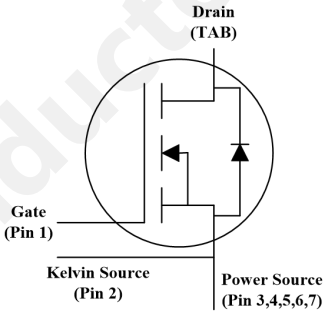
SiC MOSFET P3M17700G7

N-Channel Enhancement Mode

Features

- Qualified to AEC-Q101
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small Q_{gd}



TO-263-7

Drain	TAB
Gate	1
Kelvin Source	2
Power Source	3~7

Benefits

- Improve System Efficiency
- Increase Power Density
- Reduce Heat Sink Requirements
- Reduction of System Cost

Applications

- Solar Inverters
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supplies

RoHS

Halogen

Order Information

Part Number	Package	Marking
P3M17700G7	TO-263-7	P3M17700G7

Contents

1. Maximum Ratings

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1700	V	V_{GS}= 0V I_D= 100μA
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +21	V	AC (f>1Hz)
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	$V_{GS,on}$ $V_{GS,off}$	+12 /+15 /+18 -3	V	Static
Continuous Drain Current	I_D	7.7	A	V_{GS}= 15V T_C= 25℃
		5.4		V_{GS}= 15V T_C= 100℃
Pulsed Drain Current	$I_{D(pulse)}$	12	A	PW≤ 10us， Duty cycle ≤ 1%
Power Dissipation	P_D	127	W	
Operating Junction Temperature	T_J	-55 To +175	℃	
Storage Temperature	T_{stg}	-55 To +150	℃	
Solder Temperature	T_L	245	˚C	

2. Electrical Characteristics

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1700	/	/	V	V_{GS}= 0V I_D= 0.2mA
Gate Threshold Voltage	$V_{GS(th)}$	2.0	2.7	/	V	(tested after 30ms pulse at V_{GS}=15V) V_{DS}= V_{GS} I_D= 2mA T_J= 25°C
		/	1.9	/	V	V_{DS}= V_{GS} I_D= 2mA T_J= 175°C
Zero Gate Voltage Drain Current	I_{DSS}	/	10	200	μA	V_{GS}= 0V V_{DS}= 1700V
Gate-Source Leakage Current	I_{GSS}	/	2	125	nA	V_{GS}= 15V V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	0.7	1.05	Ω	V_{GS}= 15V I_D= 2A T_J= 25°C
		/	1.3	/		V_{GS}= 15V I_D= 2A T_J= 175°C
		/	0.64	/		V_{GS}= 18V I_D= 2A T_J= 25°C
		/	1.2	/		V_{GS}= 18V I_D= 2A T_J= 175°C

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Transconductance	g_{fs}	/	1.1	/	S	V_{DS}= 20V I_{DS}= 2A T_J= 25°C
		/	1.2	/		V_{DS}= 20V I_{DS}= 2A T_J= 175°C
Input Capacitance	C_{iss}	/	230	/	pF	V_{GS}= 0V V_{DS}= 1200V f= 1MHz V_{AC}= 25mV
Output Capacitance	C_{oss}	/	21	/	pF	
Reverse Transfer Capacitance	C_{rss}	/	6.1	/	pF	
Coss Stored Energy	E_{oss}	/	16.7	/	μJ	
Turn-on Energy	E_{on}	/	91.6	/	μJ	V_{DS}= 1200V V_{GS}= -3/15V I_D= 4A R_G= 3Ω
Turn-off Energy	E_{off}	/	19.6	/		
Rise Time	T_r	/	29	/	ns	
Turn-On Delay Time	T_{don}	/	13	/		
Turn-Off Delay Time	T_{doff}	/	19	/		
Fall Time	T_f	/	113	/		
Internal Gate Resistance	$R_{G(int)}$	/	20	/	Ω	f=1MHz V_{AC}= 25mV
Gate to Source Charge	Q_{gs}	/	3.7	/	nC	V_{DS}= 1200V I_{DS}= 2A V_{GS}= -3 to 15V I_G= 2mA
Gate to Drain Charge	Q_{gd}	/	8.3	/		
Total Gate Charge	Q_g	/	13.3	/		

3. Reverse Diode Characteristics

At T_J=25 ℃, unless specified otherwise

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	5.6	/	V	V_{GS}= -3V I_{SD}= 1 A T_J= 25℃
		5.4	/	V	V_{GS}= -3V I_{SD}= 1A T_J= 175℃
Continuous Diode Forward Current	I_S	4	/	A	V_{GS}= -3V
Reverse Recover Time	Trr	7.1	/	ns	V_{GS} = -3/15V I_{SD}= 4A V_R = 1200V d_{if}/d_t = 500A/us
Reverse Recovery Charge	Qrr	22.3	/	nC	
Peak Reverse Recovery Current	Irm	5.3	/	A	

