



P3M12040G7 SiC MOS N-Channel Enhancement Mode

V_{RRM} = 1200 V
 I_D = 63 A
 $I_D (100^\circ\text{C})$ = 44 A
 $R_{DS(on)}$ = 40 m Ω

SiC MOS P3M12040G7 N-Channel Enhancement Mode



Features

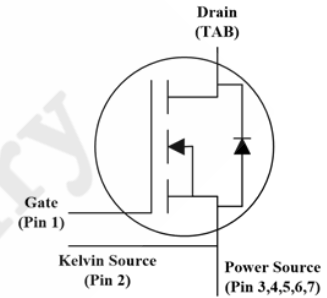
- Qualified to AEC-Q101
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small Q_{gd}
- 100% UIS tested

Benefits

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

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
P3M12040G7	TO-263-7	P3M12040G7



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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 ($f > 1\text{Hz}$)
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	63	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$
		44		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$
Power Dissipation	P_D	349	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	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	$V_{(BR)DSS}$	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 $V_{GS} = 15V$) $V_{DS} = V_{GS}$ $I_D = 10mA$ $T_J = 25^\circ\text{C}$
		/	1.6	/	V	$V_{DS} = V_{GS}$ $I_D = 10mA$ $T_J = 175^\circ\text{C}$
Reverse Bias Drain Current	I_{DSS}	/	1	100	μA	$V_{GS} = 0V$ $V_{DS} = 1200V$
Gate-Source Leakage Current	I_{GSS}	/	20	250	nA	$V_{GS} = 15V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	40	52	m Ω	$V_{GS} = 15V$ $I_D = 40A$ $T_J = 25^\circ\text{C}$
		/	59	/		$V_{GS} = 15V$ $I_D = 40A$ $T_J = 175^\circ\text{C}$
		/	35	/		$V_{GS} = 18V$ $I_D = 40A$ $T_J = 25^\circ\text{C}$
Transconductance	g_{fs}	/	21	/	S	$V_{DS} = 20V$ $I_{DS} = 40A$ $T_J = 25^\circ\text{C}$
		/	20	/		$V_{DS} = 20V$ $I_{DS} = 40A$ $T_J = 175^\circ\text{C}$



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Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Input Capacitance	C_{iss}	/	3505	/	pF	$V_{GS} = 0V$ $V_{DS} = 800V$ $f = 1MHz$ $V_{AC} = 25mV$
Output Capacitance	C_{oss}	/	125.6	/		
Reverse Transfer Capacitance	C_{rss}	/	5.4	/		
Coss Stored Energy	E_{oss}	/	91.1	/	μJ	
Internal Gate Resistance	$R_{G(int)}$	/	1.3	/	Ω	$f = 1MHz$ $V_{AC} = 25mV$
Gate to Source Charge	Q_{gs}	/	38	/	nC	$V_{DS} = 800V$ $I_{DS} = 40A$ $V_{GS} = -3/15V$ $I_G = 5mA$
Gate to Drain Charge	Q_{gd}	/	19	/		
Total Gate Charge	Q_g	/	98	/		

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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	$V_{GS} = -3\text{V}$ $I_{SD} = 20\text{A}$ $T_J = 25^\circ\text{C}$
		4.9	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 20\text{A}$ $T_J = 175^\circ\text{C}$
Continuous Diode Forward Current	I_S	51	/	A	$V_{GS} = -3\text{V}$

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.43	$^\circ\text{C}/\text{W}$

