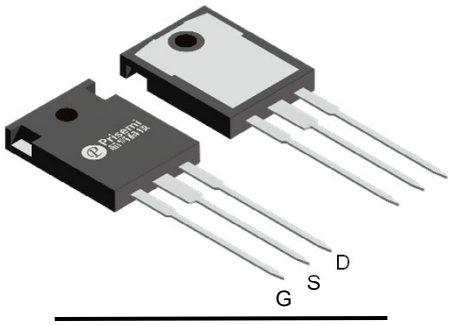
Prisemi®

PGCTAF65R50B

650V Enhancement-mode GaN Transistor

Description

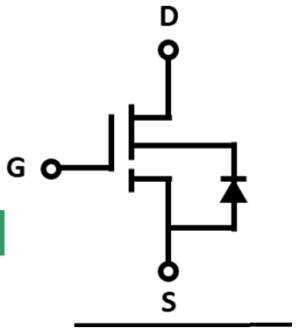
650V Normally-OFF GaN			
V_{DS}(V)	$R_{DS(on)}$(mΩ)	I_{DS}(A)	Q_G(nC)
650	50	38	17



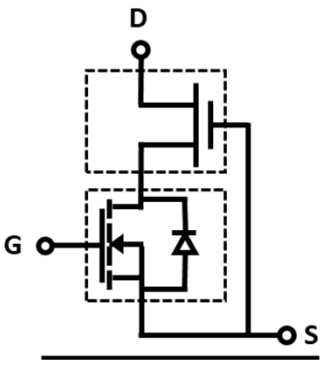
TO-247-3L

Feature

- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
- Low switching loss
- RoHS compliant and Halogen-free
- Package:TO-247-3L



Schematic Symbol



Cascode Device Structure

Applications

- High efficiency power supplies
- Telecom and datacom
- Automotive
- Servo motors

Absolute maximum rating@25℃

Rating		Symbol	Value	Units
Drain-Source Voltage		V_{DSS}	650	V
Drain-Source Voltage-transient[1)]		V_{TDSS}	800	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current-Continuous	T_C =25℃	I_D	38	A
	T_C =100℃		25	
Pulse Drain Current (pulse width: 100μs)	T_C =25℃	I_{DM}	156	A
	T_C =150℃		101	
Maximum Power Dissipation		P_D	139	W
Operating and Storage Temperature Range		T_C,T_J,T_{STG}	-55~+150	℃
Soldering Peak temperature		T_{CSOLD}	260	℃

Thermal characteristics

Parameter	Symbol	Typ.	Units
Thermal Resistance, Junction - Case	$R_{θJC}$	0.91	℃/W
Thermal Resistance, Junction - Ambient[2)]	$R_{θJA}$	50	℃/W

Electrical characteristics per line@25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Statistic Characteristics						
Drain-Source Voltage-Max	$V_{DSS-Max}$	V_{GS}= 0V	650	-	-	V
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}= 0V , I_{DS}= 250μA	-	1000	-	V
Total Drain Leakage Current	I_{DSS}	V_{DS}= 700V,V_{GS}= 0V	-	10	30	μA
		V_{DS}= 700V,V_{GS}= 0V, T_J=150℃	-	50	-	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D= 500μA	3.0	4.0	5.0	V
Gate Threshold Voltage Temperature Coefficient	$\triangle V_{GS(th)}/T_J$		-	-11.3	-	mV/℃
Gate-Source Leakage Current	I_{GSS}	V_{GS}= ±20V	-	-	±150	nA
Static Drain-Source On-Resistance[3]	$R_{DS(ON)}$	V_{GS}= 12V, I_D= 4A	-	50	65	mΩ
		V_{GS}= 12V, I_D= 4A, T_J=150℃	-	100	-	
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}= 400V,V_{GS}= 0V, f= 1MHz	-	519	-	pF
Output Capacitance	C_{oss}		-	117	-	
Reverse Transfer Capacitance	C_{rss}		-	2.7	-	
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS} =0V, V_{DS} =0V to 400V	-	175	-	pF
Effective Output Capacitance, Time Related	$C_{o(tr)}$		-	317	-	
Output Charge	Q_{oss}		-	127	-	nC
Total Gate Charge	Q_g	V_{GS}=0V to 12V, V_{DS}=400V, I_D=6A	-	17	-	nC
Gate-Source Charge	Q_{gs}		-	4.6	-	
Gate-Drain Charge	Q_{gd}		-	5.6	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DS}=400V, V_{GS}=0V to 12V, I_D=10A, R_G=40Ω,	-	44	-	ns
Turn-on Rise Time	t_r		-	16	-	
Turn-Off Delay Time	$t_{d(off)}$		-	40	-	
Turn-Off Fall Time	t_f		-	12	-	
Reverse Device Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}= 0V,I_S= 12.5A	-	1.3	-	V
		V_{GS}= 0V,I_S= 25A	-	1.9	-	
		V_{GS}= 0V,I_S= 25A, T_J=150℃	-	3.0	-	
Reverse Recovery Time	t_{rr}	I_S=25A, V_{DD}=400V, d_i/d_t=1000A/μs, V_{GS}=0V	-	43	-	ns
Reverse Recovery Charge	Q_{rr}		-	127	-	nC

