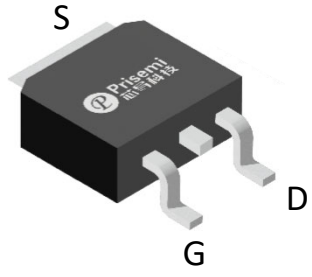
Prisemi®

PGCDP70R125B

700V GaN Power Transistor

Description

Product Summary		
V_{DS}(V)	$R_{DS(on)}$(mΩ)(Typ)	I_D(A)
700	125	18



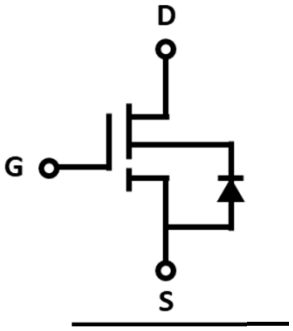
TO-252 (Top View)

Feature

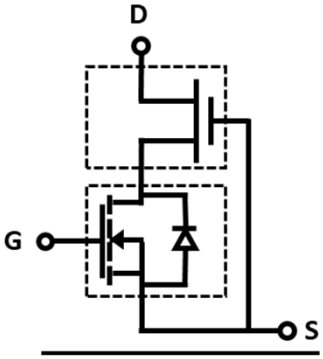
- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
- Low switching loss
- RoHS compliant and Halogen-free

Applications

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



Schematic Symbol



Cascode Device Structure

Absolute maximum rating@25℃

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	700	V
Gate-Source Voltage		V_{GS}	±20	V
Transient Drain-Source Voltage[1)]		V_{TDS}	800	V
Continuous Drain Current	T_C=25℃	I_D	18	A
	T_C=100℃		12	
Pulsed Drain Current (Pulse Width: 100μs)	T_C=25℃	I_{DM}	49	A
	T_C=150℃		37	
Power Dissipation		P_D	74	W
Soldering Peak Temperature		T_{CSOLD}	260	℃
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	℃

Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{θJC}$	-	1.7	-	℃/W
Thermal Resistance, Junction-to-Ambient[2)]	$R_{θJA}$	-	50	-	℃/W

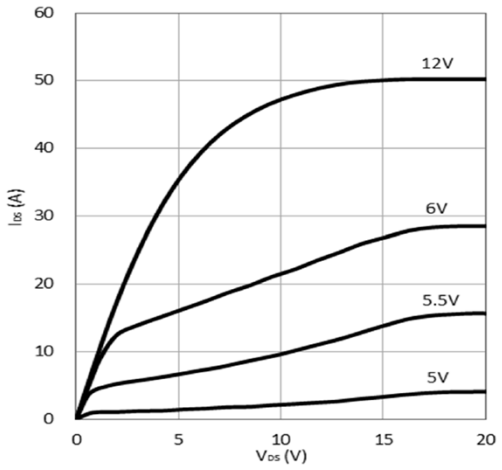
Electrical characteristics per line@25℃ (unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Statistic Characteristics							
Maximum Drain-Source Voltage	V_{DS-Max}	V_{GS} = 0V		700	-	-	V
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V,I_D = 250μA		-	1000	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=700V, V_{GS}=0V	T_J=25℃	-	8	20	μA
			T_J=150℃	-	50	-	
Gate-Body Leakage Current	I_{GSS}	V_{GS} = ±20V,V_{DS} = 0V		-	-	±150	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS},I_D = 500μA		3	4	5	V
Gate threshold voltage temperature coefficient	$\triangle V_{GS(th)}/T_J$			-	-10.7	-	mV/℃
Drain-Source On-State Resistance[3]	$R_{DS(ON)}$	V_{GS}=12V, I_D=4A	T_J=25℃	-	125	160	mΩ
			T_J=150℃	-	250	-	
Dynamic Characteristics							
Input Capacitance	C_{lss}	V_{DS} = 400V,V_{GS} = 0V, f = 1MHz		-	563	-	pF
Output Capacitance	C_{oss}			-	28	-	
Reverse Transfer Capacitance	C_{rss}			-	1.1	-	
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS} = 0V, V_{DS} = 0-400V		-	43	-	pF
Effective Output Capacitance, Time Related	$C_{o(tr)}$			-	90	-	
Output Charge	Q_{oss}			-	36	-	nC
Turn-on Delay Time	$t_{d(on)}$	V_{DS} = 400V,I_D = 12A, V_{GS} =0-12V,R_G=47Ω		-	50	-	ns
Turn-on Rise Time	t_r			-	6	-	
Turn-Off Delay Time	$t_{d(off)}$			-	80	-	
Turn-Off Fall Time	t_f			-	5	-	
Total Gate Charge	Q_g	V_{DS} = 400V,I_D = 12A, V_{GS} =0-12V		-	16	-	nC
Gate-Source Charge	Q_{gs}			-	4.8	-	
Gate-Drain Charge	Q_{gd}			-	4.4	-	
Reverse Diode Characteristics							
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=6A		-	1.1	-	V
		V_{GS}=0V, I_S=12A	T_J=25℃	-	1.5	-	
			T_J=150℃	-	2	-	
Reverse Recovery Time	t_{rr}	V_{GS}=0V, I_S=12A, V_{DD}=400V, di/dt=1000A/μs		-	21	-	ns
Reverse Recovery Charge	Q_{rr}			-	36	-	nC

