

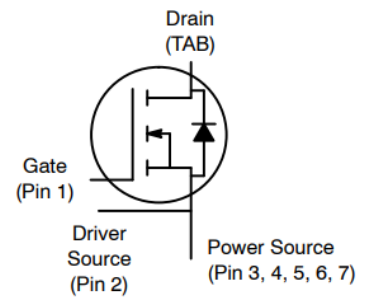
$V_{DS} = 1200\text{ V}$

$I_D (T_C=25^\circ\text{C}) = 34\text{ A}$

$R_{DS(on).typ} = 80\text{ m}\Omega @ V_{GS}=20\text{ V}$



TO-263-7



Features

- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant

Benefits

- Reduce switching losses
- Increased system Switching Frequency
- Increased power density
- Reduction of heat sink requirements

Applications

- Switch mode power supplies
- Renewable energy
- Motor drives
- High voltage DC/DC converters

Package Pin Definitions

- Pin1- Gate
- Pin2- Driver Source
- Pin3, 4, 5, 6, 7- Power Source
- TAB- Drain

Package Parameters

Part Number	Marking	Package
ES80N120HAA	ES80N120HAA	TO-263-7



Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit	Note
V_{DSmax}	Drain-Source Voltage	$V_{GS} = 0V, I_D = 100\mu A$	1200	V	
V_{GSmax}	Gate-Source voltage	AC ($f > 1\text{ Hz}$)	-10/+25	V	
V_{GSop}	Recommend Gate-Source Voltage	Static	-5/+20	V	
I_D	Continuous Drain current	$V_{GS} = 20V, T_C = 25^{\circ}\text{C}$	34	A	Fig. 14
		$V_{GS} = 20V, T_C = 100^{\circ}\text{C}$	22		
$I_{D,pulse}$	Pulsed Drain Current	Pulse with t_p limited by T_{jmax}	70	A	
P_D	Power Dissipation	$T_C = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$	242	W	Fig. 15
T_j	Operating junction temperature		-55~150	$^{\circ}\text{C}$	
T_{stg}	Storage temperature		-55~150	$^{\circ}\text{C}$	

Thermal Characteristics

Symbol	Parameter	Value			Unit	Note
		Min.	Typ.	Max.		
$R_{th(jc)}$	Thermal resistance from Junction to Case		0.62		K/W	

Electrical Characteristics $T_j=25^{\circ}\text{C}$ unless otherwise specified
Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-Source Breakdown voltage	$V_{GS} = 0V, I_D = 100\mu A$	1200			V	
$V_{GS(th)}$	Gate Threshold voltage	$V_{GS} = V_{DS}, I_D = 5mA$		3.0		V	Fig. 9
		$V_{GS} = V_{DS}, I_D = 5mA, T_j = 175^{\circ}\text{C}$		2.3			
I_{GSS}	Gate-Source Leakage current	$V_{GS} = 20V, V_{DS} = 0V$			250	nA	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200V, V_{GS} = 0V, T_j = 25^{\circ}\text{C}$		1	50	μA	
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS} = 20V, I_D = 20A$ $V_{GS} = 18V, I_D = 20A$		80	98	m Ω	Fig. 3, 4, 5
		$V_{GS} = 20V, I_D = 20A, T_j = 175^{\circ}\text{C}$ $V_{GS} = 18V, I_D = 20A, T_j = 175^{\circ}\text{C}$		130			
g_{fs}	Transconductance	$V_{GS} = 20V, I_D = 20A$		9		S	Fig. 6
		$V_{GS} = 20V, I_D = 20A, T_j = 175^{\circ}\text{C}$		7			

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
Q_{GS}	Gate to Source Charge	$V_{DS} = 800V$ $I_D = 20A$ $V_{GS} = -5V/20V$		15		nC	Fig. 10
Q_{GD}	Gate to Drain Charge			30			
Q_G	Total Gate Charge			66			

AC Characteristics ($T_J=25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 1000V$ $f = 1\text{ MHz}$ $V_{AC} = 25mV$		1374		pF	Fig. 13
C_{oss}	Output Capacitance			63		pF	
C_{rss}	Reverse Transfer Capacitance			3.5		pF	
$R_{G(int)}$	Internal Gate Resistance	$f=1\text{ MHz}, V_{AC} = 25mV$		2		Ω	

