



## SiC MOS P3M171K0G7

### N-Channel Enhancement Mode



#### Features

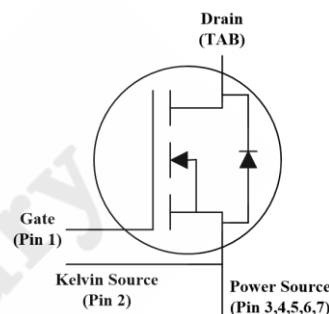
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small  $Q_{gd}$
- 100% UIS tested

#### 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



TO-263-7

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



#### Order Information

Part Number	Package	Marking
P3M171K0G7	TO-263-7	P3M171K0G7



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## 1. Maximum Ratings

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

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	$V_{DSmax}$	1700	V	$V_{GS} = 0V$ $I_D = 200\mu A$
Gate - Source Voltage (Dynamic)	$V_{GSmax}$	-8 / +19	V	AC ( $f > 1\text{Hz}$ )
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	$V_{GS,on}$ $V_{GS,off}$	+15 -3	V	Static
Continuous Drain Current	$I_D$	6	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$
		4		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$
Pulsed Drain Current	$I_{D(pulse)}$	12	A	
Power Dissipation	$P_D$	68	W	
Operating Junction Temperature	$T_J$	-55 To +175	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-55 To +175	$^\circ\text{C}$	
Solder Temperature	$T_L$	260	$^\circ\text{C}$	



## 2. Electrical Characteristics

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

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1700	/	/	V	$V_{GS} = 0V$ $I_D = 200\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.2	/	V	(tested after 30ms pulse at $V_{GS} = 15V$ ) $V_{DS} = V_{GS}$ $I_D = 2mA$ $T_J = 25^\circ\text{C}$
		/	1.45	/	V	$V_{DS} = V_{GS}$ $I_D = 2mA$ $T_J = 175^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	/	2.6	200	$\mu A$	$V_{GS} = 0V$ $V_{DS} = 1700V$
Gate-Source Leakage Current	$I_{GSS}$	/	2	125	nA	$V_{GS} = 15V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	1	1.4	$\Omega$	$V_{GS} = 15V$ $I_D = 2A$ $T_J = 25^\circ\text{C}$
		/	1.4	/		$V_{GS} = 15V$ $I_D = 2A$ $T_J = 125^\circ\text{C}$
		/	1.7	/		$V_{GS} = 15V$ $I_D = 2A$ $T_J = 175^\circ\text{C}$
Transconductance	$g_{fs}$	/	0.29	/	S	$V_{DS} = 20V$ $I_{DS} = 2A$ $T_J = 25^\circ\text{C}$
		/	0.31	/		$V_{DS} = 20V$ $I_{DS} = 2A$ $T_J = 175^\circ\text{C}$



# P3M171K0G7 SiC MOS

## N-Channel Enhancement Mode

Parameter	Symbol	Value			Unit	Test Conditions	
		Min.	Typ.	Max.			
Input Capacitance	$C_{iss}$	/	235	/	pF	$V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 1MHz$ $V_{AC} = 25mV$	
Output Capacitance	$C_{oss}$	/	8.9	/	pF		
Reverse Transfer Capacitance	$C_{rss}$	/	2.8	/	pF		
Coss Stored Energy	$E_{oss}$	/	9.4	/	$\mu J$		
Turn-on Energy	$E_{on}$	/	53	/	$\mu J$	$V_{DS} = 1200V$ $V_{GS} = -3/15V$ $I_D = 2A$ $R_G = 1\Omega$	
Turn-off Energy	$E_{off}$	/	20	/			
Rise Time	$T_r$	/	44	/	ns		
Turn-On Delay Time	$T_{don}$	/	12	/			
Turn-Off Delay Time	$T_{doff}$	/	35	/			
Fall Time	$T_f$	/	75	/			
Internal Gate Resistance	$R_{G(int)}$	/	27	/	$\Omega$		$f = 1MHz$ $V_{AC} = 25mV$
Gate to Source Charge	$Q_{gs}$	/	2.2	/	nC		$V_{DS} = 1200V$ $I_{DS} = 2A$ $V_{GS} = -3 \text{ to } 15V$ $I_G = 2mA$
Gate to Drain Charge	$Q_{gd}$	/	2.5	/			
Total Gate Charge	$Q_g$	/	7.4	/			