Notes:
1. Off-state spike duty cycle < 0.01, spike duration < 2us
2. Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling, with 6cm² copper area and 70μm thickness)
3. Dynamic on-resistance; see Figure 17 and 18 for test circuit and configurations

Typical Characteristics

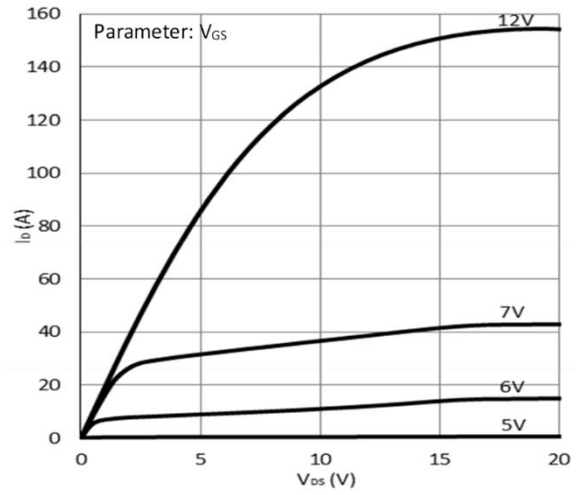


Figure 1. Typical Output Characteristics T_J=25℃

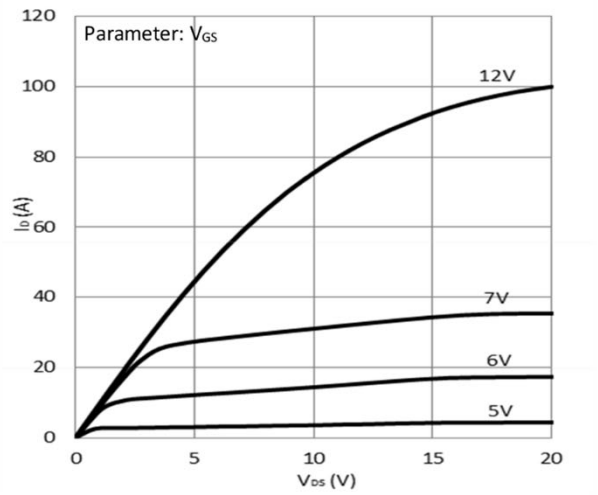


