



# P3M06060L8 SiC MOS N-Channel Enhancement Mode

$V_{RRM}$  = 650 V  
 $I_D$  = 37 A  
 $I_D(100^\circ\text{C})$  = 24 A  
 $R_{DS(on)}$  = 60 m $\Omega$

## SiC MOS P3M06060L8 N-Channel Enhancement Mode

### Features

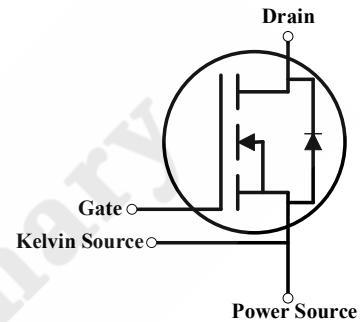
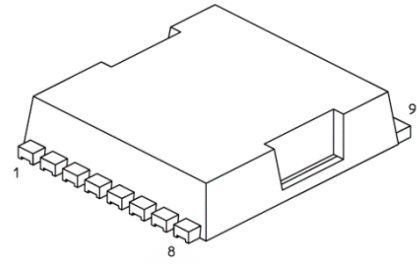
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small  $Q_{gd}$
- 100% UIS tested

### 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



TOLL

Gate	1
Kelvin Source	2
Power Source	3~8
Drain	9



### Order Information

Part Number	Package	Marking
P3M06060L8	TOLL	P3M06060L8



## 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 .....	5
4. Thermal Characteristics .....	6
5. Typical Performance .....	6
6. Package Outlines .....	10

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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	$V_{DSmax}$	650	V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate - Source Voltage (dynamic)	$V_{GSmax}$	-8 / +20	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	$I_D$	37	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$
		24		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$
Power Dissipation	$P_D$	156	W	
Operating Junction	$T_J$	-55 To +150	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-55 To +150	$^\circ\text{C}$	
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	$V_{(BR)DSS}$	650	/	/	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 $V_{GS} = 15V$ $V_{DS} = V_{GS}$ $I_D = 5mA$ $T_J = 25^\circ\text{C}$
		/	1.8	/	V	$V_{DS} = V_{GS}$ $I_D = 5mA$ $T_J = 150^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	/	1	100	$\mu A$	$V_{GS} = 0V$ $V_{DS} = 650V$
Gate-Source Leakage Current	$I_{GSS}$	/	20	250	nA	$V_{GS} = 15V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	60	78	m $\Omega$	$V_{GS} = 15V$ $I_D = 20A$ $T_J = 25^\circ\text{C}$
		/	52	/		$V_{GS} = 18V$ $I_D = 20A$ $T_J = 25^\circ\text{C}$
Trans conductance	$g_{fs}$	/	12	/	S	$V_{DS} = 20V$ $I_{DS} = 20A$ $T_J = 25^\circ\text{C}$
		/	11	/		$V_{DS} = 20V$ $I_{DS} = 20A$ $T_J = 150^\circ\text{C}$



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Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Input Capacitance	$C_{iss}$	/	1853	/	pF	$V_{GS} = 0V$ $V_{DS} = 400V$ $f = 1MHz$ $V_{AC} = 25mV$
Output Capacitance	$C_{oss}$	/	139	/		
Reverse Transfer Capacitance	$C_{rss}$	/	8.3	/		
Coss Stored Energy	$E_{oss}$	/	13.6	/	$\mu J$	
Internal Gate Resistance	$R_{G(int)}$	/	1.2	/	$\Omega$	$f = 1MHz$ $V_{AC} = 25mV$
Gate to Source Charge	$Q_{gs}$	/	17.5	/	nC	$V_{DS} = 400V$ $I_{DS} = 20A$ $V_{GS} = -3 \text{ to } 15V$ $I_G = 50mA$
Gate to Drain Charge	$Q_{gd}$	/	15.3	/		
Total Gate Charge	$Q_g$	/	53.1	/		

## 3. Reverse Diode Characteristics

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

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	$V_{SD}$	5.7	/	V	$V_{GS} = -3V$ $I_{SD} = 10A$ $T_J = 25^\circ C$
		5.1	/	V	$V_{GS} = -3V$ $I_{SD} = 10A$ $T_J = 150^\circ C$
Continuous Diode Forward Current	$I_S$	24	/	A	$V_{GS} = -3V$