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	1.18	℃/W

5. Typical Performance

At T_J= 25℃, unless specified otherwise

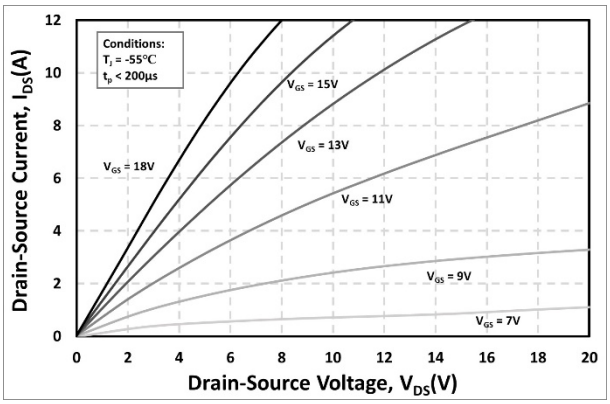


Figure 1. Output Characteristics T_J= -55℃

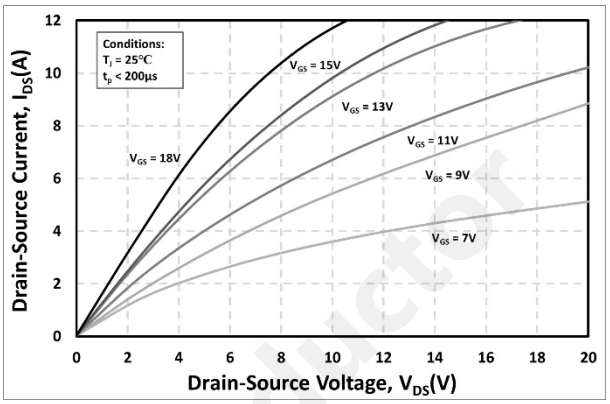


Figure 2. Output Characteristics T_J= 25℃

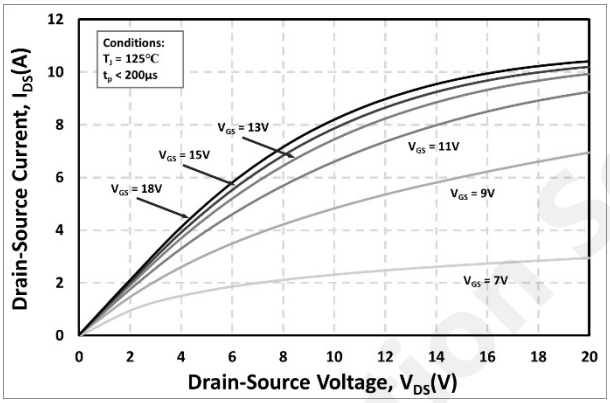


Figure 3. Output Characteristics T_J= 125℃

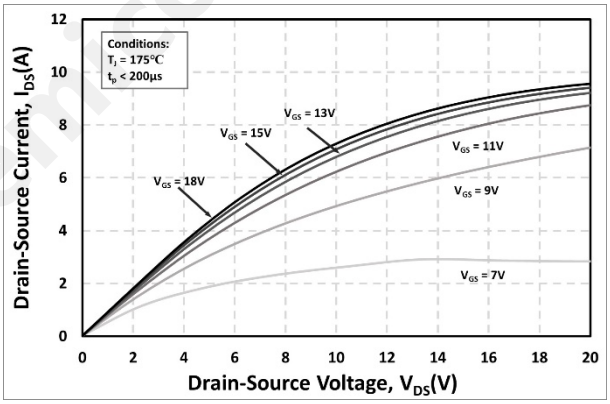


Figure 4. Output Characteristics T_J= 175℃

