



# P3M12080G7 SiC MOS N-Channel Enhancement Mode

$V_{RRM}$  = 1200 V  
 $I_D$  = 32 A  
 $I_D (100^\circ\text{C})$  = 23 A  
 $R_{DS(on)}$  = 80 m $\Omega$

## SiC MOS P3M12080G7 N-Channel Enhancement Mode

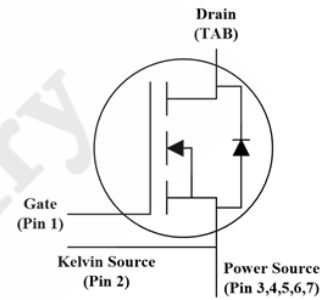


### Features

- Qualified to AEC-Q101
- 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



TO-263-7

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

### Applications

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



### Order Information

Part Number	Package	Marking
P3M12080G7	TO-263-7	P3M12080G7



## **Contents**

Features.....	1
Benefits.....	1
Applications.....	1
Order Information .....	1
<b>Contents</b> .....	<b>2</b>
1. Maximum Ratings.....	3
2. Electrical Characteristics .....	4
3. Reverse Diode Characteristics .....	6
4. Thermal Characteristics.....	6
5. Typical Performance .....	7
6. Package Outlines.....	11

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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	$V_{DSmax}$	1200	V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate - Source Voltage (dynamic)	$V_{GSmax}$	-8 / +21	V	AC (f > 1Hz)
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	$V_{GS,on}$ $V_{GS,off}$	+15 / +18 -3	V	Static
Continuous Drain Current	$I_D$	32	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$
		23		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$
Power Dissipation	$P_D$	136	W	
Operating Junction	$T_J$	-55 To +175	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-55 To +175	$^\circ\text{C}$	
Solder Temperature	$T_L$	245	$^\circ\text{C}$	



## 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	$V_{(BR)DSS}$	1200	/	/	V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.4	/	V	(tested after 30ms pulse at $V_{GS} = 15V$ ) $V_{DS} = V_{GS}$ $I_D = 5mA$ $T_J = 25^\circ\text{C}$
		/	1.6	/	V	$V_{DS} = V_{GS}$ $I_D = 5mA$ $T_J = 175^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	/	1.8	100	$\mu A$	$V_{GS} = 0V$ $V_{DS} = 1200V$
Gate-Source Leakage Current	$I_{GSS}$	/	20	250	nA	$V_{GS} = 15V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	80	104	m $\Omega$	$V_{GS} = 15V$ $I_D = 20A$ $T_J = 25^\circ\text{C}$
		/	104	/		$V_{GS} = 15V$ $I_D = 20A$ $T_J = 175^\circ\text{C}$
		/	66	/		$V_{GS} = 18V$ $I_D = 20A$ $T_J = 25^\circ\text{C}$



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Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Transconductance	$g_{fs}$	/	10	/	S	$V_{DS} = 20V$ $I_{DS} = 20A$ $T_J = 25^{\circ}C$
		/	9.6	/		$V_{DS} = 20V$ $I_{DS} = 20A$ $T_J = 175^{\circ}C$
Input Capacitance	$C_{iss}$	/	2032	/	pF	$V_{GS} = 0V$ $V_{DS} = 800V$ $f = 1MHz$ $V_{AC} = 25mV$
Output Capacitance	$C_{oss}$	/	73.6	/		
Reverse Transfer Capacitance	$C_{rss}$	/	6	/		
Coss Stored Energy	$E_{oss}$	/	52.9	/	$\mu J$	
Internal Gate Resistance	$R_{G(int)}$	/	3.5	/	$\Omega$	$f = 1MHz$ $V_{AC} = 25mV$
Gate to Source Charge	$Q_{gs}$	/	22.2	/	nC	$V_{DS} = 800V$ $I_{DS} = 20A$ $V_{GS} = -3 \text{ to } 15V$ $I_G = 20mA$
Gate to Drain Charge	$Q_{gd}$	/	12.3	/		
Total Gate Charge	$Q_g$	/	54.6	/		



### 3. Reverse Diode Characteristics

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

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	$V_{SD}$	5.2	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 10\text{A}$ $T_J = 25^\circ\text{C}$
		4.8	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 10\text{A}$ $T_J = 175^\circ\text{C}$
Continuous Diode Forward Current	$I_S$	31	/	A	$V_{GS} = -3\text{V}$