Reverse Diode Characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
V_{SD}	Diode Forward Voltage	$V_{GS} = -4\text{V}, I_{SD} = 10\text{A}$		3.7		V	Fig. 7,8
		$V_{GS} = -4\text{V}, I_{SD} = 10\text{A}, T_j = 175^\circ\text{C}$		3.1			
I_S	Continuous Diode Forward Current	$V_{GS} = -4\text{V}, T_C = 25^\circ\text{C}$		32		A	
$I_{S, pulse}$	Diode pulse Current	$V_{GS} = -4\text{V}$, pulse width t_p limited by T_{jmax}		80		A	

Typical Performance

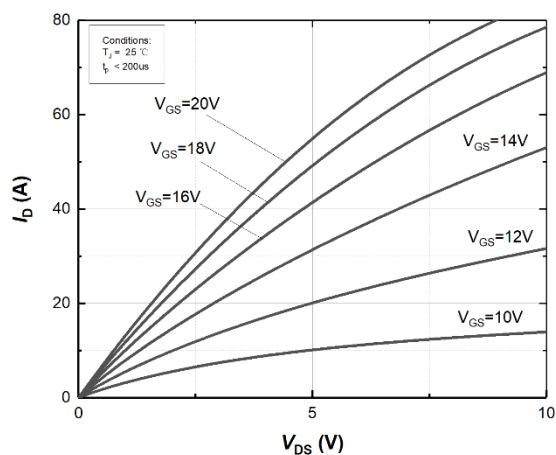