## 4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.8	$^{\circ}\text{C}/\text{W}$

## 5. Typical Performance

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

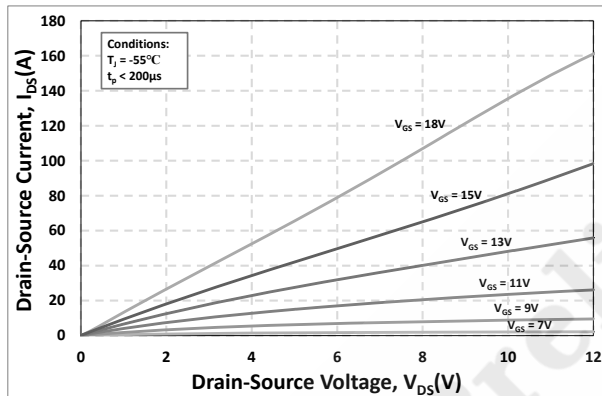


Figure 1. Output Characteristics  $T_J = -55^{\circ}\text{C}$

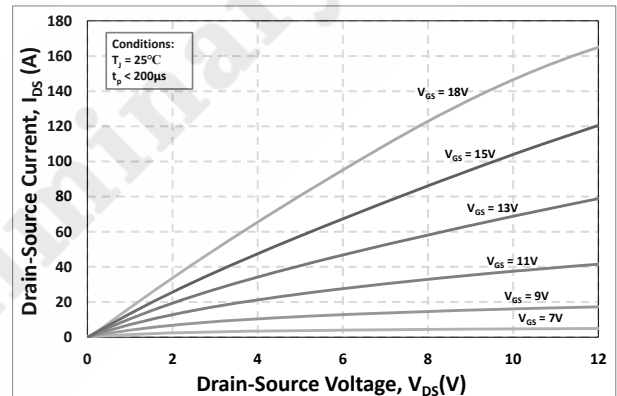


Figure 2. Output Characteristics  $T_J = 25^{\circ}\text{C}$

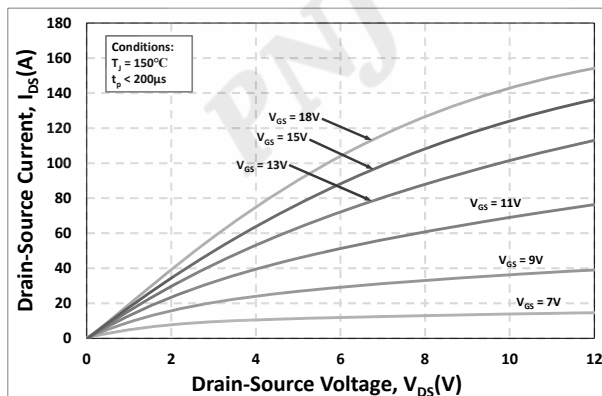


Figure 3. Output Characteristics  $T_J = 150^{\circ}\text{C}$

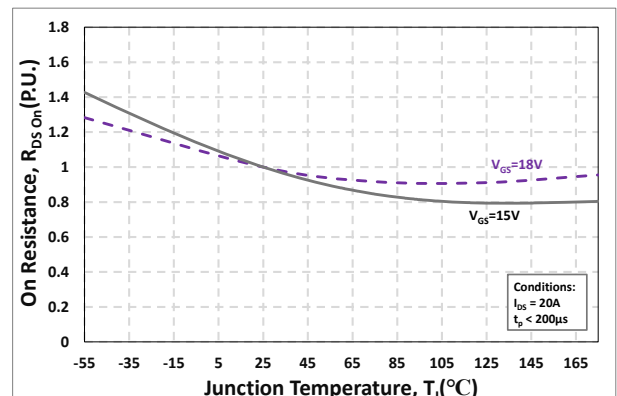


Figure 4. Normalized On-Resistance vs. Temperature



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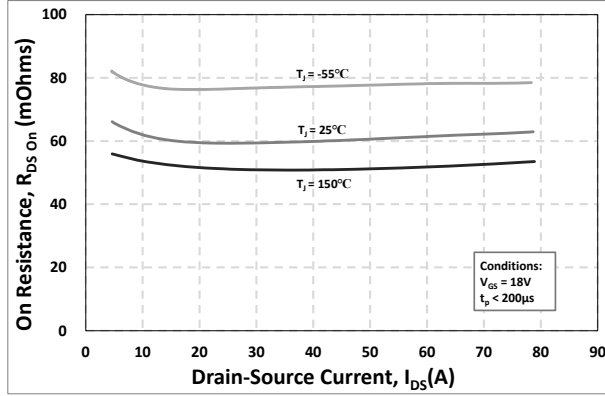