### 4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	1.1	$^\circ\text{C}/\text{W}$

## 5. Typical Performance

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

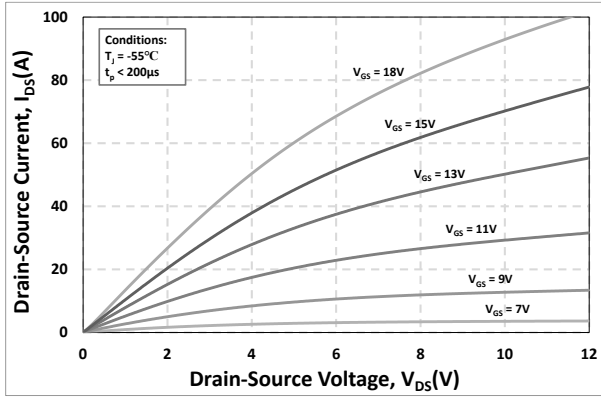


Figure 1. Output Characteristics  $T_J = -55^\circ\text{C}$

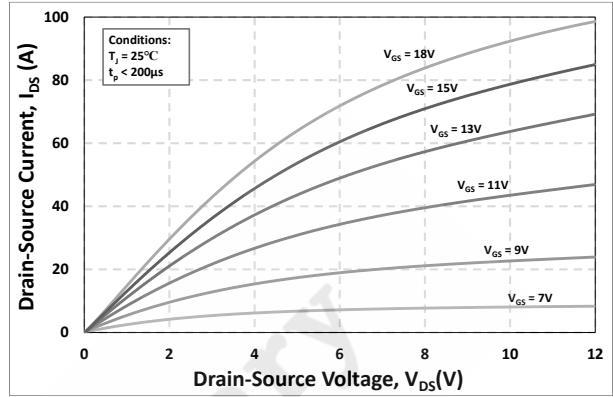


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

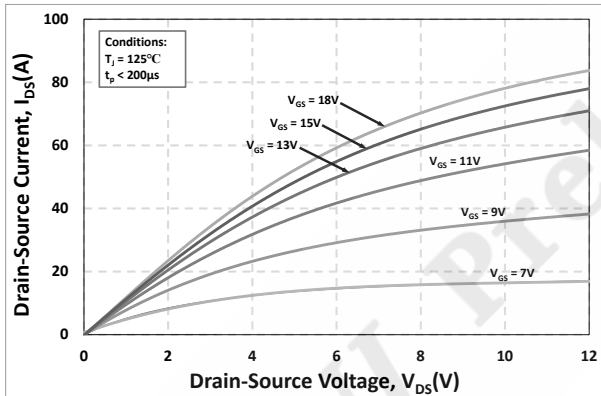


Figure 3. Output Characteristics  $T_J = 125^\circ\text{C}$

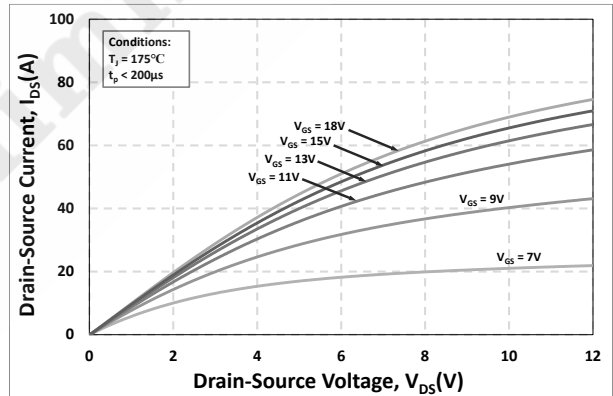


Figure 4. Output Characteristics  $T_J = 175^\circ\text{C}$

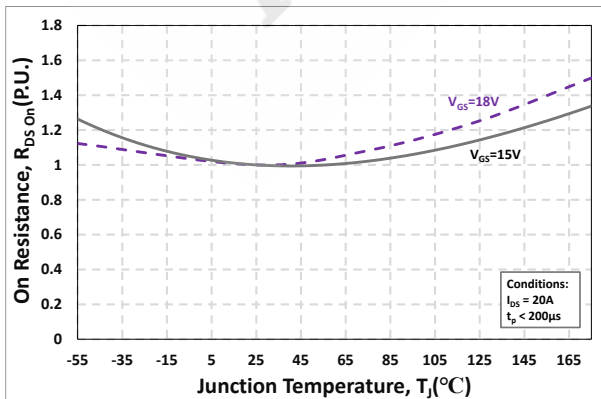


Figure 5. Normalized On-Resistance vs. Temperature

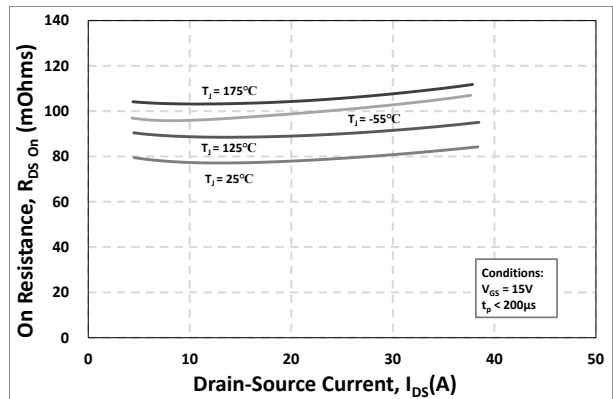


Figure 6. On-Resistance vs. Drain Current Various Temperatures



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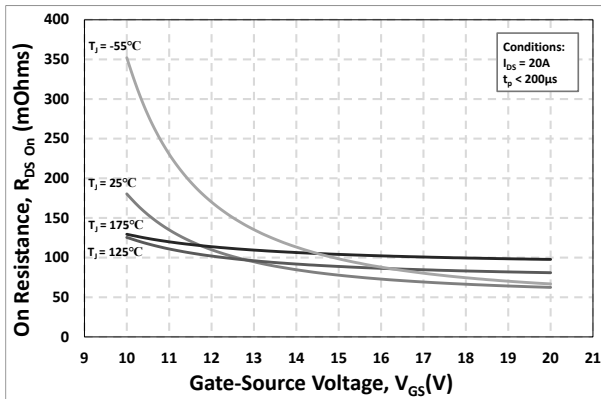