Figure 2. Typical Output Characteristics T_J=150℃

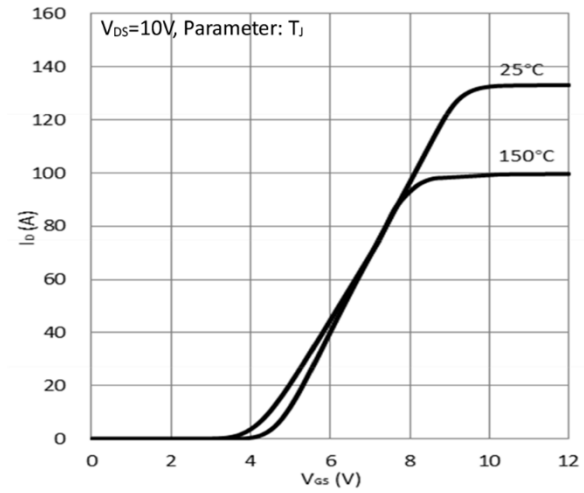


Figure 3. Typical Transfer Characteristics

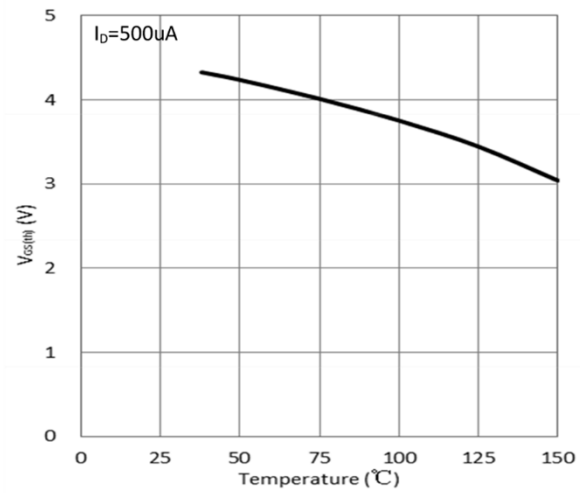


Figure 4. $V_{GS(th)}$ Vs Temperature Characteristics

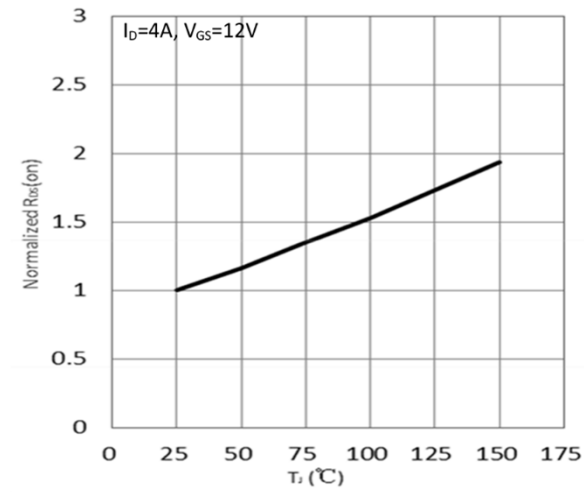


Figure 5. Normalized On-resistance

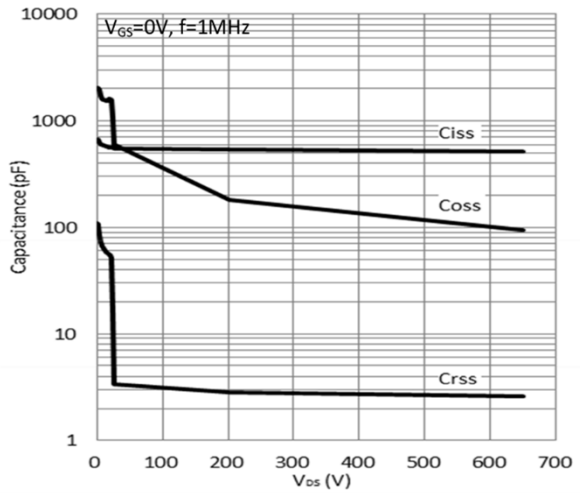


Figure 6. Typical Capacitance

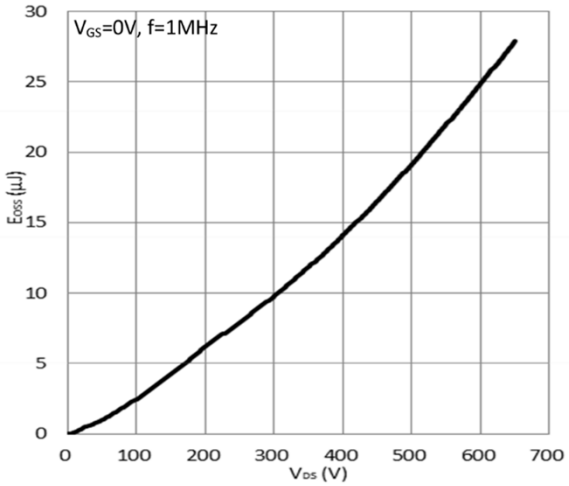