### 3. Reverse Diode Characteristics

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

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	$V_{SD}$	5.1	/	V	$V_{GS} = -3V$ $I_{SD} = 1A$ $T_J = 25^\circ C$
		5.1	/	V	$V_{GS} = -3V$ $I_{SD} = 1A$ $T_J = 175^\circ C$
Continuous Diode Forward Current	$I_S$	8	/	A	$V_{GS} = -3V$

### 4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2.2	$^\circ\text{C}/\text{W}$

### 5. Typical Performance

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

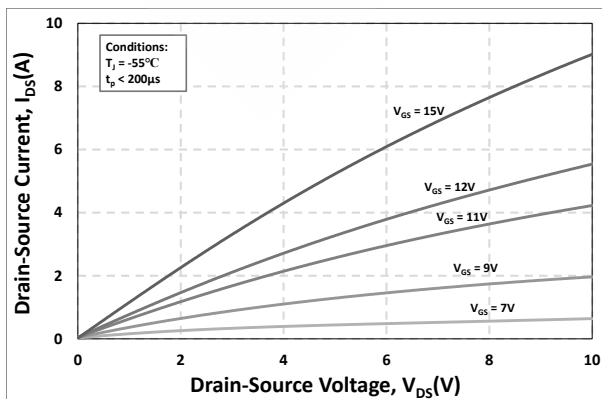


Figure 1. Output Characteristics  $T_J=-55^\circ\text{C}$