Figure 5. On-Resistance vs. Drain Current Various Temperatures

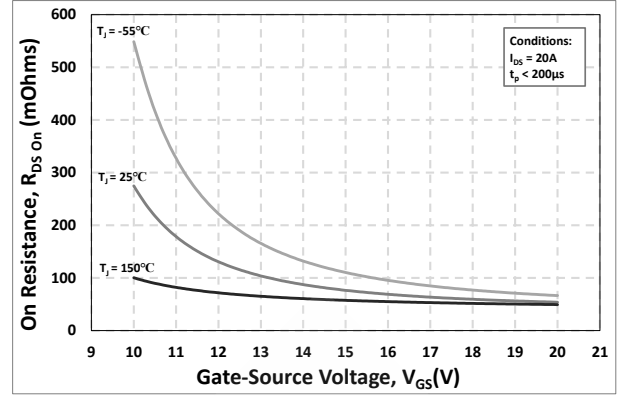


Figure 6. On-Resistance vs. Gate-Source Voltage

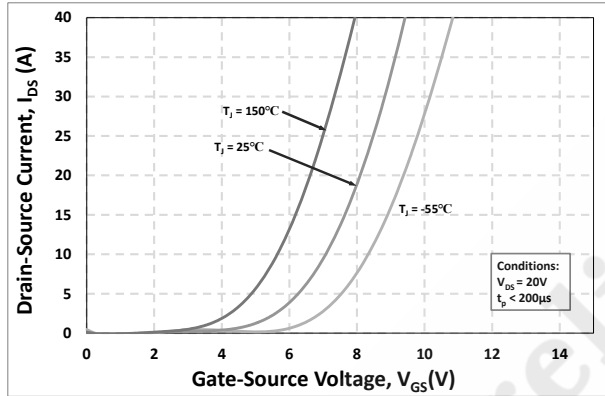


Figure 7. Transfer Characteristic for Various Junction Temperatures

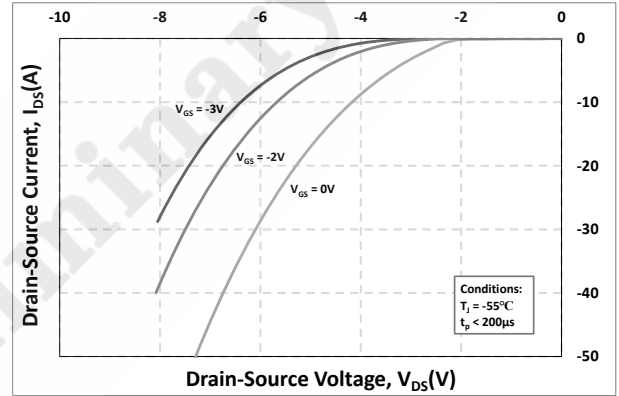


Figure 8. Body Diode Characteristic at -55°C

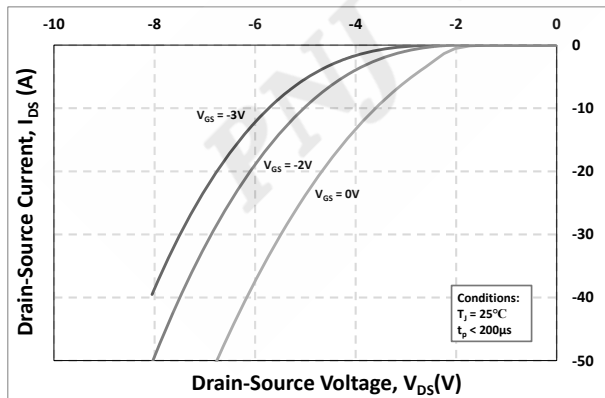


Figure 9. Body Diode Characteristic at 25°C