Notes:
1. Off-state spike duty cycle < 0.01, spike duration < 2μs
2. Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling, with 6cm²copper area and 70μm thickness)
3. Dynamic on-resistance; see Figure 19 and 20 for test circuit and configurations

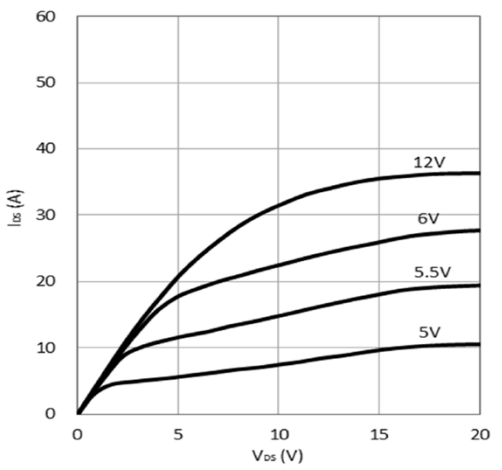
Typical Characteristics

Figure 1. Typical Output Characteristics T_J=25℃



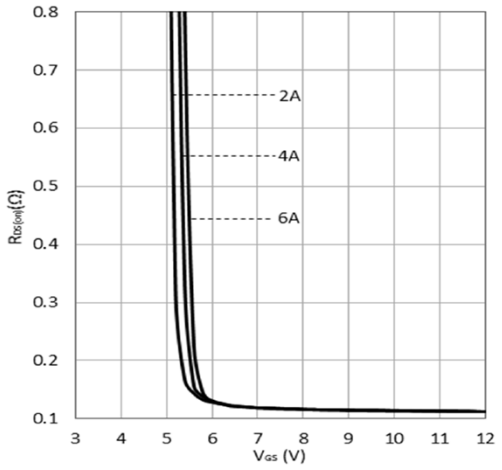
Parameter: V_{GS}

Figure 2. Typical Output Characteristics T_J=150℃



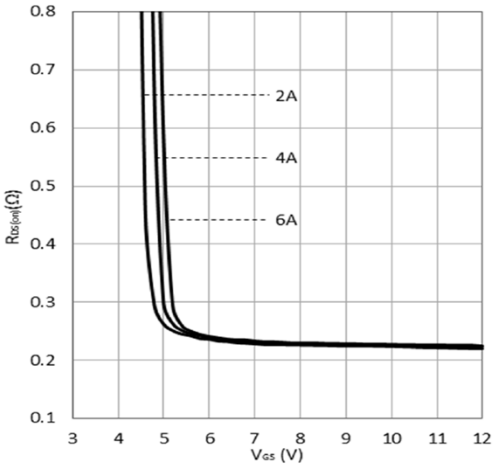
Parameter: V_{GS}

Figure 3.Typical Drain to Source On-resistance TJ= 25°C