Figure 7. On-Resistance vs. Gate-Source Voltage

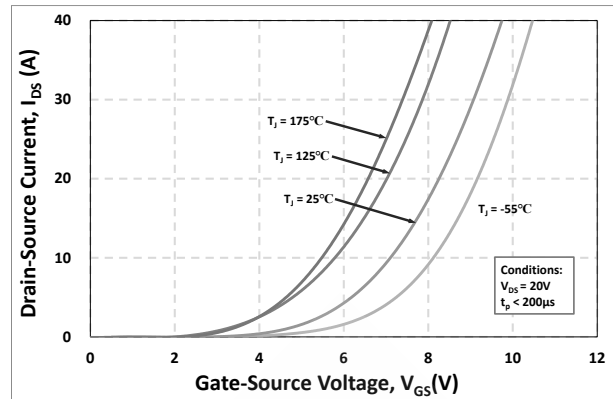


Figure 8. Transfer Characteristic for Various Junction Temperatures

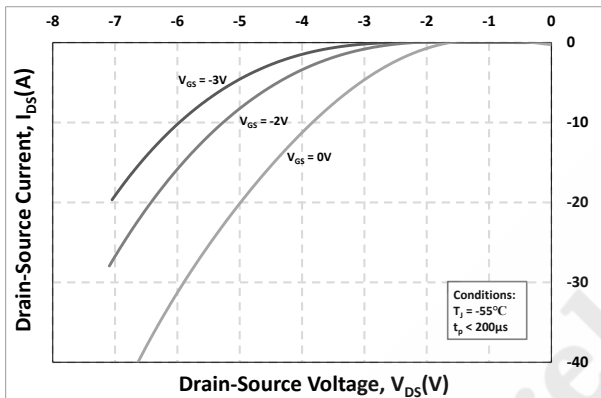


Figure 9. Body Diode Characteristic at -55°C

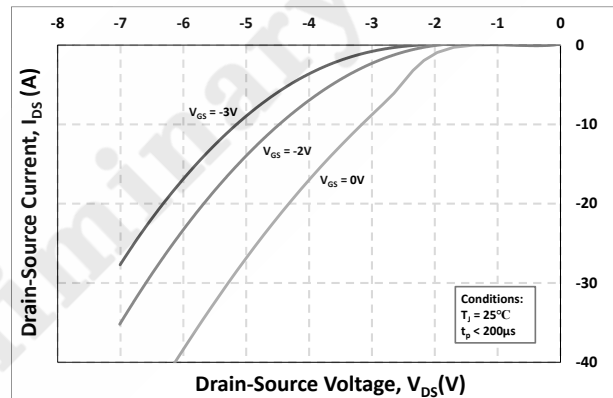


Figure 10. Body Diode Characteristic at 25°C

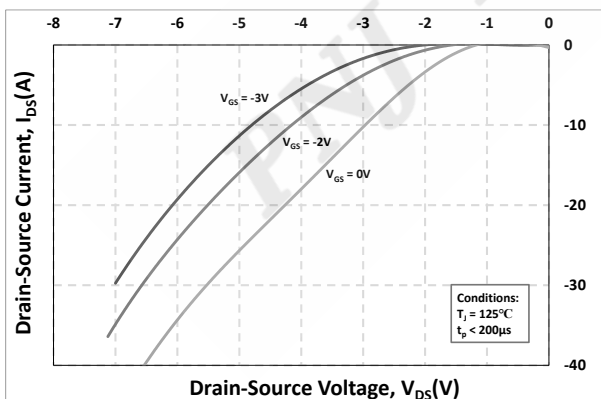


Figure 11. Body Diode Characteristic at 125°C

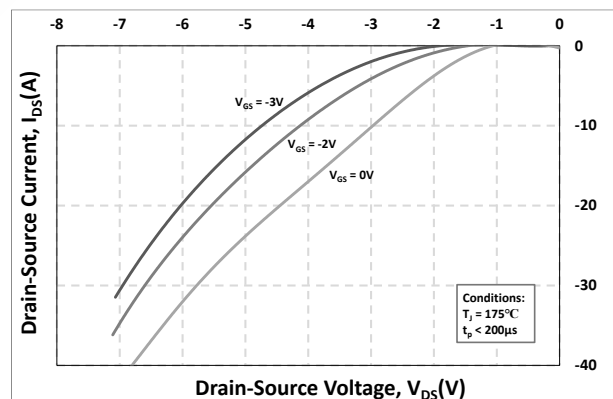


Figure 12. Body Diode Characteristic at 175°C



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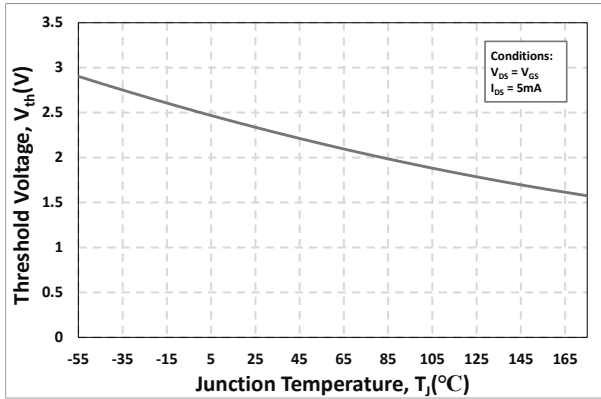