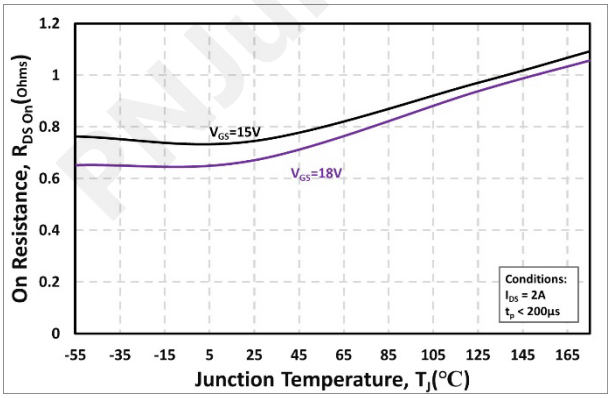


Figure 5. Normalized On-Resistance vs. Temperature

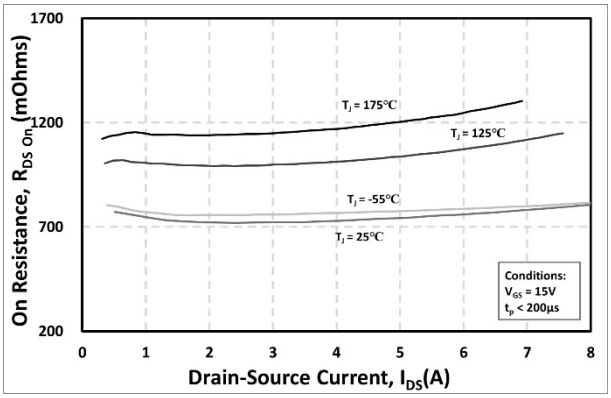


Figure 6. On-Resistance vs. Drain Current Various Temperatures

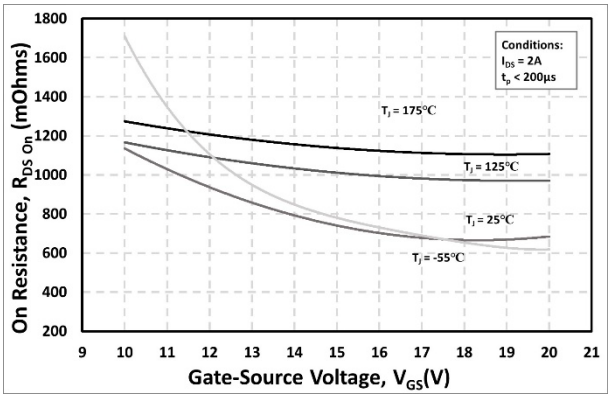


Figure 7. On-Resistance vs. Gate-Source Voltage

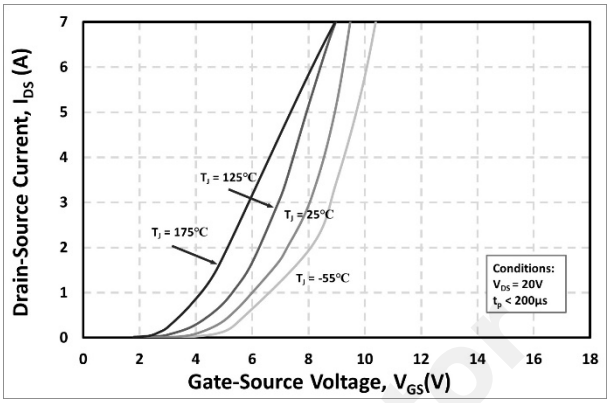


Figure 8. Transfer Characteristic for Various Junction Temperatures

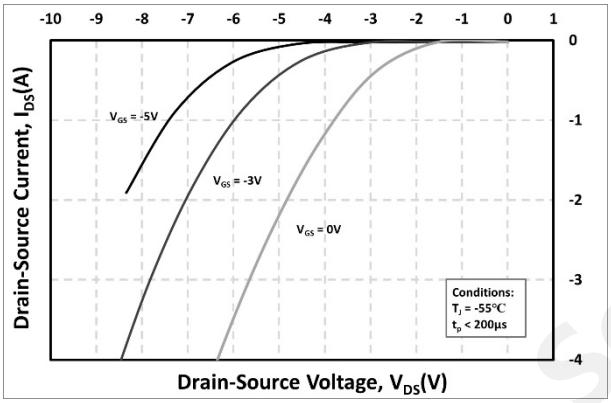


Figure 9. Body Diode Characteristic at -55°C