Figure 7. Typical Coss Stored Energy

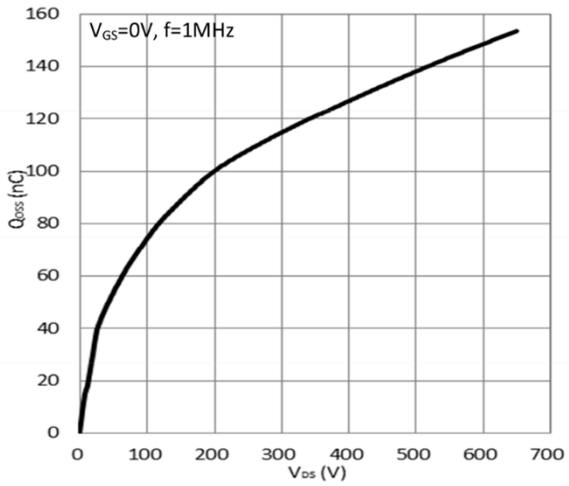


Figure 8. Typical Qoss

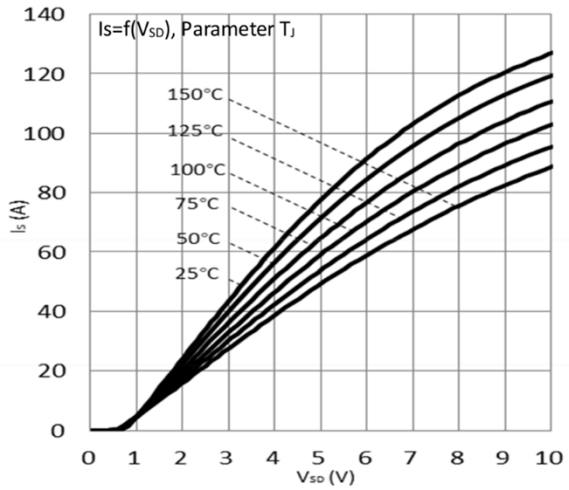


Figure 9. Forward Characteristic of Rev. Diode

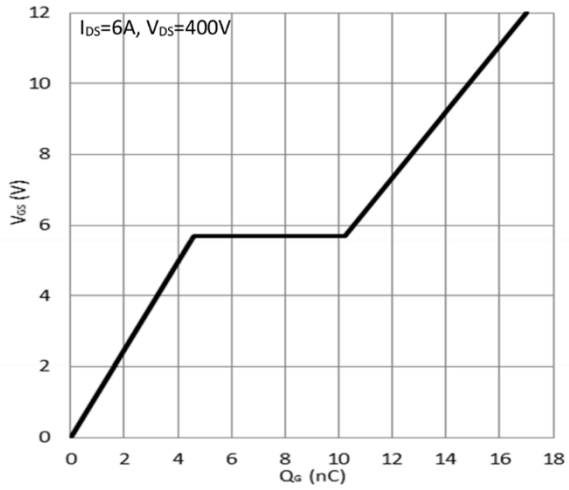


Figure 10. Typical Gate Charge

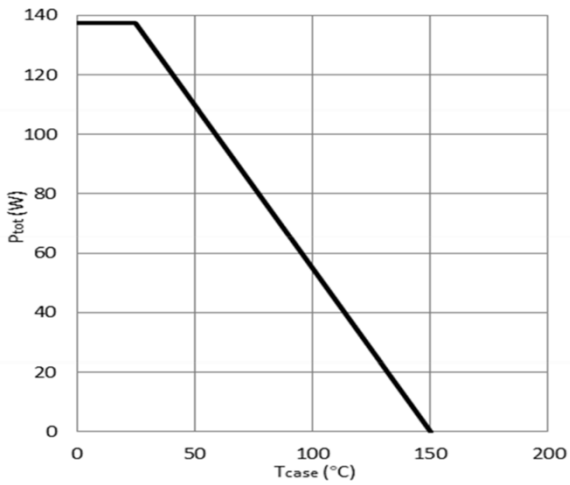


Figure 11. Power Dissipation

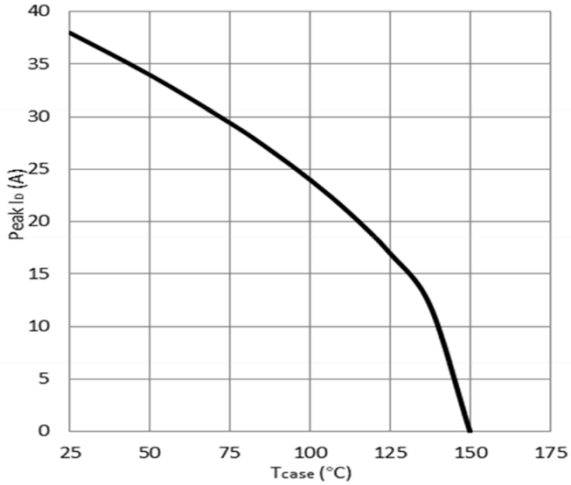


Figure 12. Current Derating