Figure 13. Threshold Voltage vs. Temperature

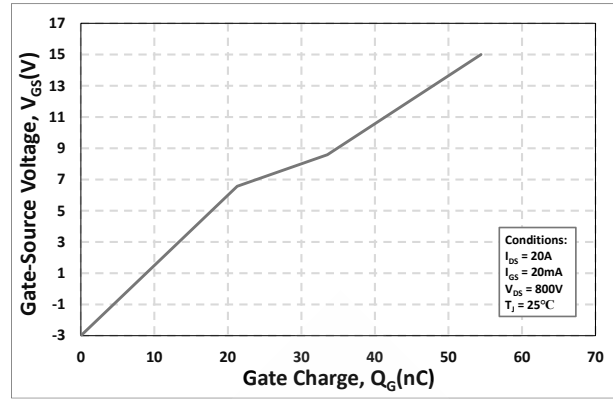


Figure 14. Gate Charge Characteristics

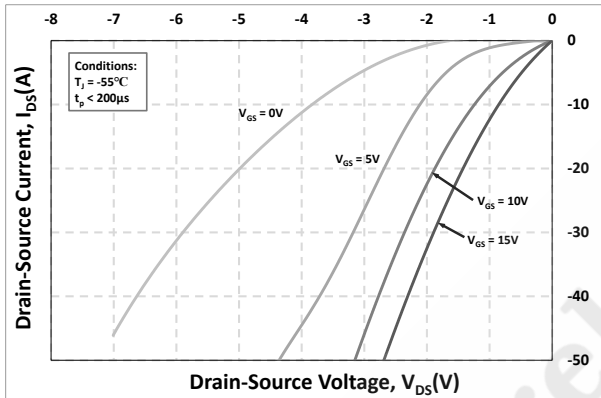


Figure 15. 3rd Quadrant Characteristic at -55°C

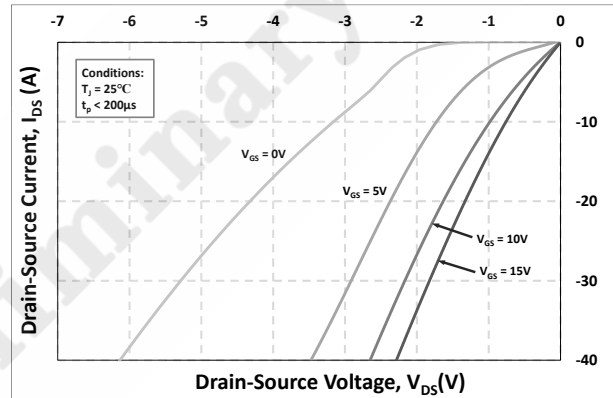


Figure 16. 3rd Quadrant Characteristic at 25°C

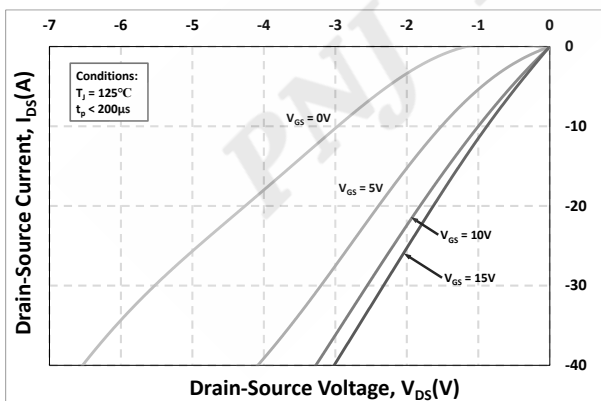


Figure 17. 3rd Quadrant Characteristic at 125°C