Figure 1. Output characteristics at $T_j=25^\circ\text{C}$

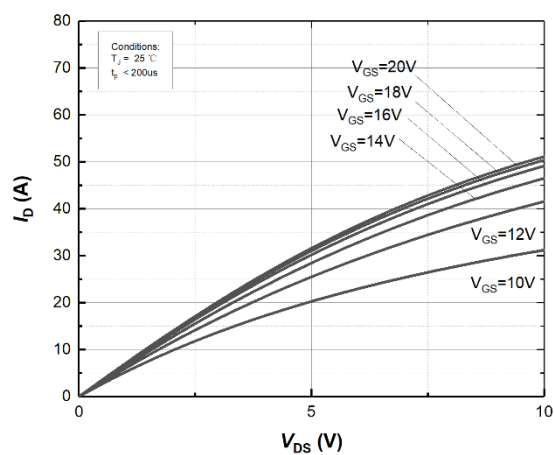


Figure 2. Output characteristics at $T_j=175^\circ\text{C}$

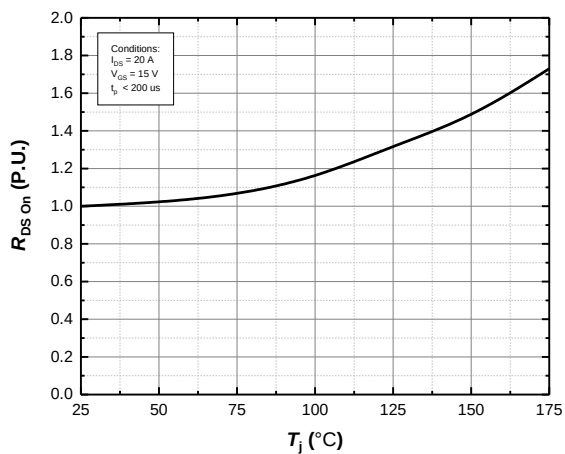


Figure 3. Normalized On-Resistance vs. Temperature

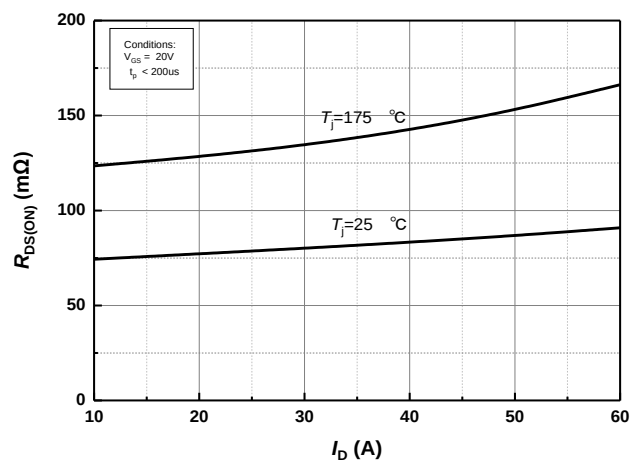


Figure 4. On-Resistance vs. Drain current for Various Temperature

Typical Performance

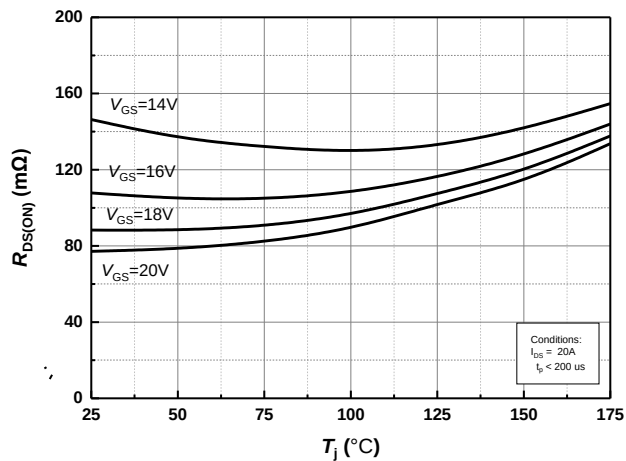


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

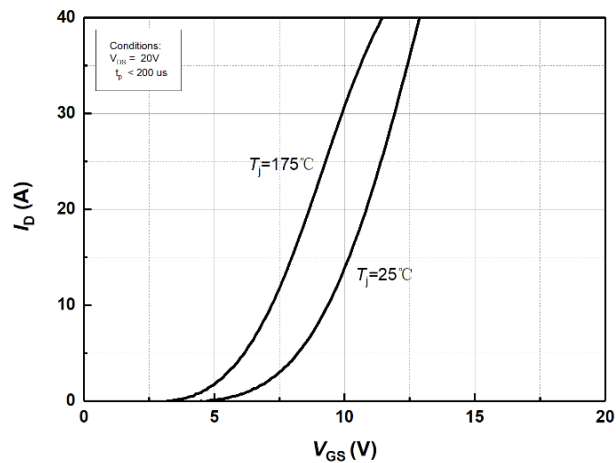