5. Typical Performance

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

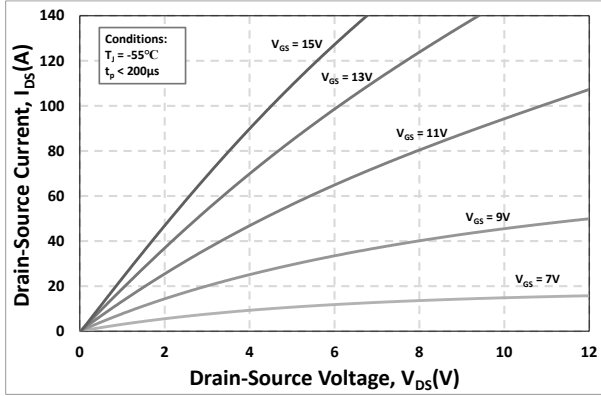


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

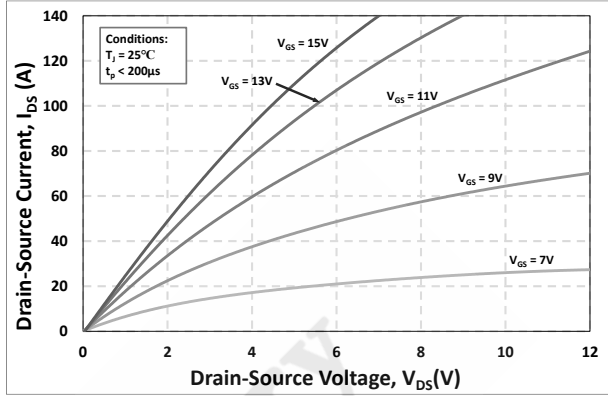


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

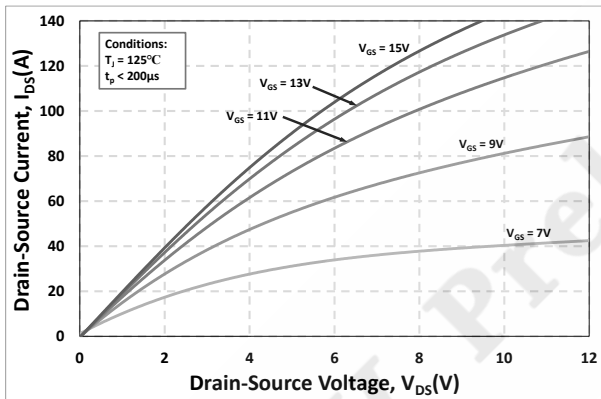


Figure 3. Output Characteristics $T_J = 125^\circ\text{C}$

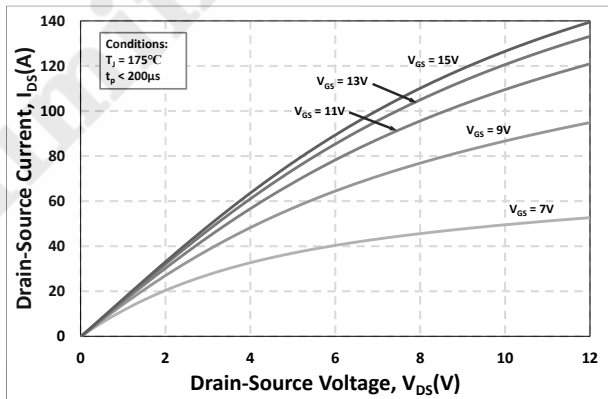


Figure 4. Output Characteristics $T_J = 175^\circ\text{C}$