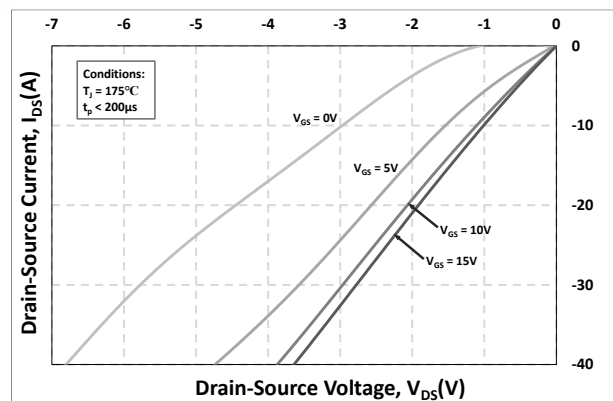


Figure 18. 3rd Quadrant Characteristic at 175°C



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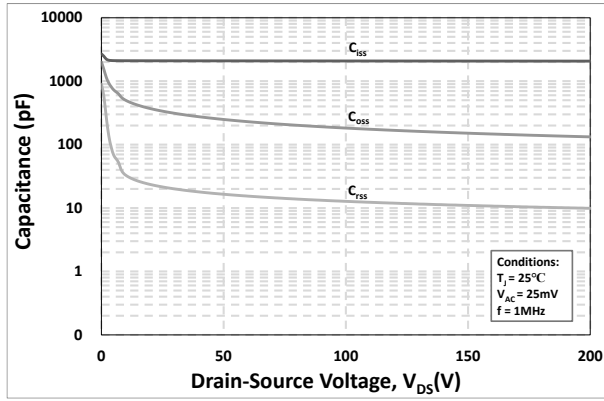


Figure 19. Capacitances vs. Drain-Source Voltage (0 - 200V)

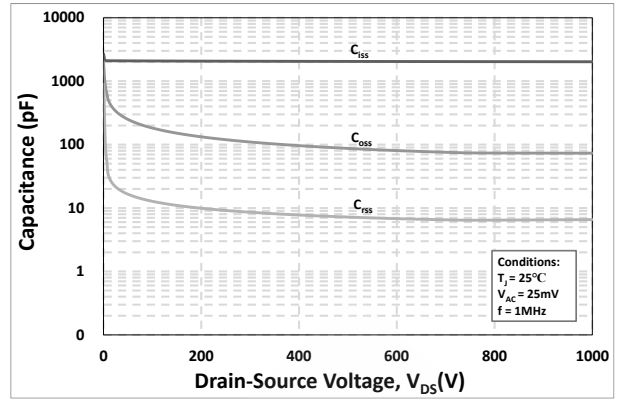


Figure 20. Capacitances vs. Drain-Source Voltage (0 - 1000V)