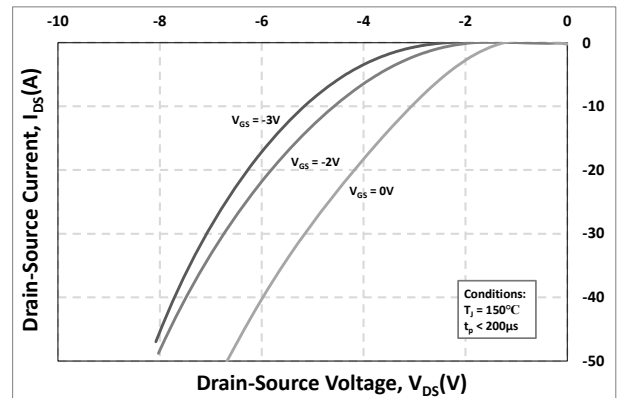


Figure 10. Body Diode Characteristic at 150°C

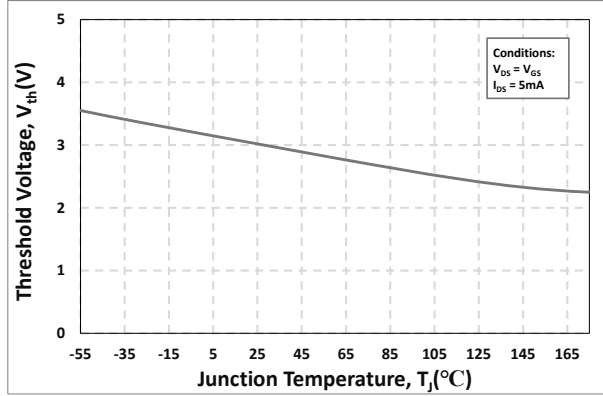


Figure 11. Threshold Voltage vs. Temperature

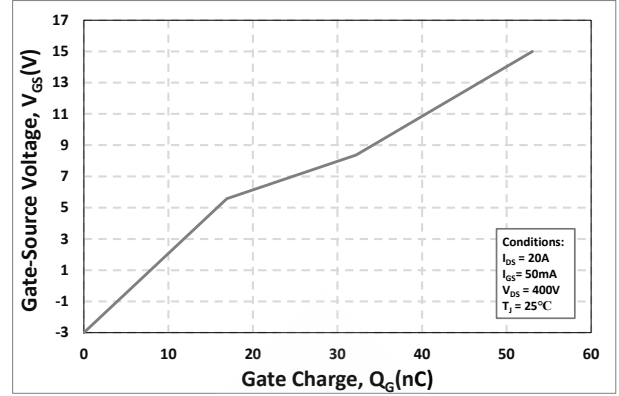


Figure 12. Gate Charge Characteristics

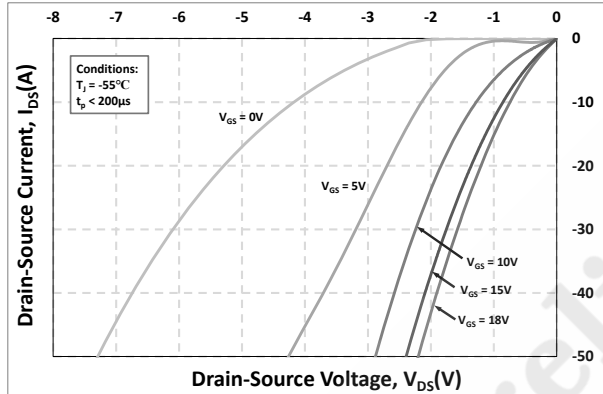


Figure 13. 3rd Quadrant Characteristic at -55°C

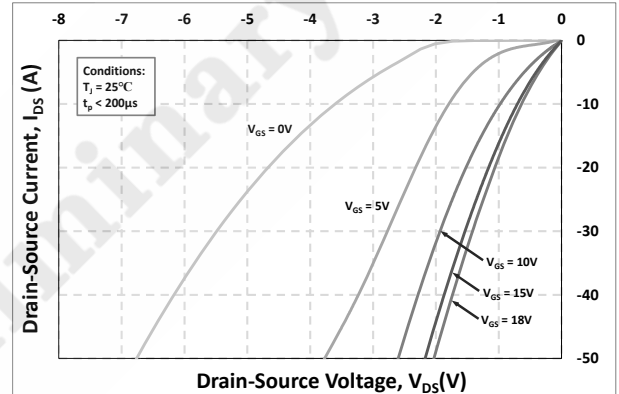