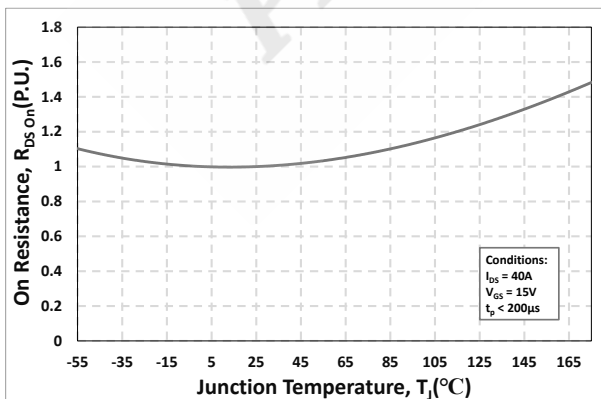


Figure 5. Normalized On-Resistance vs. Temperature

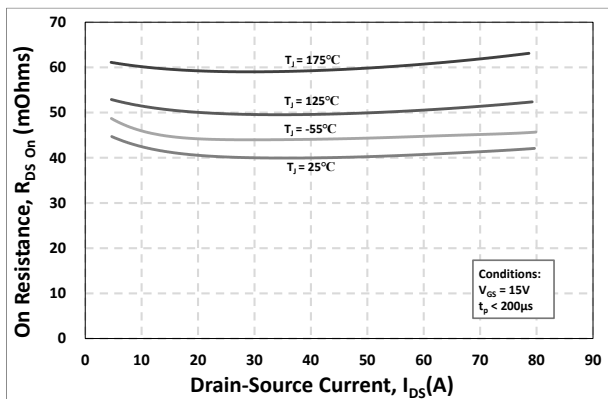


Figure 6. On-Resistance vs. Drain Current Various Temperatures

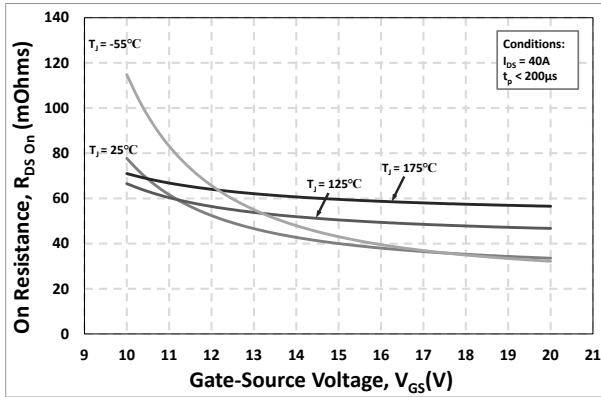


Figure 7. On-Resistance vs. Gate-Source Voltage

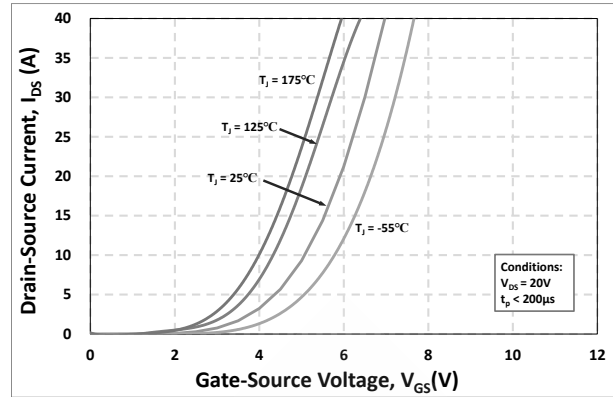


Figure 8. Transfer Characteristic for Various Junction Temperatures

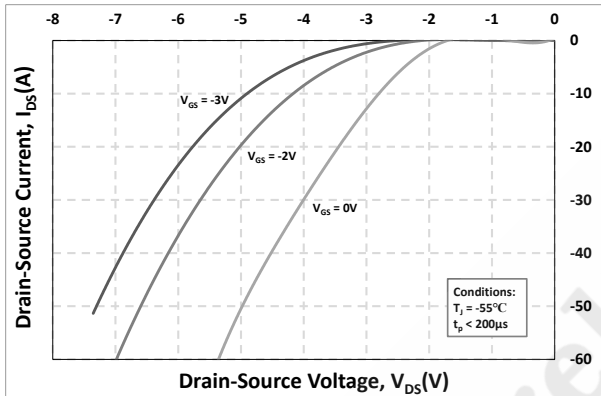


Figure 9. Body Diode Characteristic at -55°C