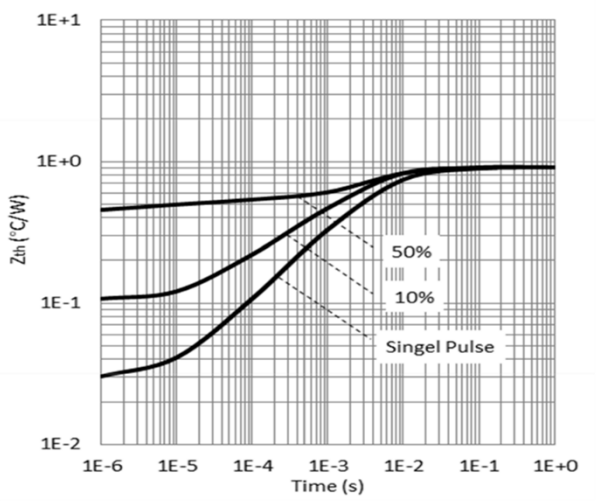


Figure 13. Transient Thermal Resistance

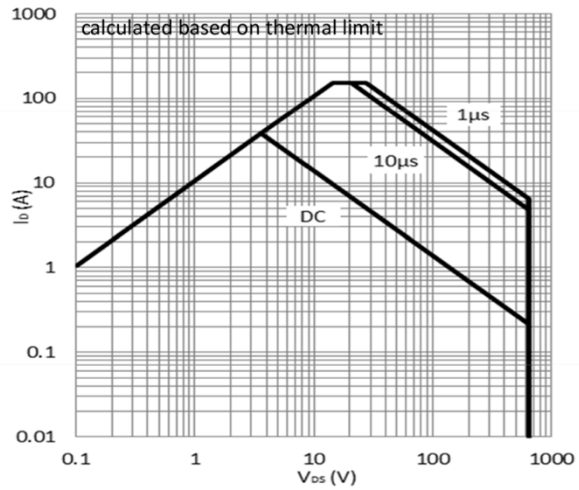


Figure 14. Safe Operating Area T_C=25℃

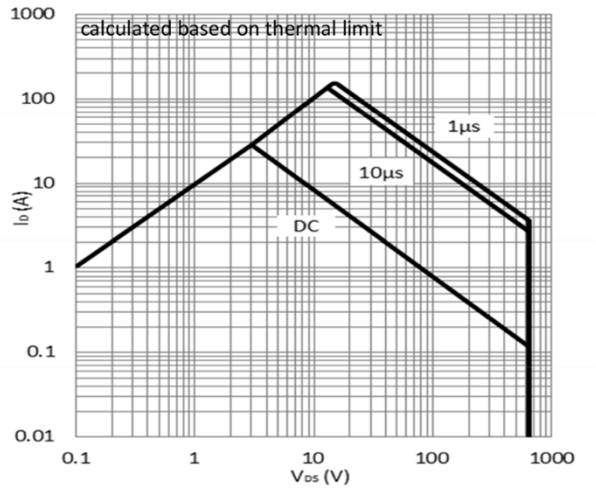


Figure 15. Safe Operating Area T_C=80℃

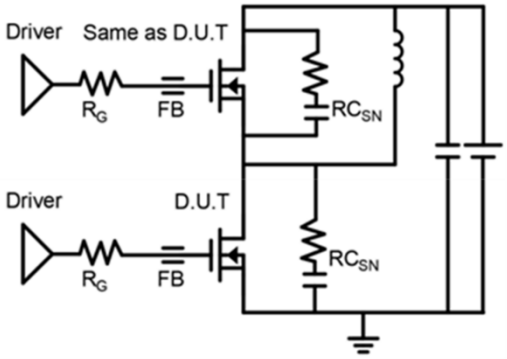


Figure 15. Switching Time Test Circuit

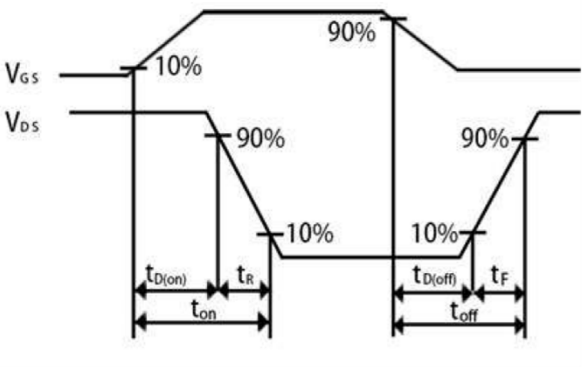


Figure 16. Switching Time Waveform

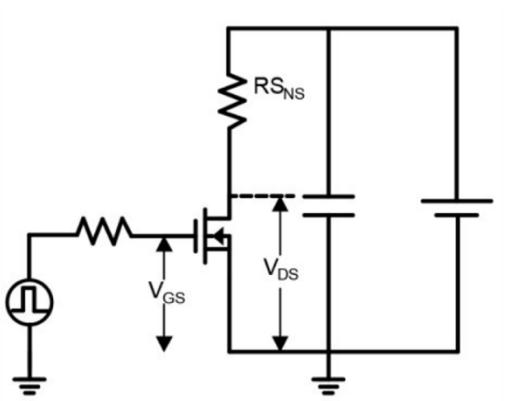