Figure 14. 3rd Quadrant Characteristic at 25°C

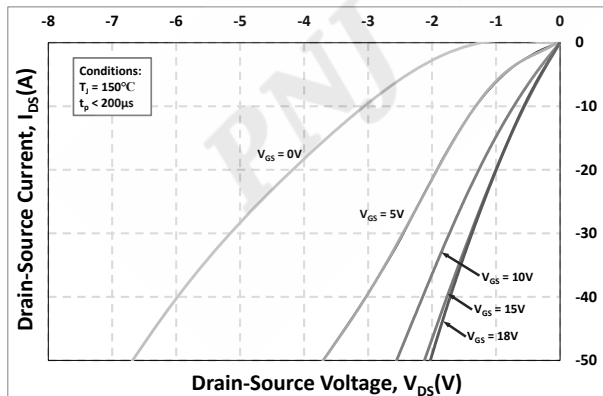


Figure 15. 3rd Quadrant Characteristic at 150°C

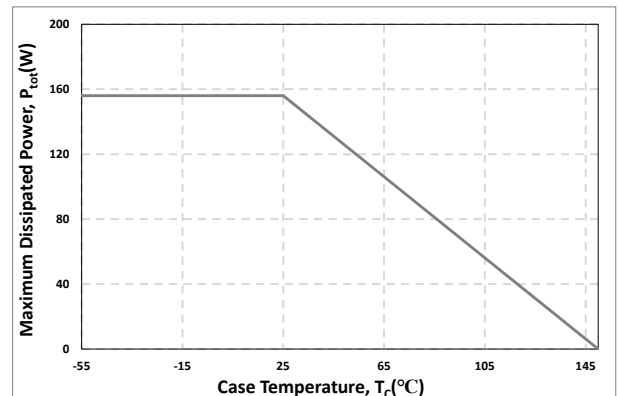


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature



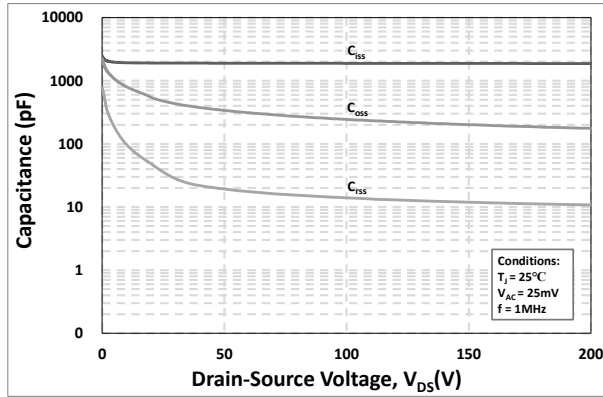


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

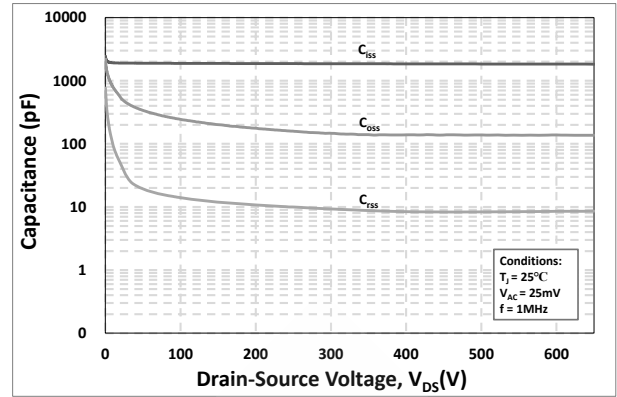


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 650V)