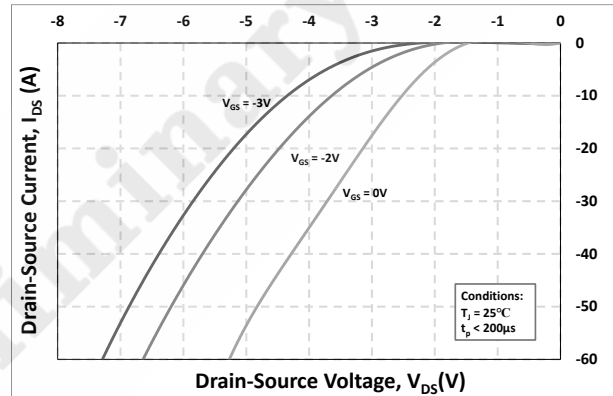


Figure 10. Body Diode Characteristic at 25°C

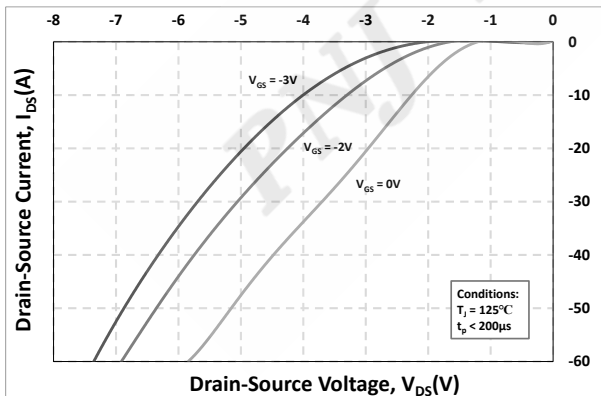


Figure 11. Body Diode Characteristic at 125°C

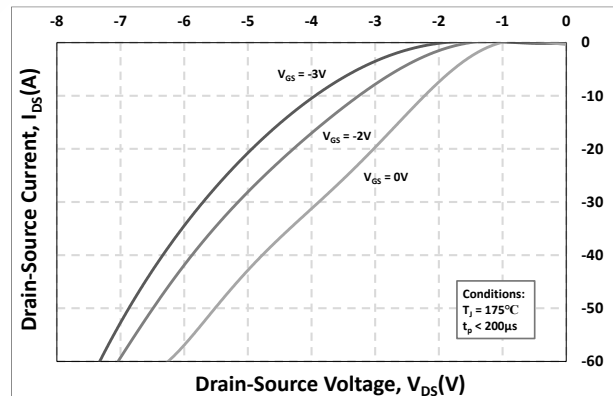


Figure 12. Body Diode Characteristic at 175°C

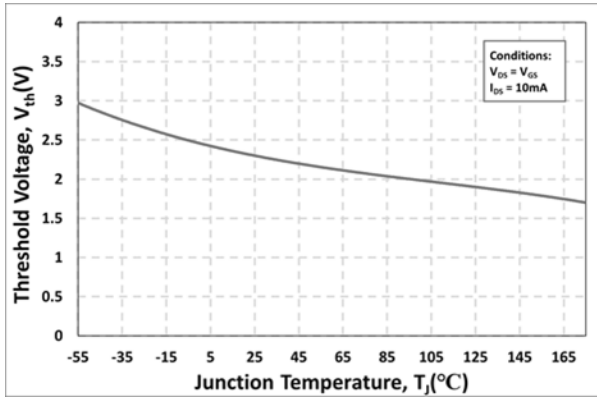


Figure 13. Threshold Voltage vs. Temperature

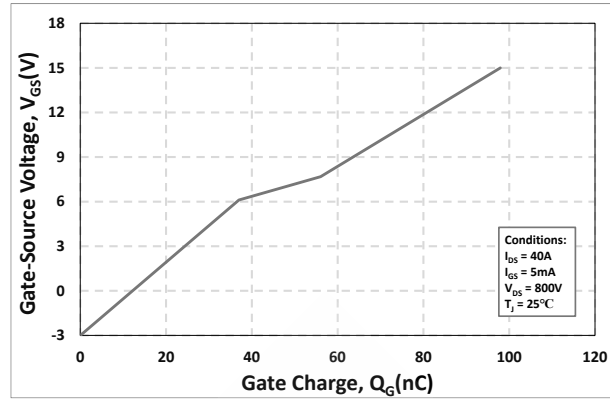


Figure 14. Gate Charge Characteristics

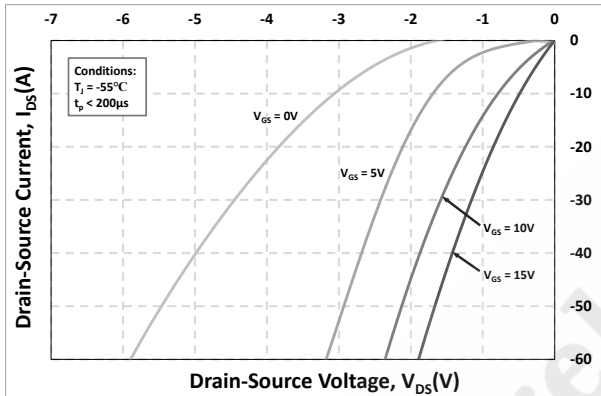


Figure 15. 3rd Quadrant Characteristic at -55°C