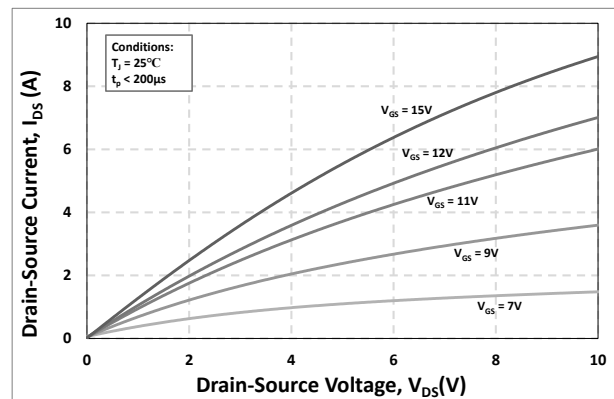


Figure 2. Output Characteristics  $T_J=25^\circ\text{C}$

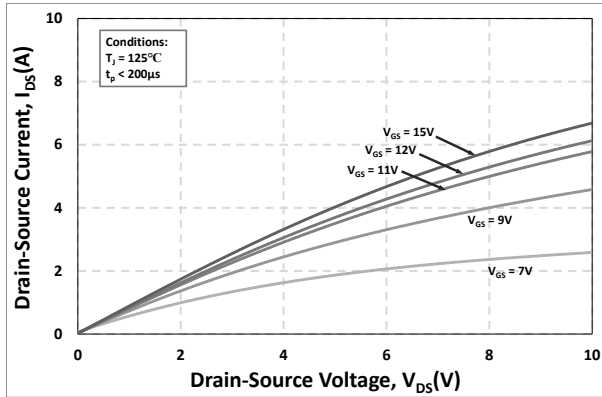


Figure 3. Output Characteristics  $T_j = 125^\circ\text{C}$

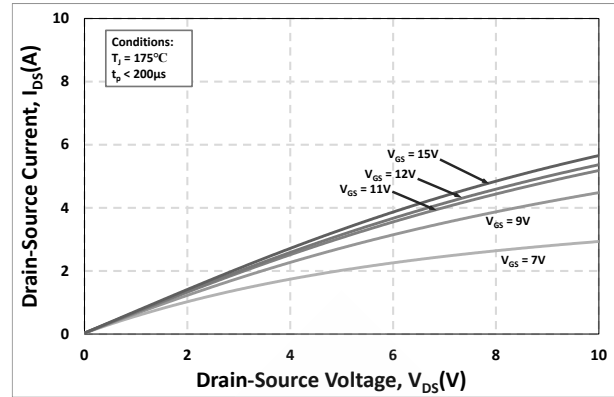


Figure 4. Output Characteristics  $T_j = 175^\circ\text{C}$

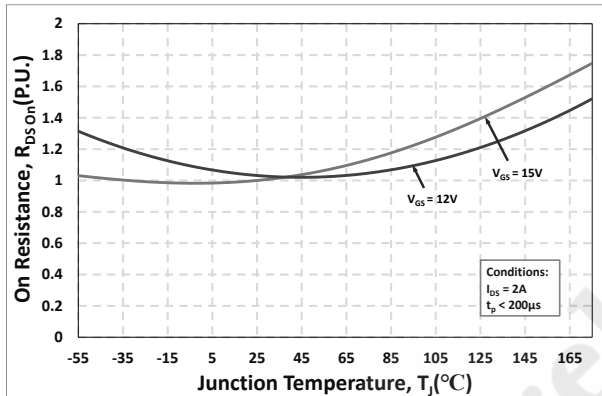


Figure 5. Normalized On-Resistance vs. Temperature

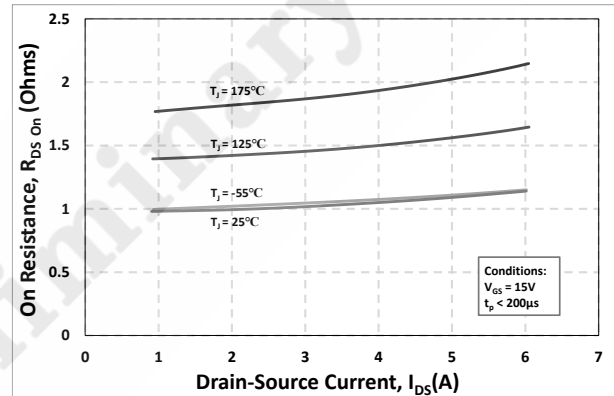


Figure 6. On-Resistance vs. Drain Current Various Temperatures

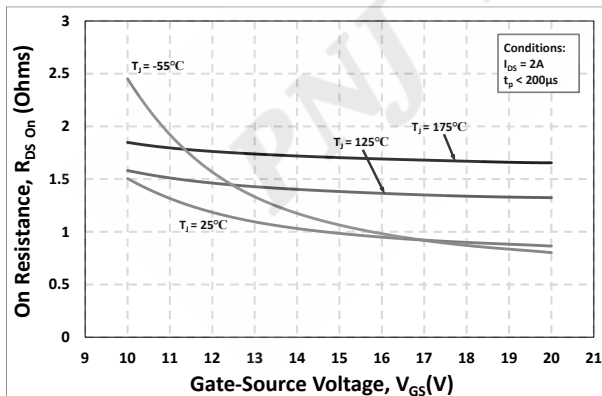