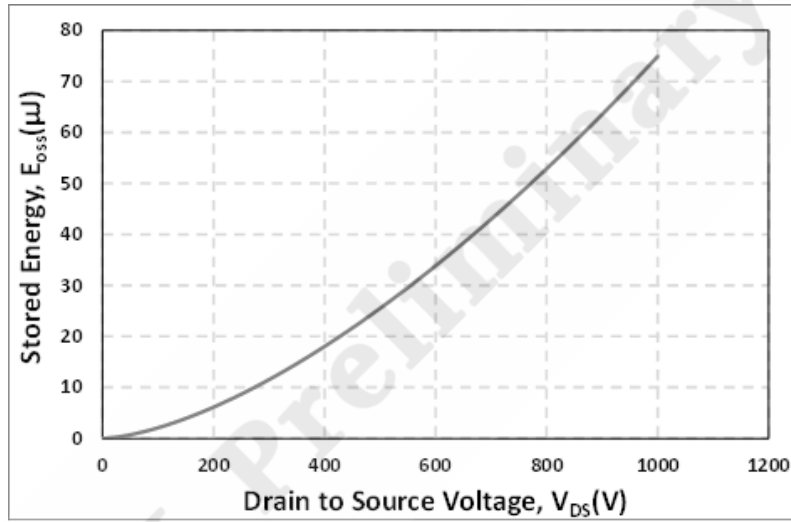
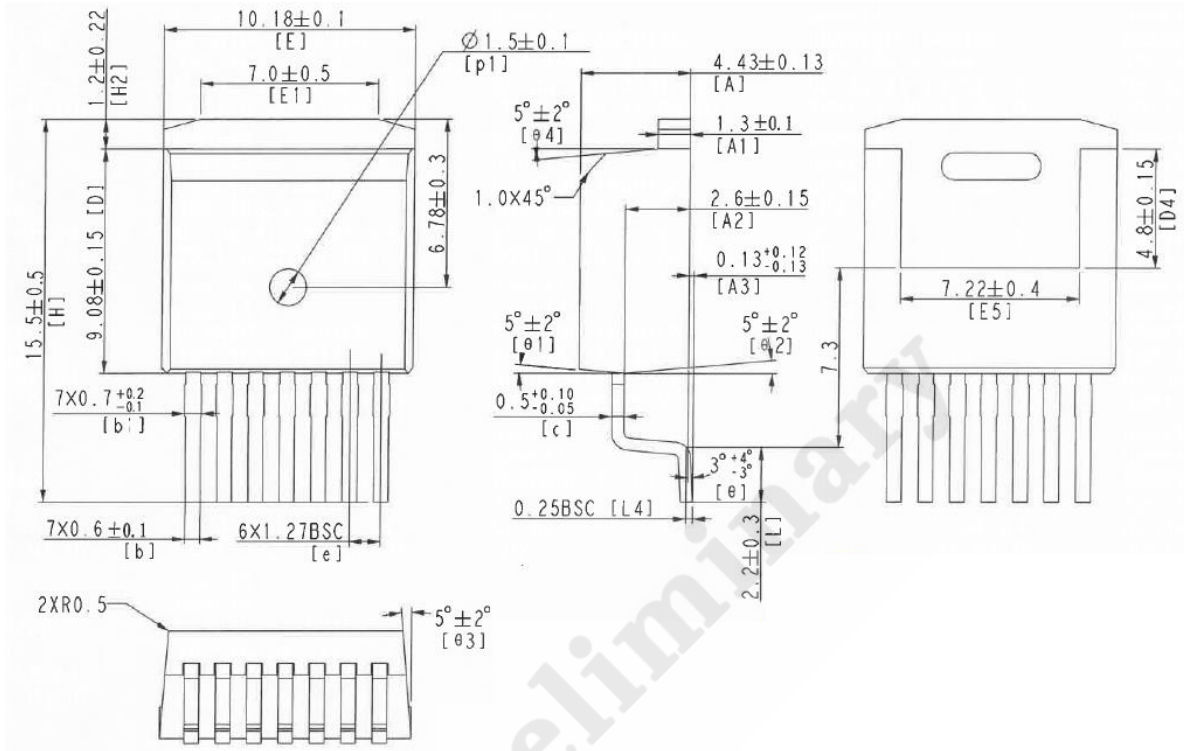


Figure 21. Output Capacitor Stored Energy

## 6. Package Outlines



Drawing and Dimensions

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