Figure 6. Transfer Characteristics for Various Junction Temperatures

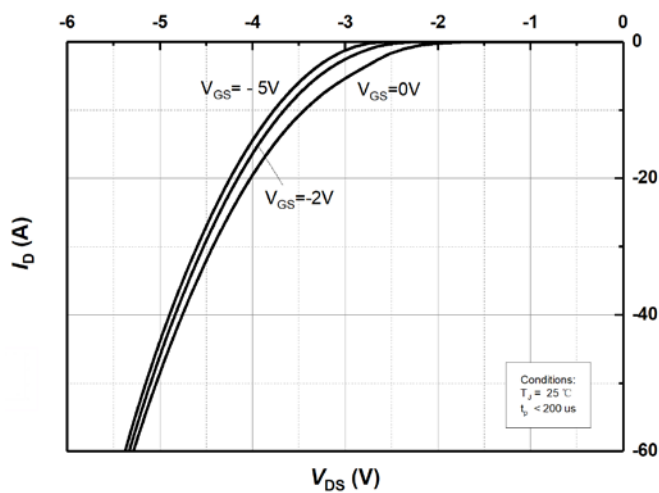


Figure 7. Body Diode Characteristics at $T_J=25^{\circ}\text{C}$

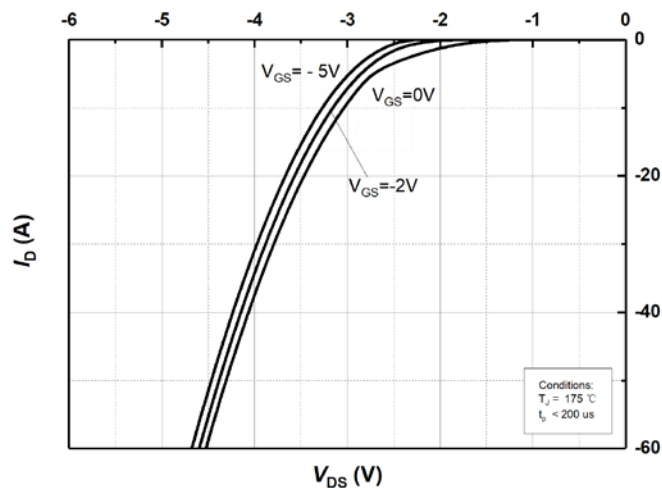


Figure 8. Body Diode Characteristics at $T_J=175^{\circ}\text{C}$

Typical Performance

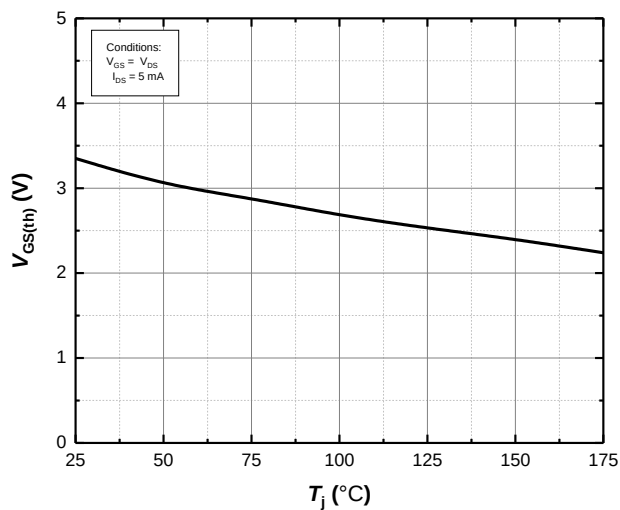


Figure 9. Threshold Voltage vs. Temperature

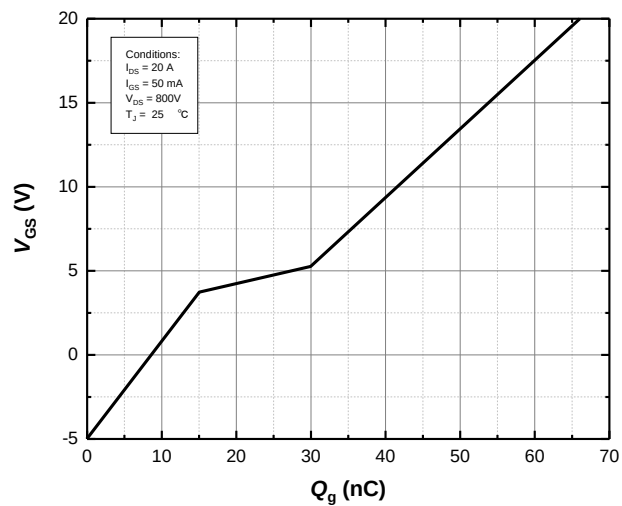


Figure 10 Gate Charge Characteristics

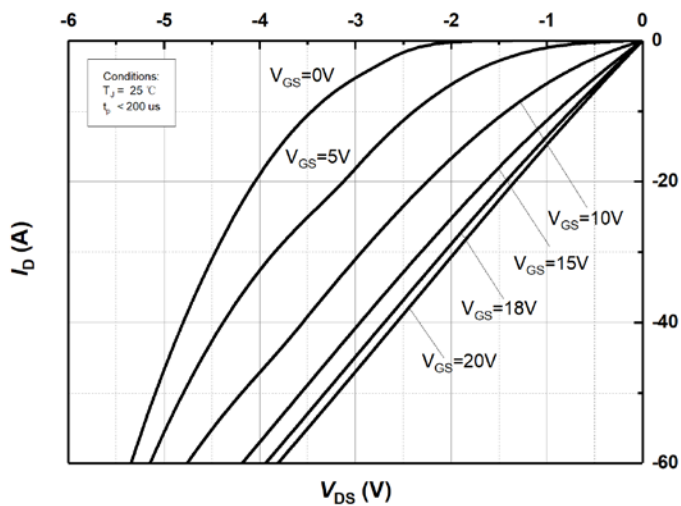