Figure 7. On-Resistance vs. Gate-Source Voltage

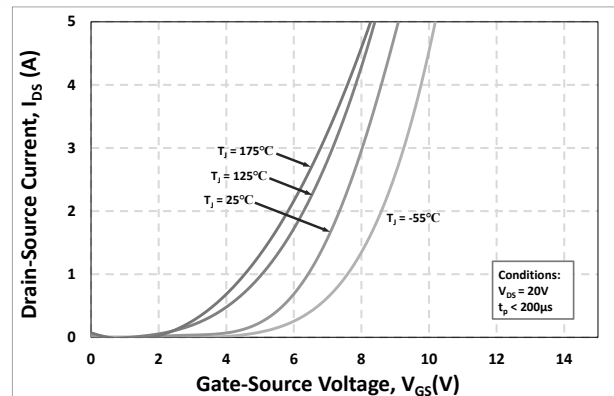


Figure 8. Transfer Characteristic for Various Junction Temperatures

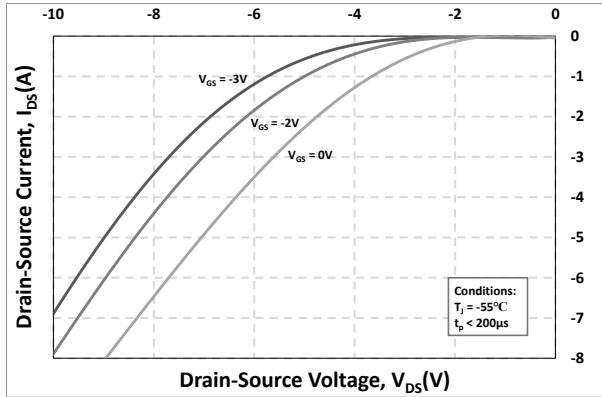


Figure 9. Body Diode Characteristic at -55°C

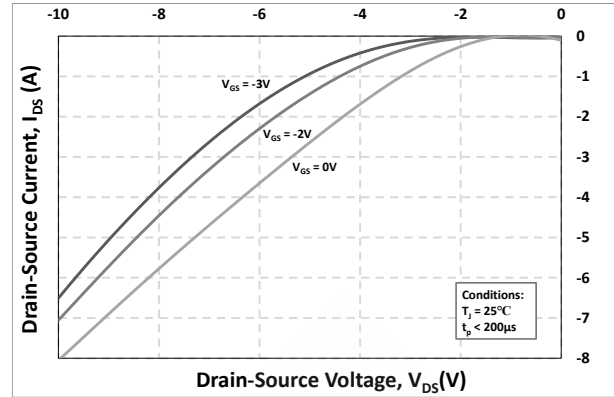


Figure 10. Body Diode Characteristic at 25°C

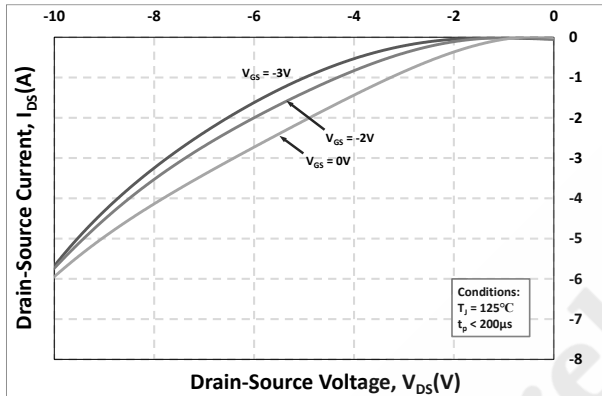


Figure 11. Body Diode Characteristic at 125°C

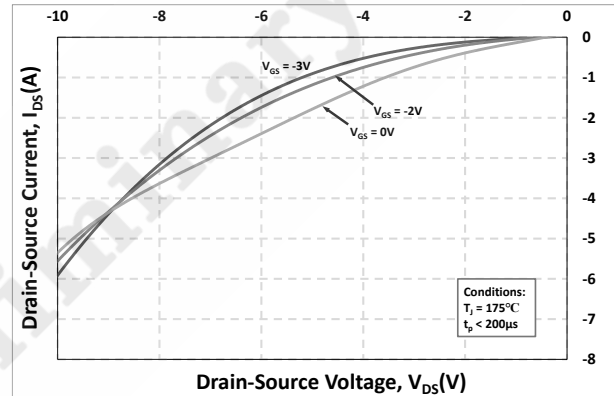


Figure 12. Body Diode Characteristic at 175°C

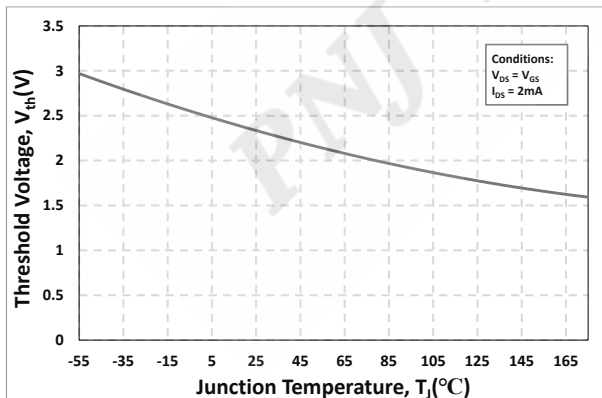


Figure 13. Threshold Voltage vs. Temperatures