Figure 17. Dynamic $R_{DS(on)}$ Test Circuit

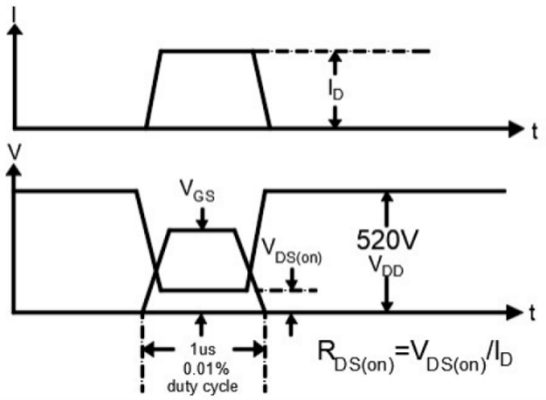


Figure 18. Dynamic $R_{DS(on)}$ Waveform

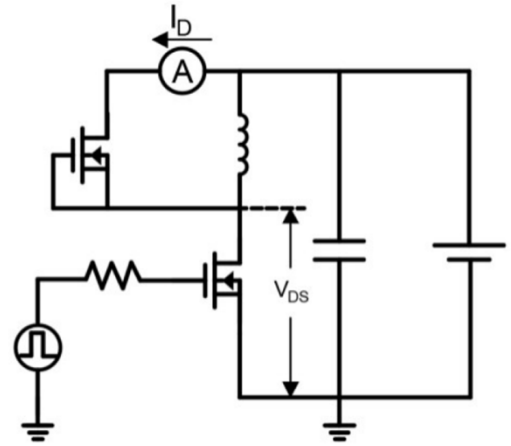


Figure 19. Diode Characteristic Test Circuits

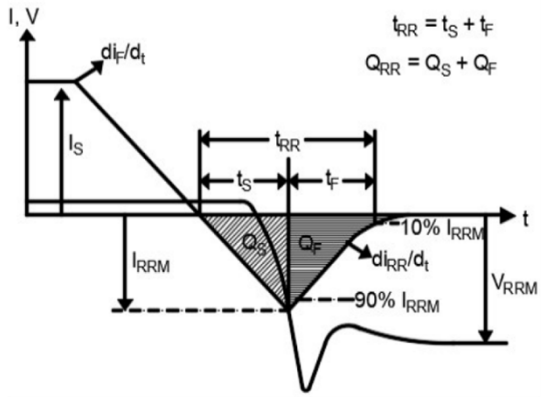
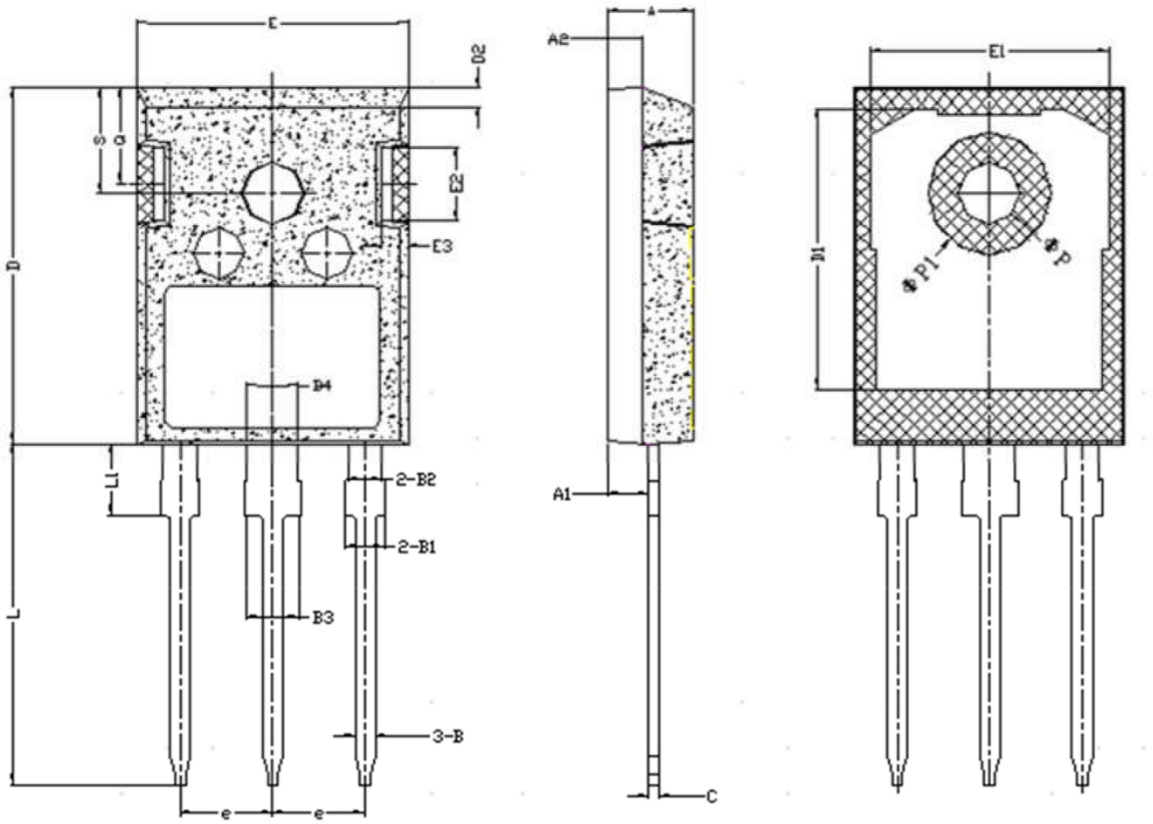


Figure 20. Diode Recovery Waveform

Product Dimension (TO-247-3L)



SYMBOL	Millimeter		
	Min	Nom	Max
A	4.60	4.90	5.20
A1	2.20	2.40	2.60
B	0.90	1.20	1.40
B1	1.75	2.05	2.35
B2	1.75	1.95	2.15
B3	2.80	3.00	3.35
B4	2.80	2.95	3.15
C	0.50	0.60	0.70
D	20.60	21.00	21.30
D1	16.00	17.00	18.00
E	15.50	15.80	16.10
E1	13.00	13.80	14.70
E2	3.80	4.50	5.30
E3	0.80	1.70	2.60
E	5.20	5.40	5.7
L	19.00	20.00	20.50
L1	3.90	4.30	4.60
ΦP	3.30	3.50	3.70
ΦP1	7.00	7.20	7.40
Q	5.20	5.60	6.00
S	5.80	6.20	6.60

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