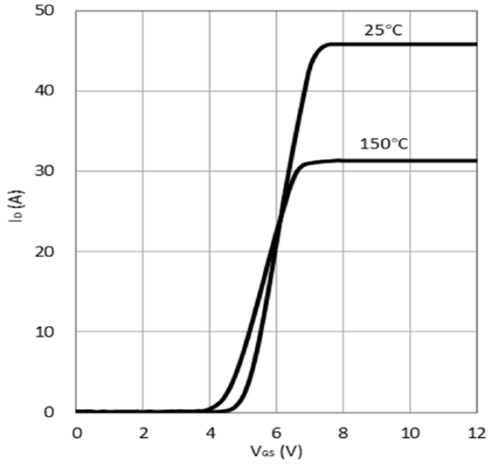
Parameter: I_D

Figure 4. Typical Drain to Source On-resistance T_J= 150°C



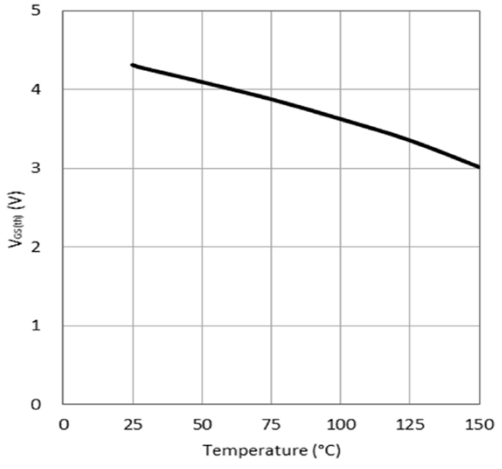
Parameter: I_D

Figure 5. Typical Transfer Characteristics



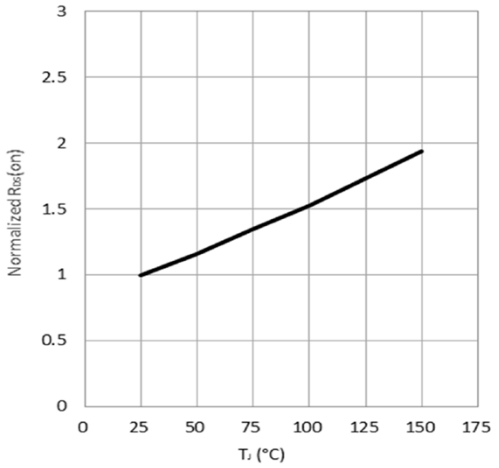
V_{DS}=10V, Parameter: T_J

Figure 6. $V_{GS(th)}$ Vs Temperature Characteristics



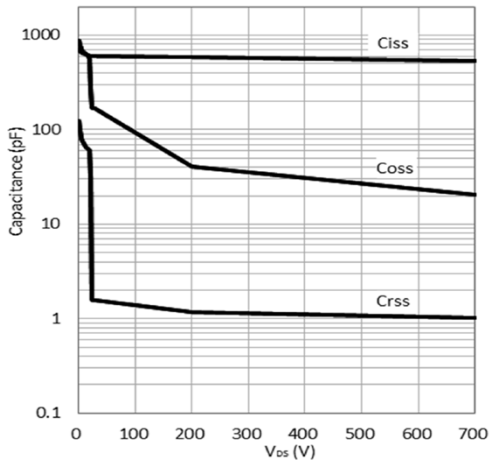
I_D=500uA

Figure 7. Normalized On-resistance



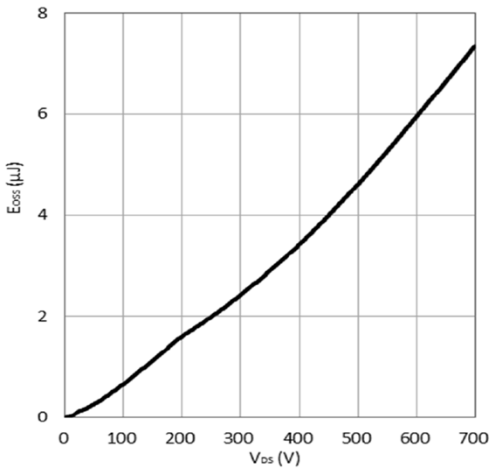
I_D=4A, V_{GS}=12V

Figure 8. Typical Capacitance



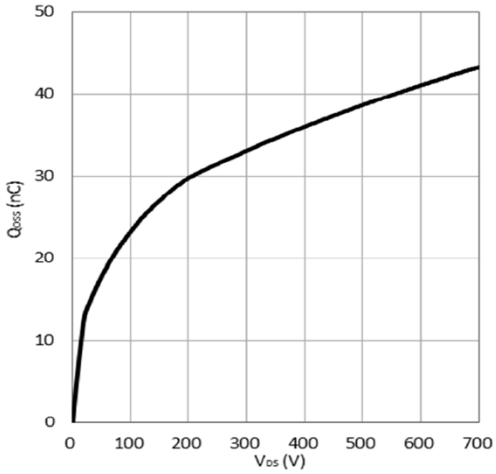
V_{GS}=0V, f=1MHz

Figure 9. Typical Coss Stored Energy