Figure 11. 3rd Quadrant Characteristic at $T_j=25^{\circ}\text{C}$

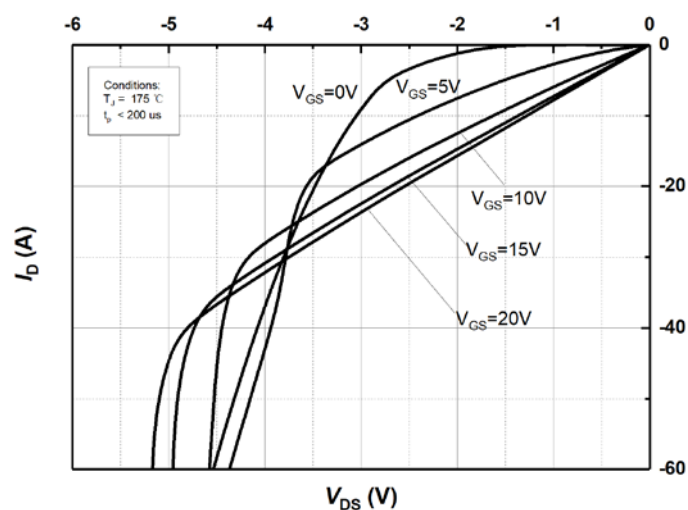


Figure 12. 3rd Quadrant Characteristic at $T_j=175^{\circ}\text{C}$

Typical Performance

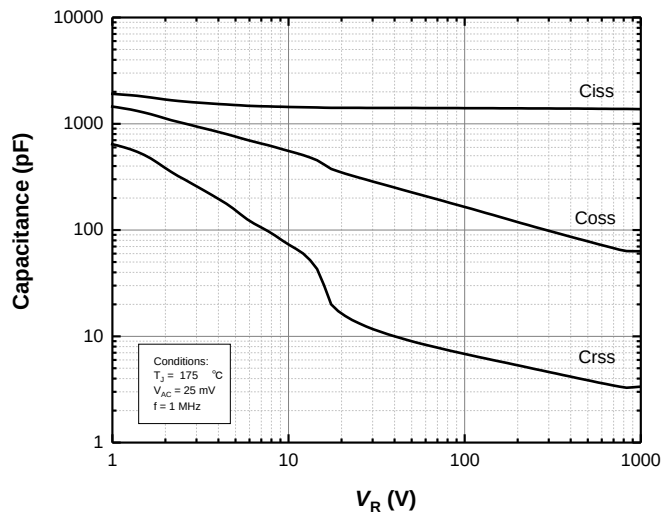


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 1000V)

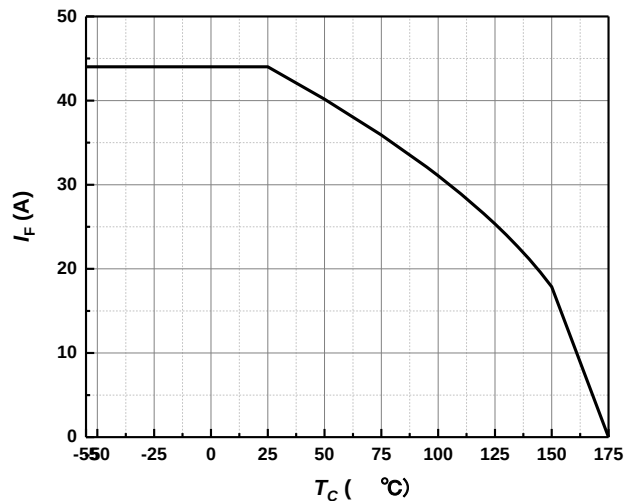


Figure 14. Continuous Drain Current Derating vs Case Temperature

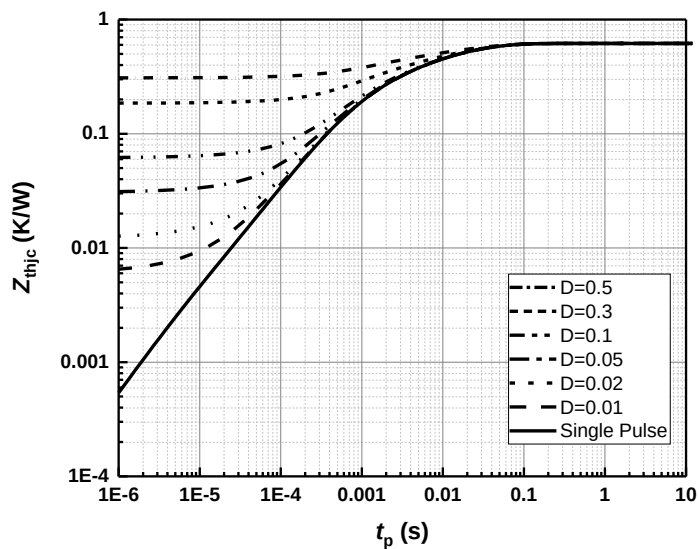


Figure 15. Transient Thermal Impedance (Junction – Case)