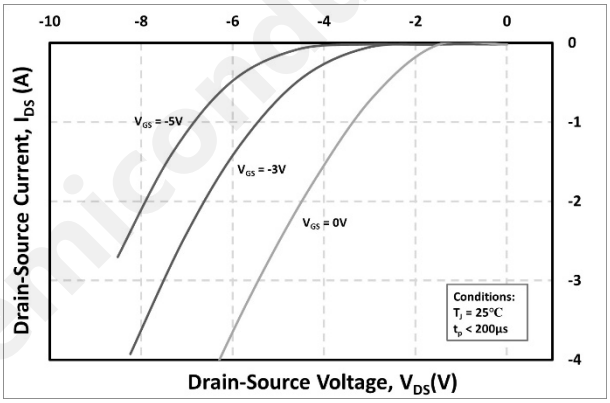


Figure 10. Body Diode Characteristic at 25°C

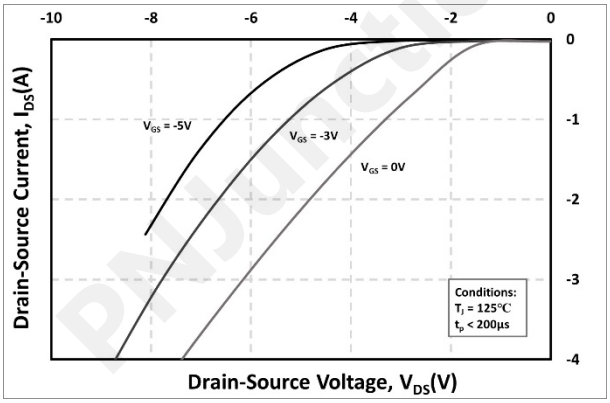


Figure 11. Body Diode Characteristic at 125°C

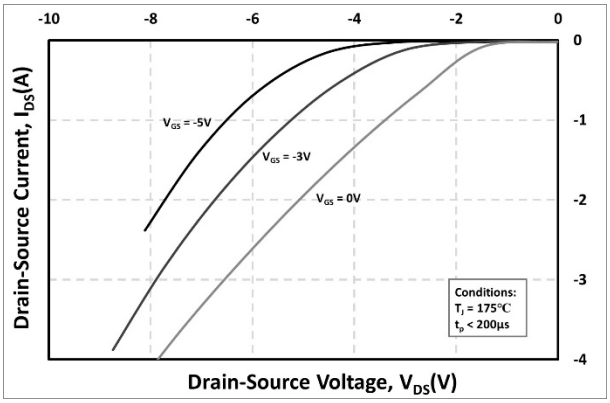


Figure 12. Body Diode Characteristic at 175°C

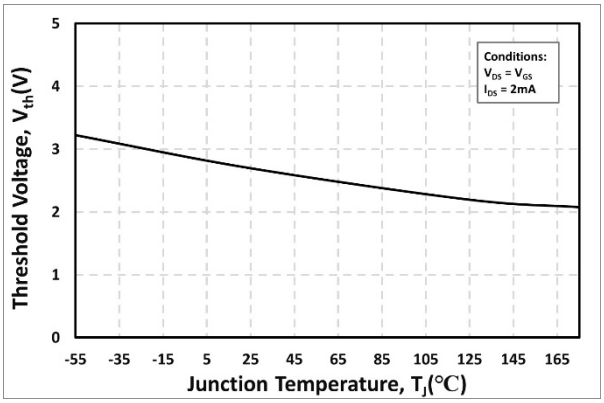


Figure 13. Threshold Voltage vs. Temperatures

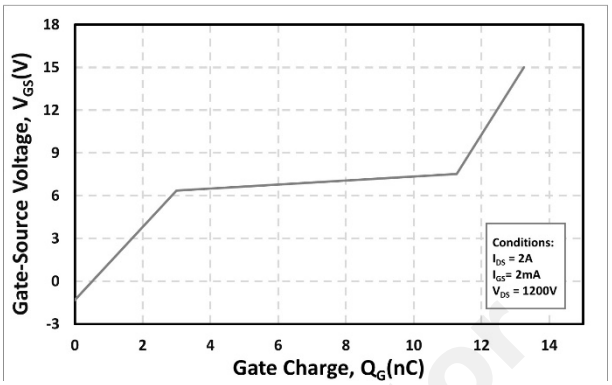


Figure 14. Gate Charge Characteristics