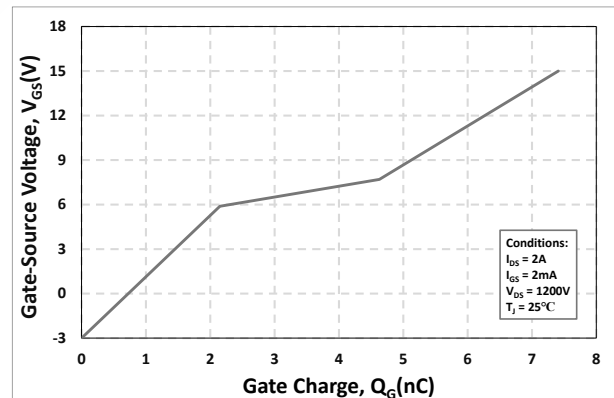


Figure 14. Gate Charge Characteristics



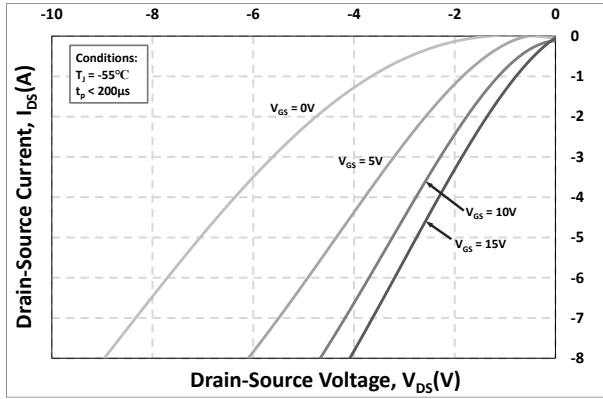


Figure 15. 3rd Quadrant Characteristic at -55°C

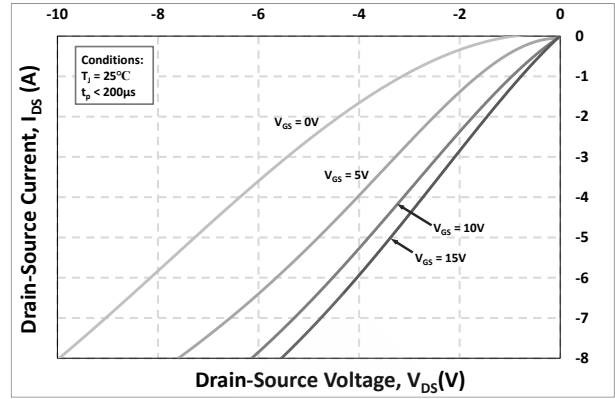


Figure 16. 3rd Quadrant Characteristic at 25°C

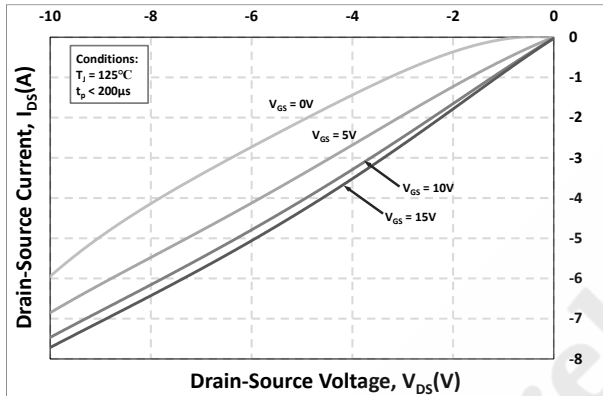


Figure 17. 3rd Quadrant Characteristic at 125°C

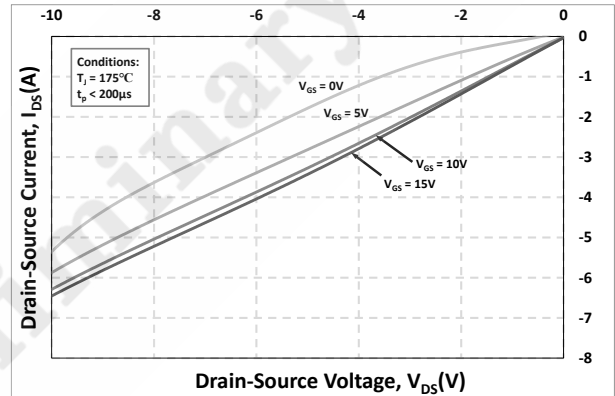


Figure 18. 3rd Quadrant Characteristic at 175°C

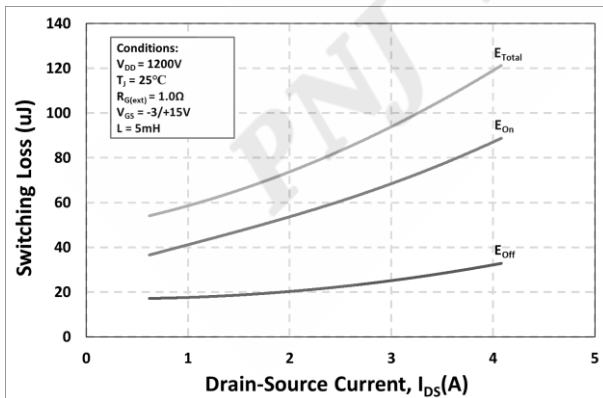


Figure 19. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DD} = 1200V$ )