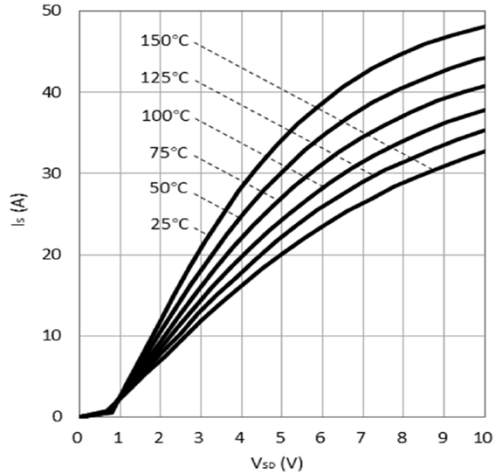
V_{GS}=0V, f=1MHz

Figure 10. Typical Qoss



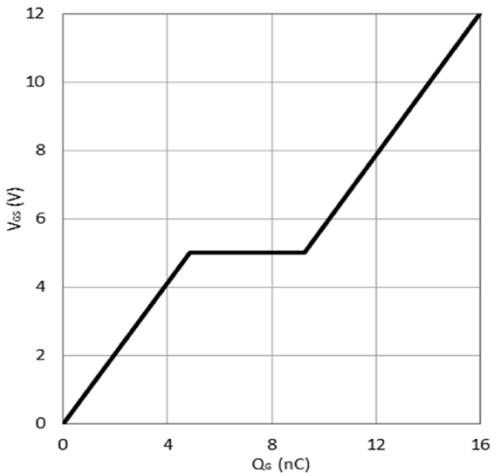
V_{GS}=0V, f=1MHz

Figure 11. Forward Characteristic of Rev. Diode



Is=f(V_{SD}), Parameter T_J

Figure 12. Typical Gate Charge



I_{DS}=12A, V_{DS}=400V

Figure 13. Power Dissipation

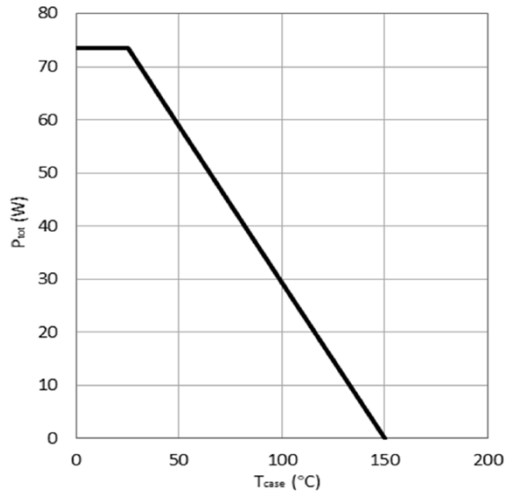


Figure 14. Current Derating

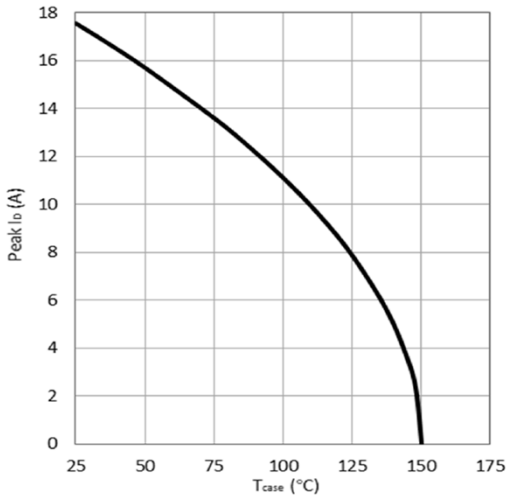


Figure 15. Transient Thermal Resistance

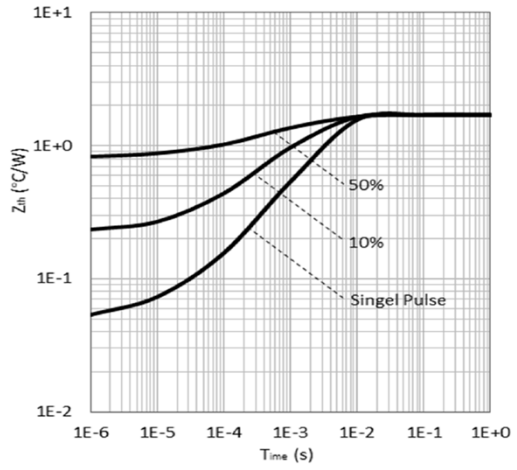
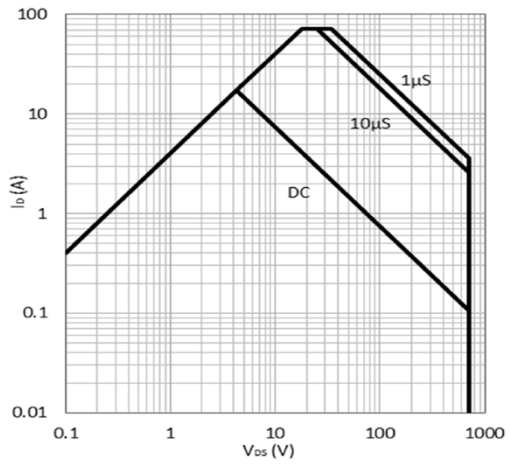
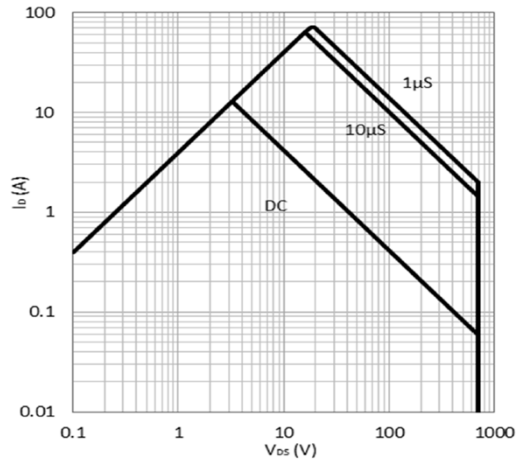