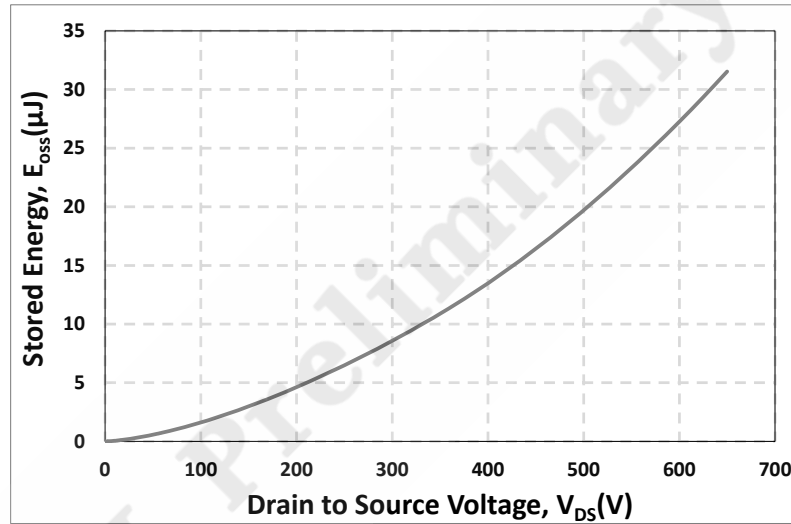
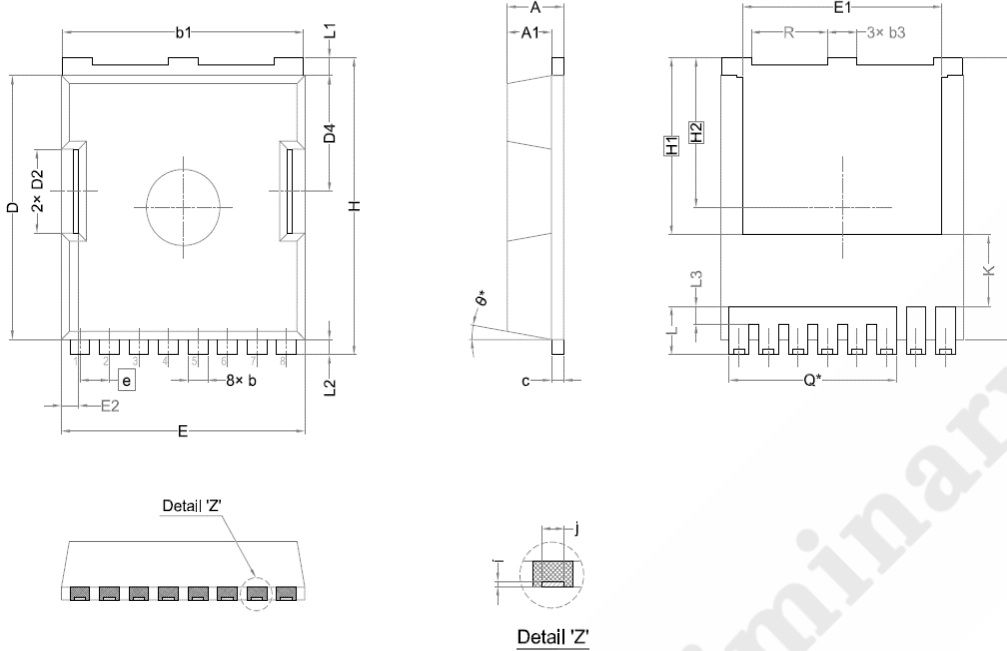


Figure 19. Output Capacitor Stored Energy

## 6. Package Outlines



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
A1	1.70	1.80	1.90
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b3	1.10	1.20	1.30
c	0.40	0.50	0.60
D	10.28	10.38	10.48
D1	10.98	11.08	11.18
D2	3.20	3.30	3.40
D4	4.45	4.55	4.65
E	9.80	9.90	10.00
E1	8.00	8.10	8.20
E2	0.60	0.70	0.80
e	1.20 BSC		
H	11.58	11.68	11.78
H1	6.95 BSC		
H2	5.89 BSC		
i	0.10 REF.		
j	0.46 REF.		
K	2.80 REF.		
L	1.40	1.90	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	0.30	0.70	0.80
N	8		
Q	6.80 REF.		
R	3.00	3.10	3.20
θ	10° REF.		

Drawing and Dimensions

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