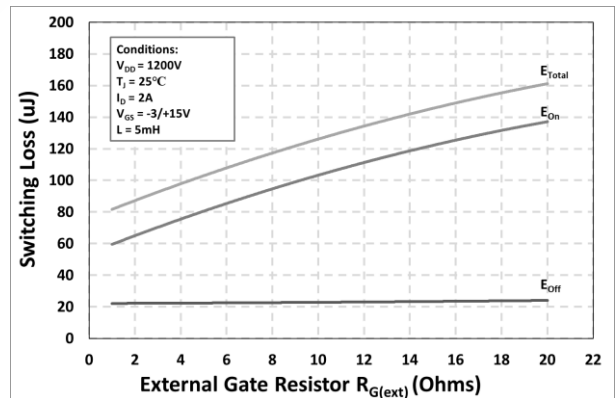


Figure 20. Clamped Inductive Switching Energy vs.  $R_{G(ext)}$

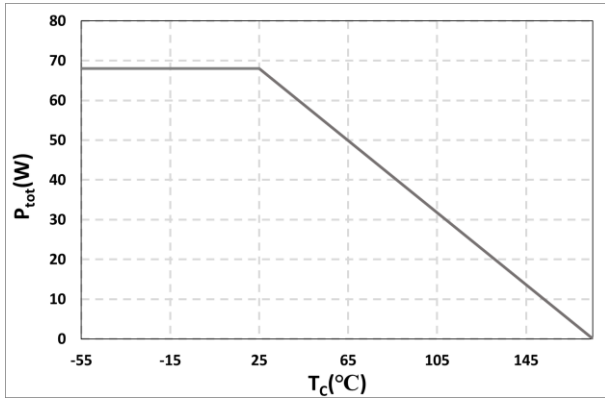


Figure 21. Maximum Power Dissipation Derating vs. Case Temperature

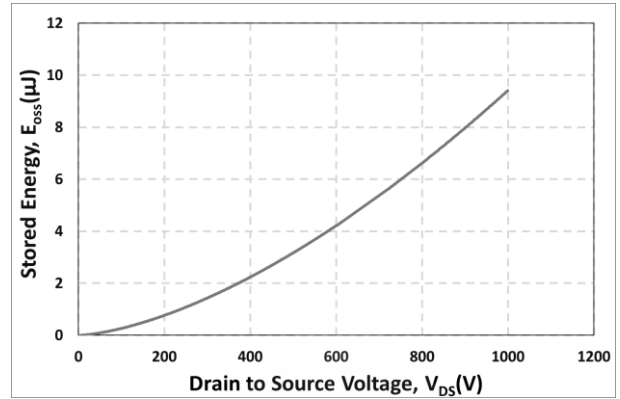


Figure 22. Output Capacitor Stored Energy

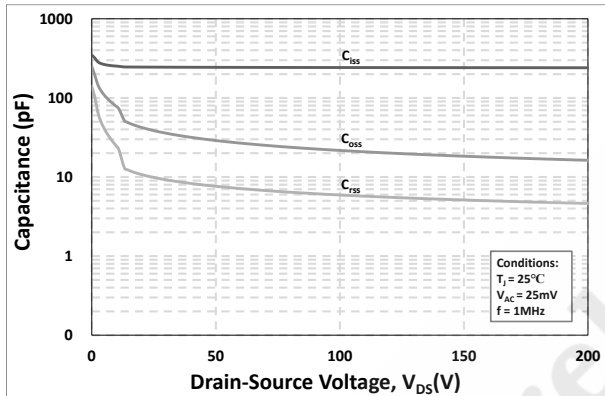


Figure 23. Capacitances vs. Drain-Source Voltage (0-200V)

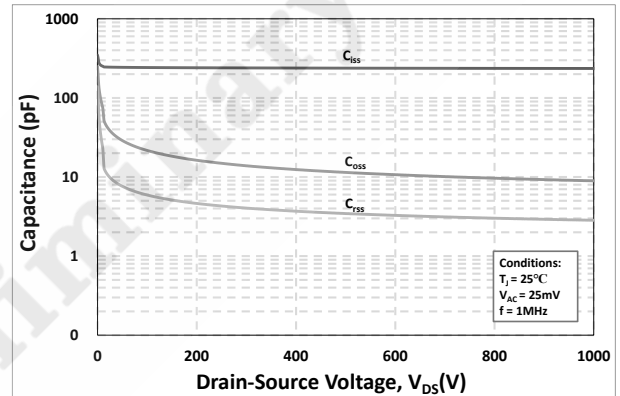


Figure 24. Capacitances vs. Drain-Source Voltage (0-1000V)