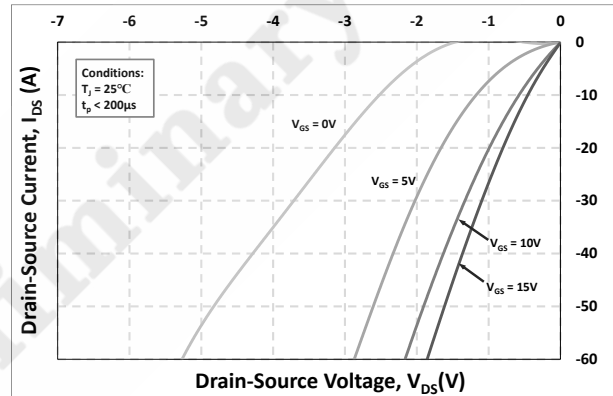


Figure 16. 3rd Quadrant Characteristic at 25°C

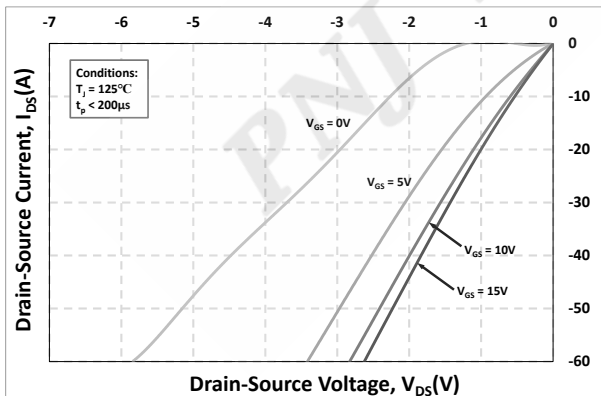


Figure 17. 3rd Quadrant Characteristic at 125°C

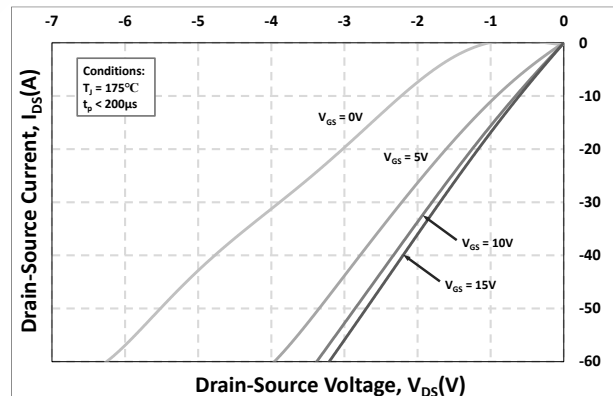


Figure 18. 3rd Quadrant Characteristic at 175°C

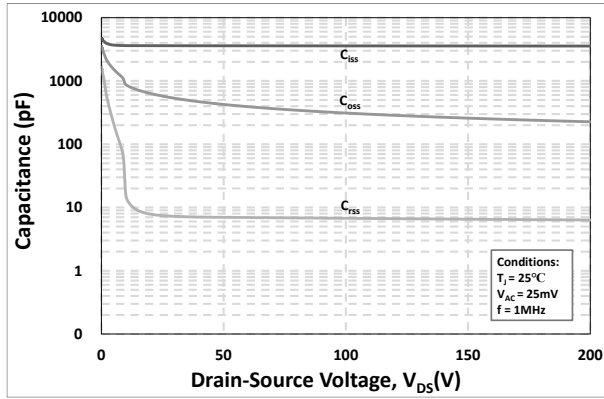


Figure 19. Capacitances vs. Drain-Source Voltage (0 - 200V)

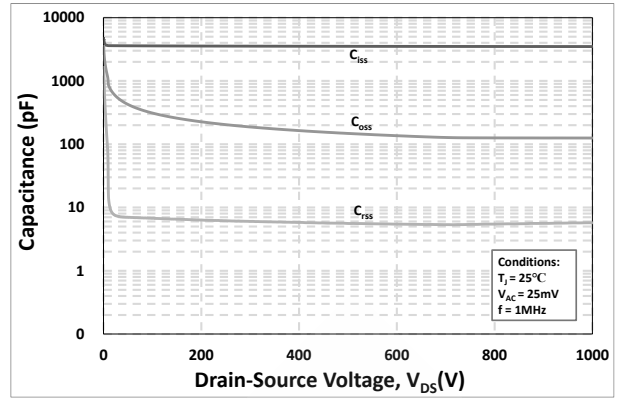


Figure 20. Capacitances vs. Drain-Source Voltage (0 - 1000V)