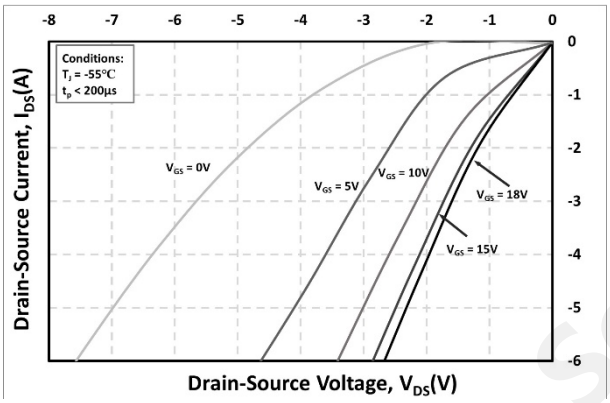


Figure 15. 3rd Quadrant Characteristic at -55°C

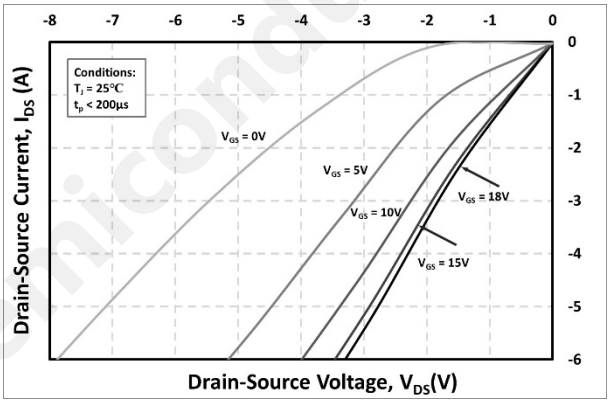


Figure 16. 3rd Quadrant Characteristic at 25°C

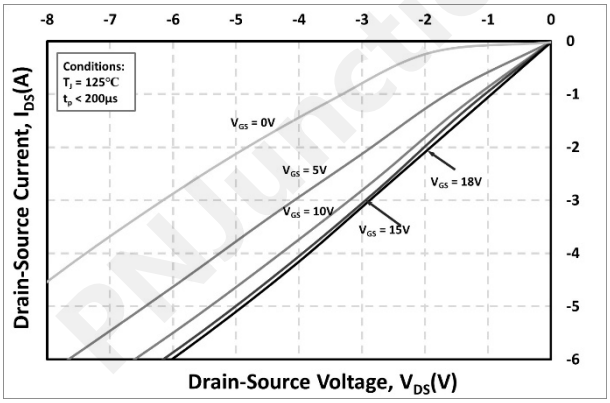


Figure 17. 3rd Quadrant Characteristic at 125 °C

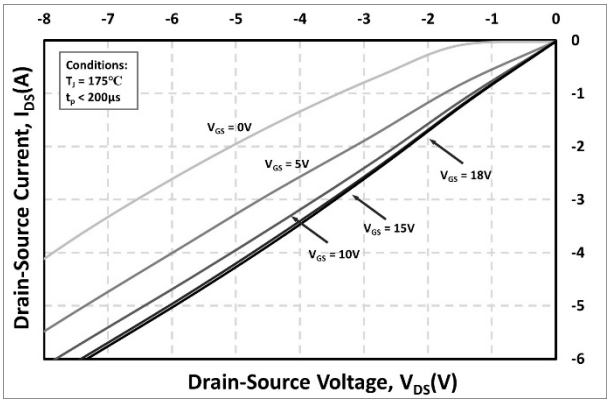


Figure 18. 3rd Quadrant Characteristic at 175 °C

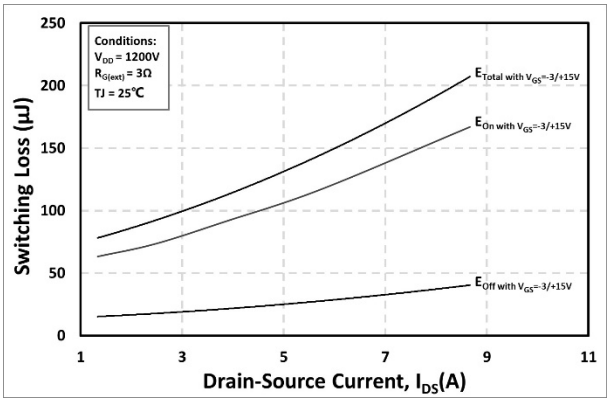


Figure 19. Clamped Inductive Switching Energy vs. Drain Current (V_{DD}= 1200V)