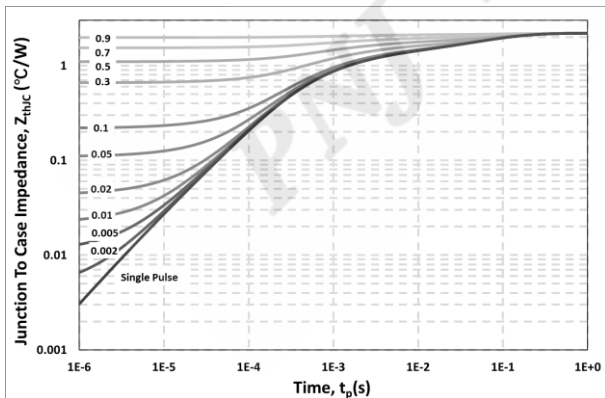


Figure 25. Transient Thermal Impedance (Junction - Case)

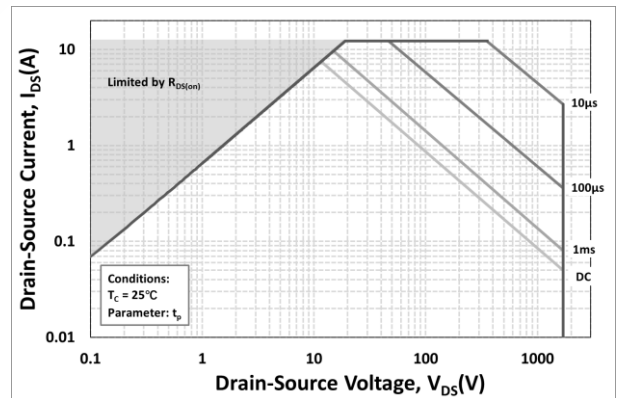


Figure 26. Safe Operating Area

## 6. Definitions

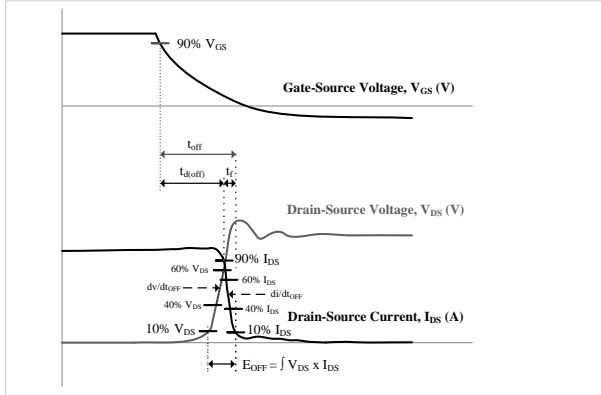


Figure 23. Turn-off Transient Definitions

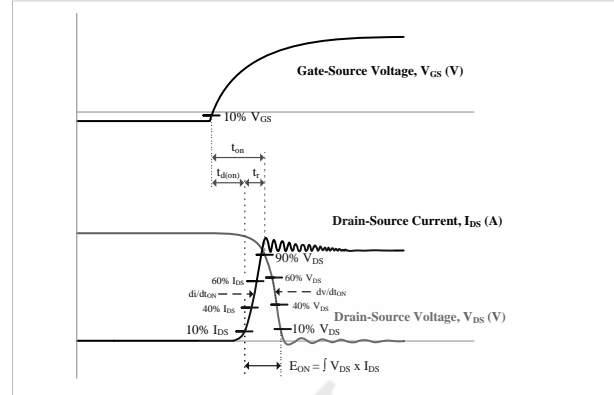


Figure 24. Turn-on Transient Definitions