Figure 16. Safe Operating Area T_C=25℃



calculated based on thermal limit

Figure 17. Safe Operating Area T_C=80℃



calculated based on thermal limit

Test Circuits and Waveforms

Test Circuits and Waveforms

Figure 18. Switching Time Test Circuit

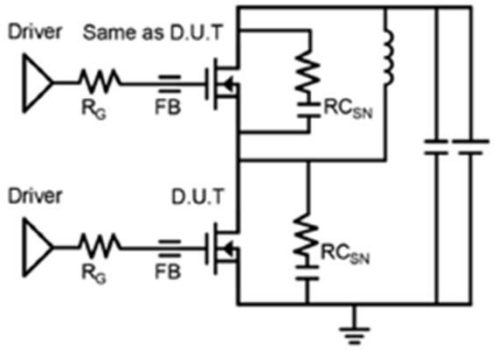


Figure 19. Switching Time Waveform

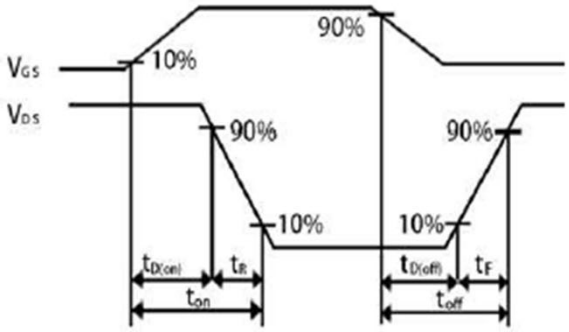


Figure 20. Dynamic $R_{DS(on)}$ Test Circuit

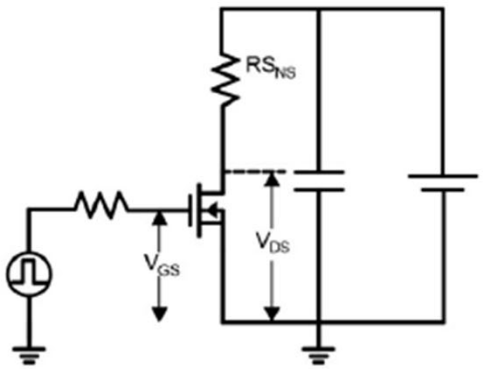


Figure 21. Dynamic $R_{DS(on)}$ Waveform

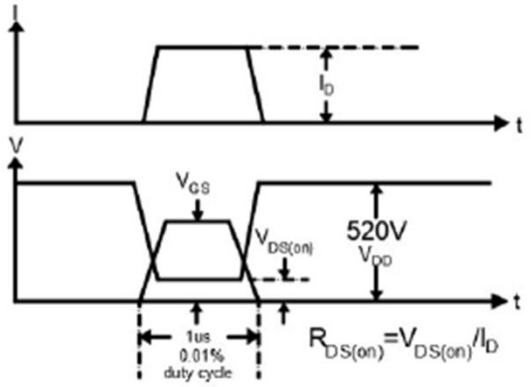