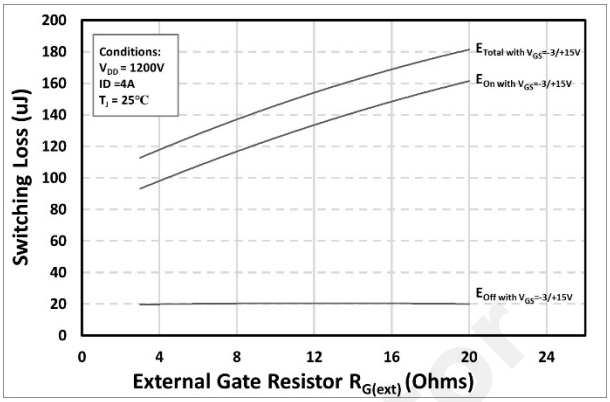


Figure 20. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

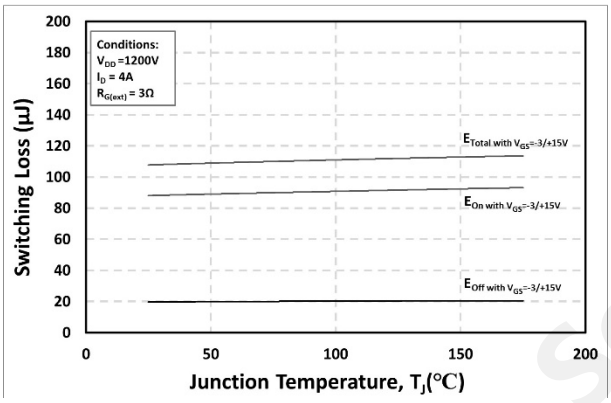


Figure 21. Clamped Inductive Switching Energy vs. Temperature

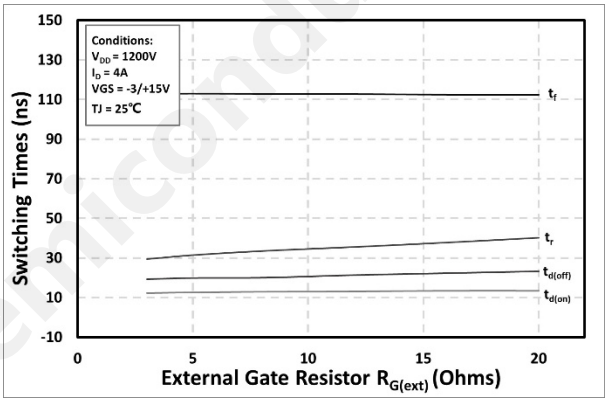


Figure 22. Switching Times vs. $R_{G(ext)}$

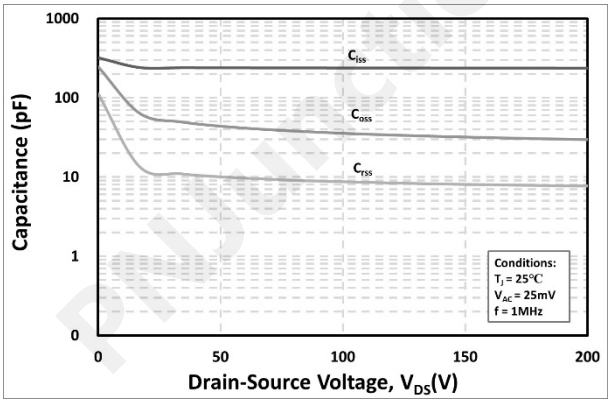


Figure 23. Capacitances vs. Drain-Source Voltage (0-200V)

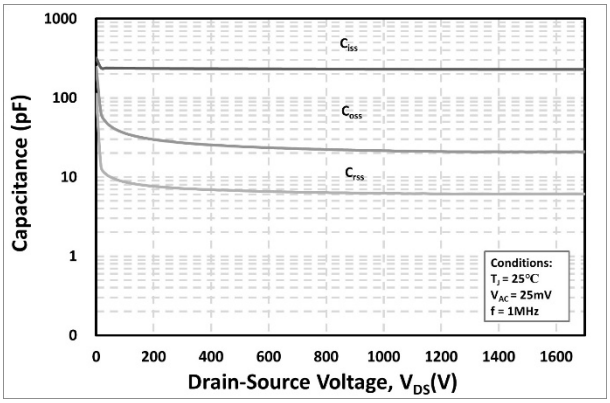


Figure 24. Capacitances vs. Drain-Source Voltage (0-1700V)