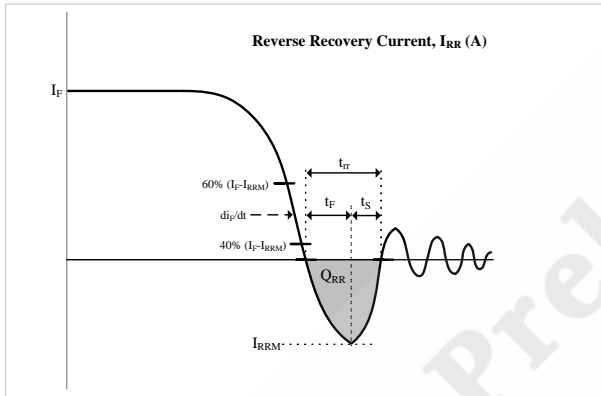


Figure 25. Reverse Recovery Definitions

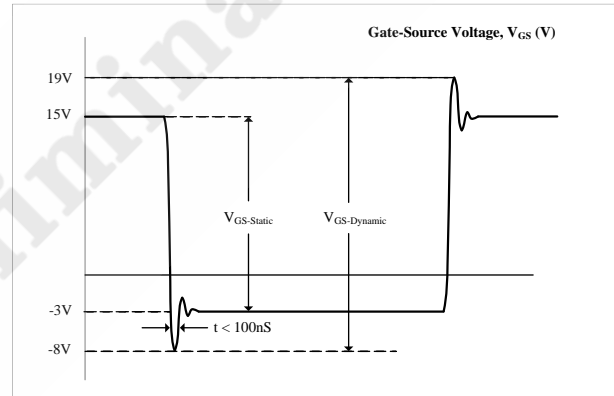
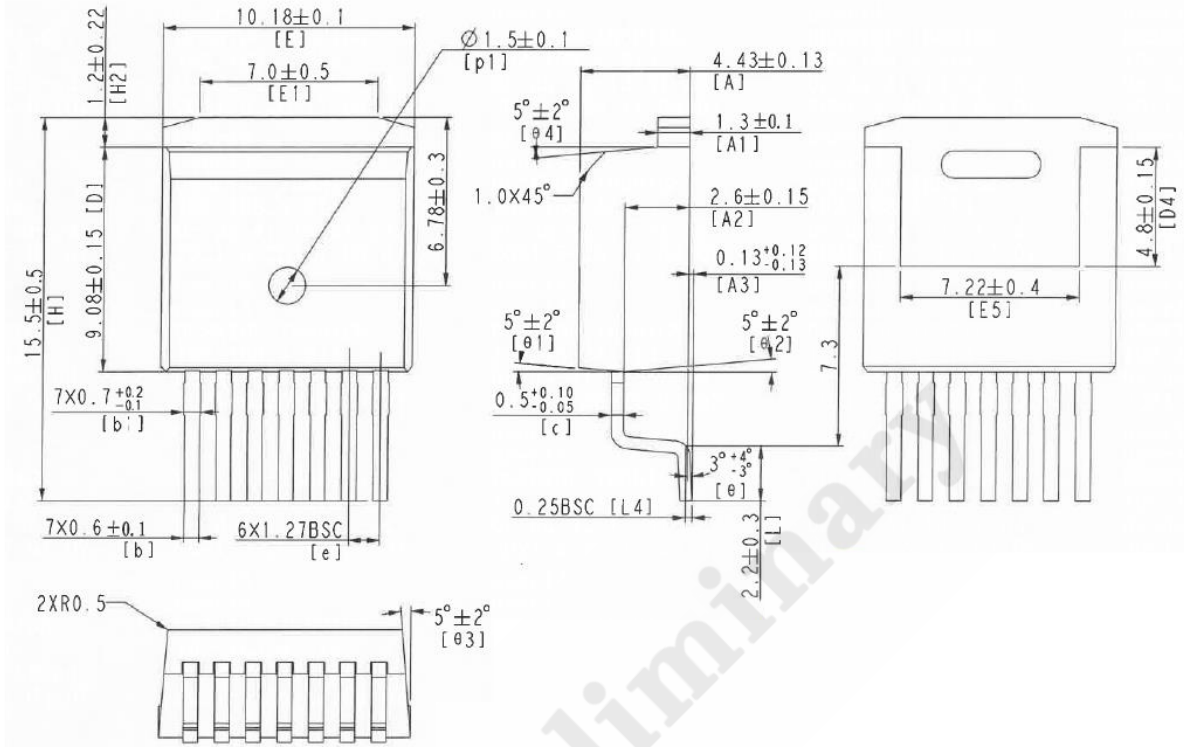


Figure 26. V<sub>GS</sub> Transient Definitions

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## 7. Package Outlines



Drawing and Dimensions

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