Figure 22. Diode Characteristic Test Circuits

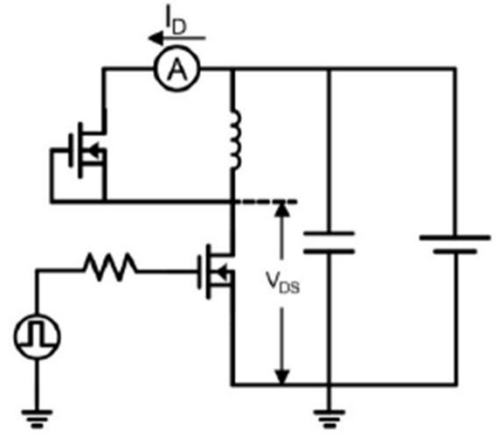
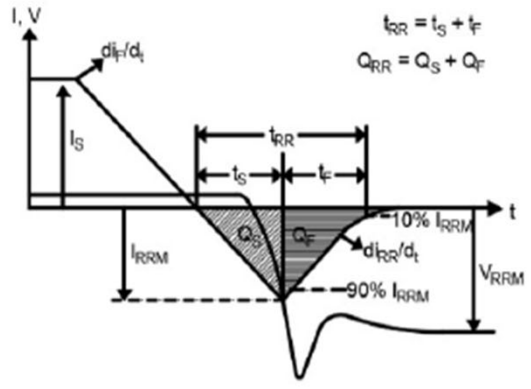
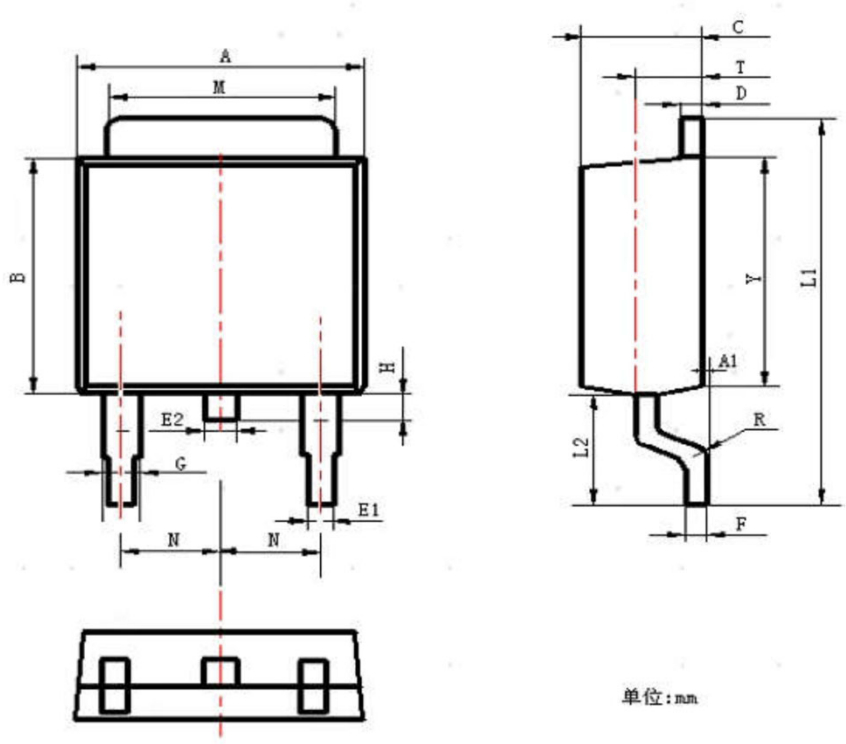


Figure 23. Diode Recovery Waveform



Product Dimension (TO-252)



SYMBOL	Millimeter		
	Min	Nom	Max
A	6.30	6.60	6.90
A1	0	0.80	0.16
B	5.70	6.00	6.30
C	2.10	2.30	2.50
D	0.30	0.60	0.90
E1	0.60	0.75	0.90
F	0.30	0.45	0.60
G	0.70	0.95	1.20
L1	9.30	9.90	10.50
L2	2.50	2.80	3.10
H	0.40	0.70	1.05
M	4.90	5.30	5.60
N	2.09	2.29	2.49

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