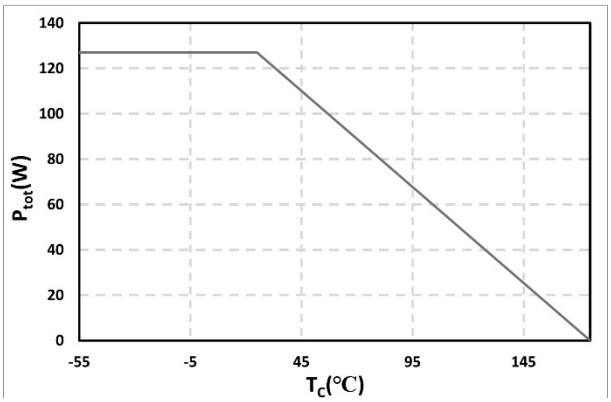


Figure 25. Maximum Power Dissipation Derating vs. Case Temperature

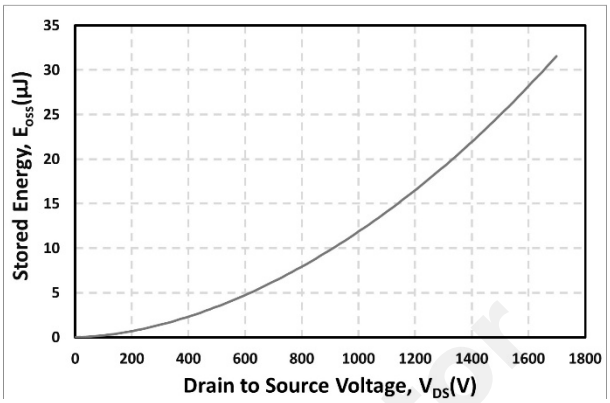


Figure 26. Output Capacitor Stored Energy

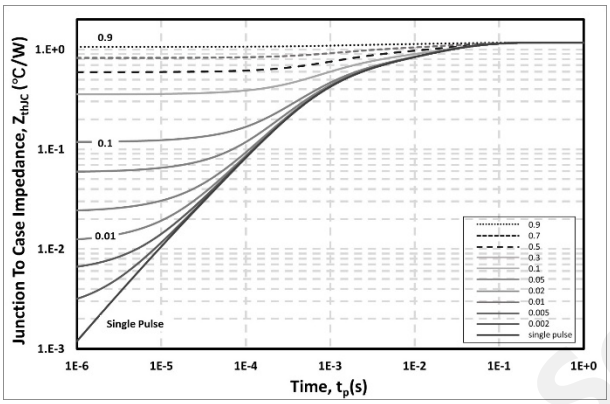


Figure 27. Transient Thermal Impedance (Junction - Case)

