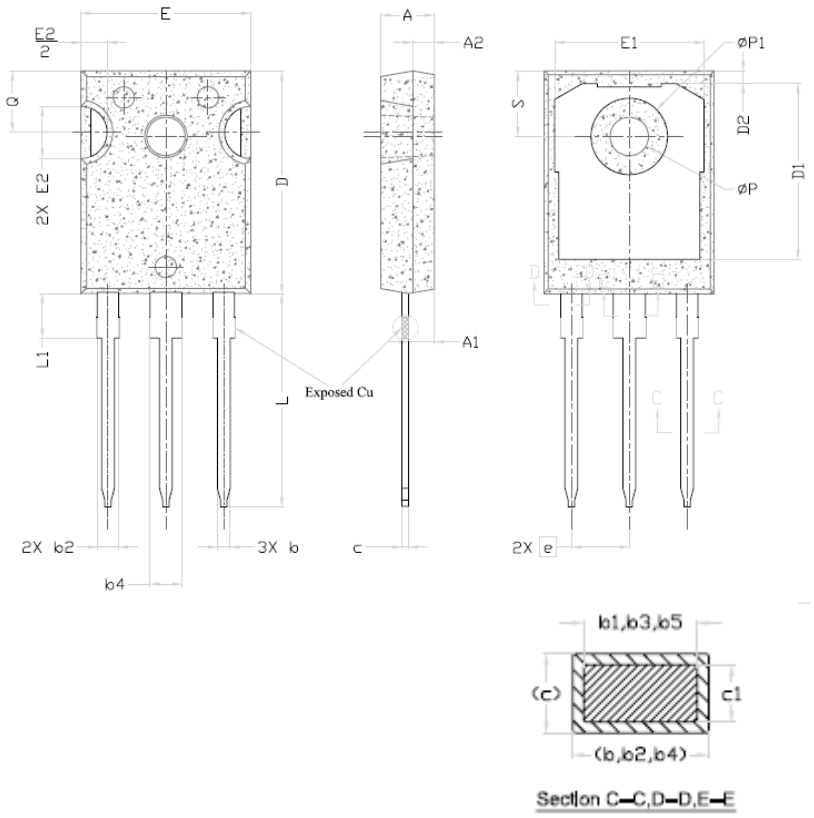


Reverse Recovery Time Waveform



Package Outline

TO-247-3L



Unit : mm

SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.55
A2	1.50	2.00	2.49
b	1.12	1.20	1.33
b1	1.12	1.20	1.28
b2	1.91	2.00	2.39
b3	1.91	2.00	2.34
b4	2.87	3.00	3.22
b5	2.87	3.00	3.18
c	0.55	0.60	0.69
c1	0.55	0.60	0.65
D	20.80	20.95	21.10
D1	16.25	16.55	17.65
D2	0.51	1.19	1.35
E	15.75	15.94	16.13
E1	13.46	14.02	14.16
E2	4.32	4.91	5.49
e	5.44BSC		
L	19.81	20.07	20.32
L1	4.10	4.19	4.40
ØP	3.56	3.61	3.65
ØP1	7.19REF.		
Q	5.39	5.79	6.20
S	6.04	6.17	6.30