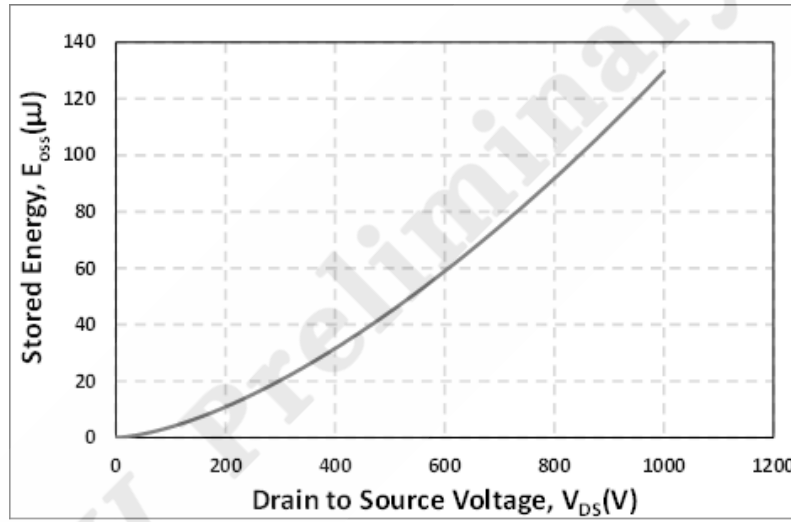
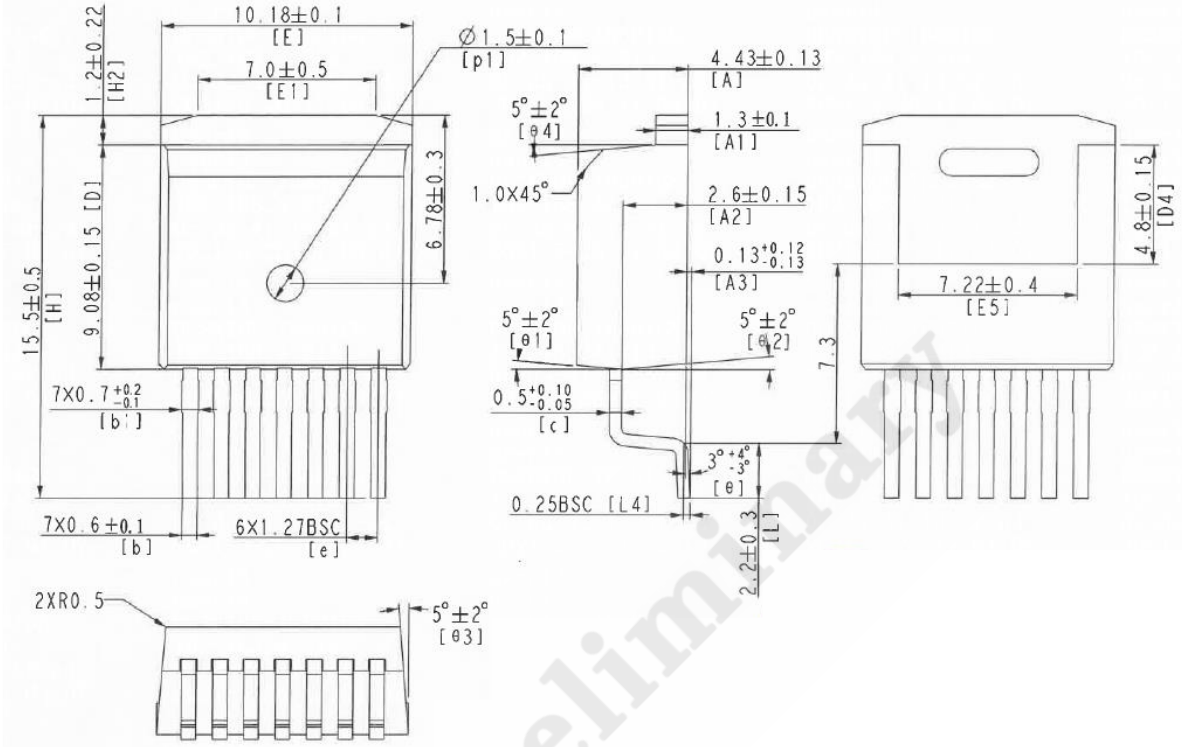


Figure 21. Output Capacitor Stored Energy

6. Package Outlines



Drawing and Dimensions



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