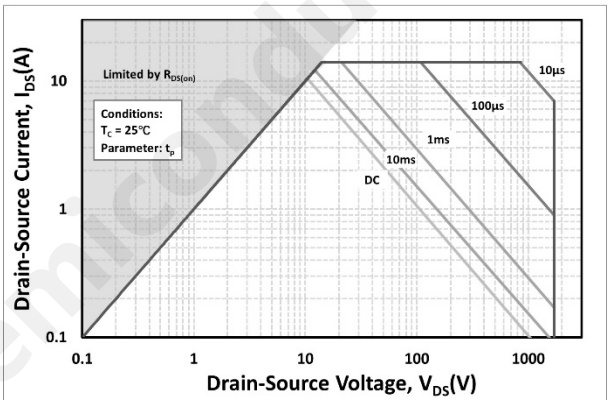


Figure 28. Safe Operating Area

6. Definitions

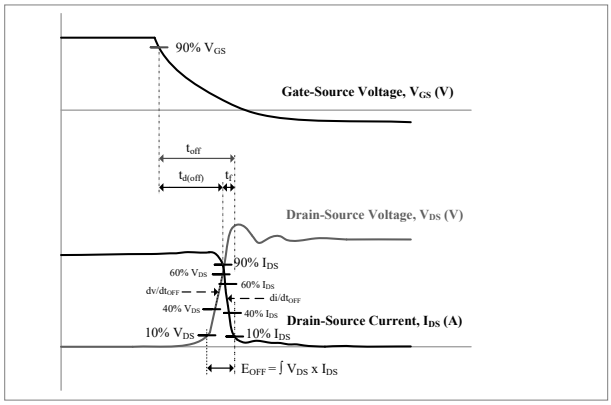


Figure 29. Turn-off Transient Definitions

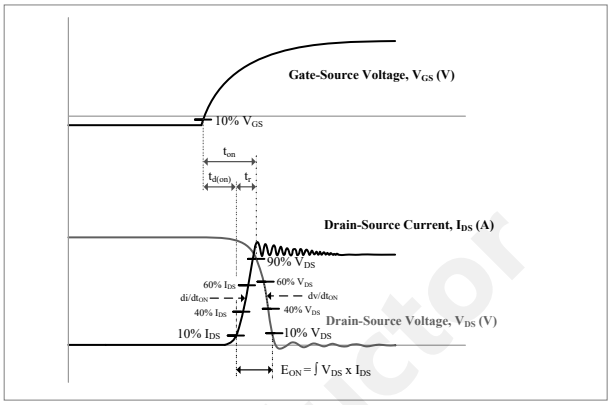


Figure 30. Turn-on Transient Definitions

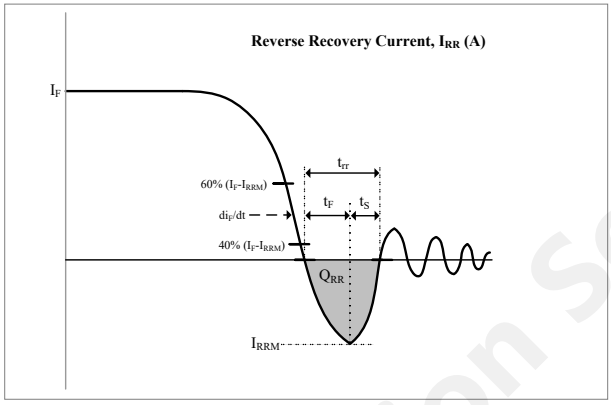


Figure 31. Reverse Recovery Definitions

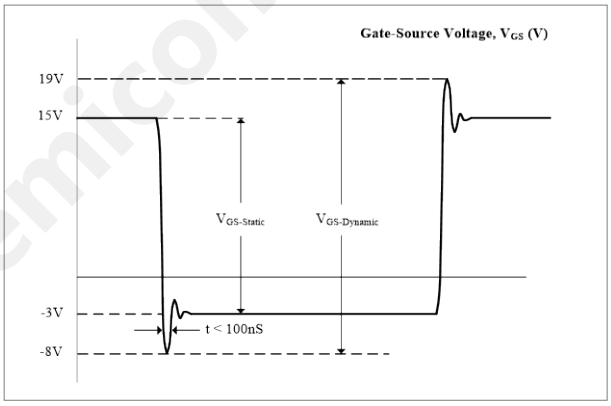
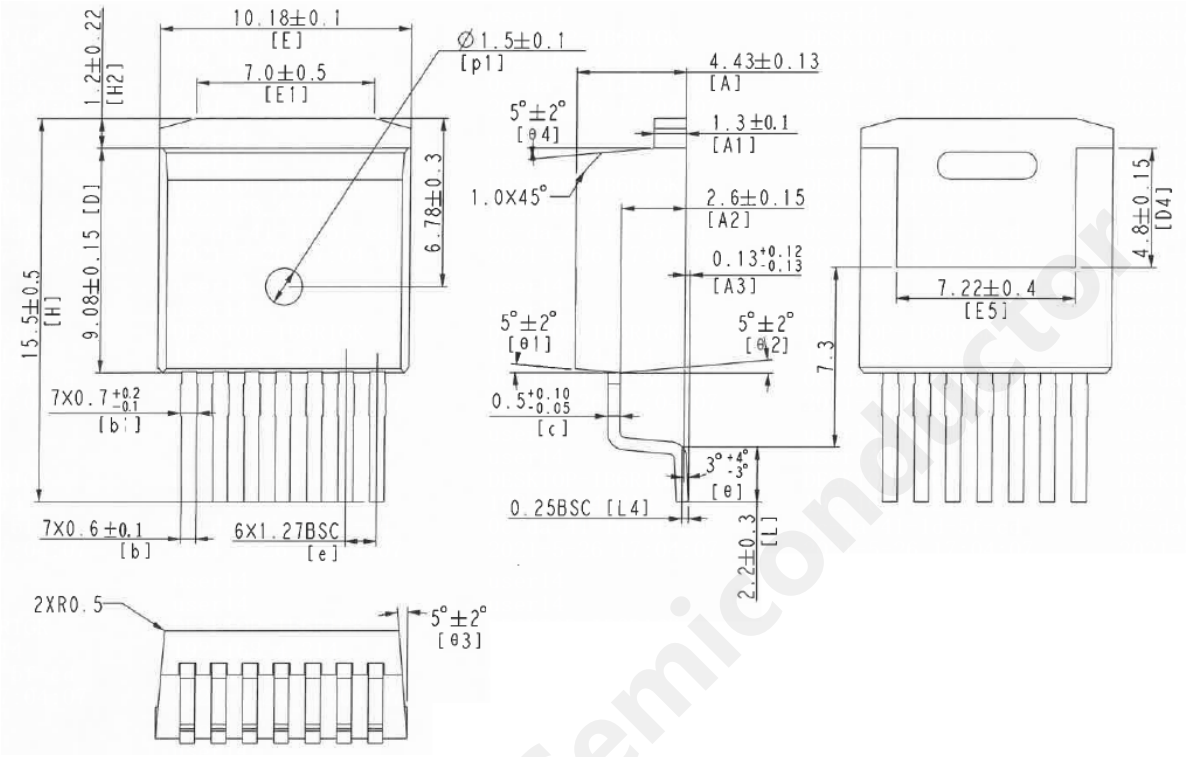


Figure 32. Vgs Transient Definitions

7. Package Outlines



Drawing and Dimensions

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