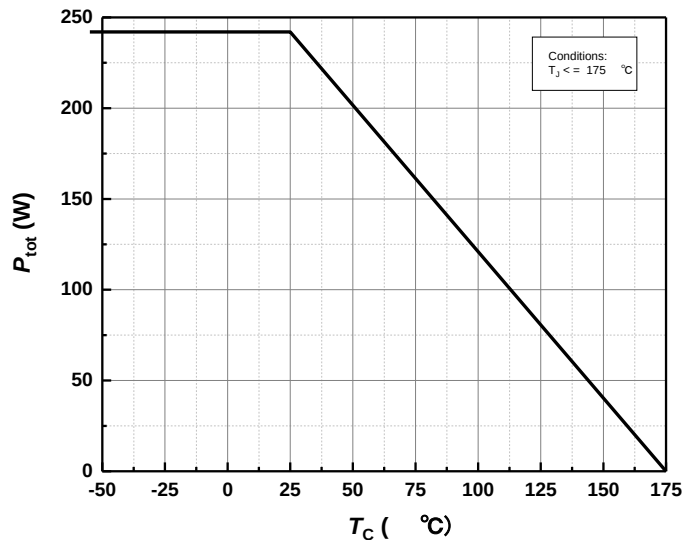


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

Typical Performance

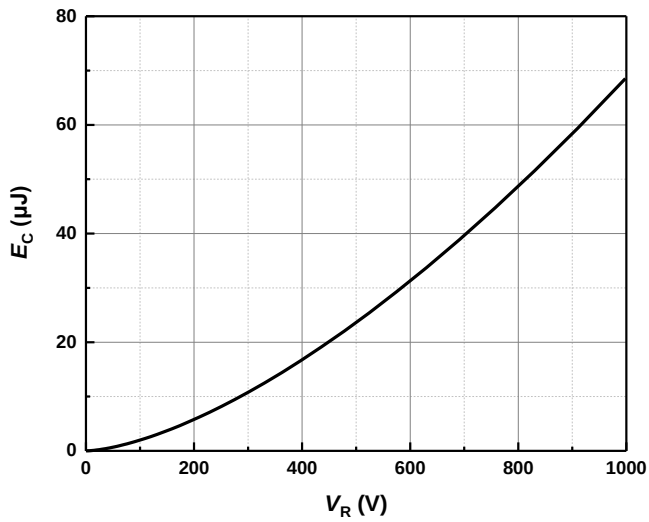


Figure 17. Output Capacitor Stored Energy

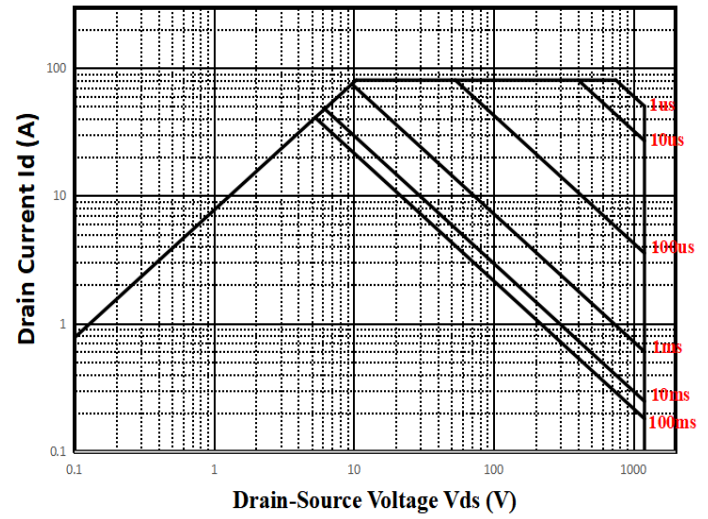
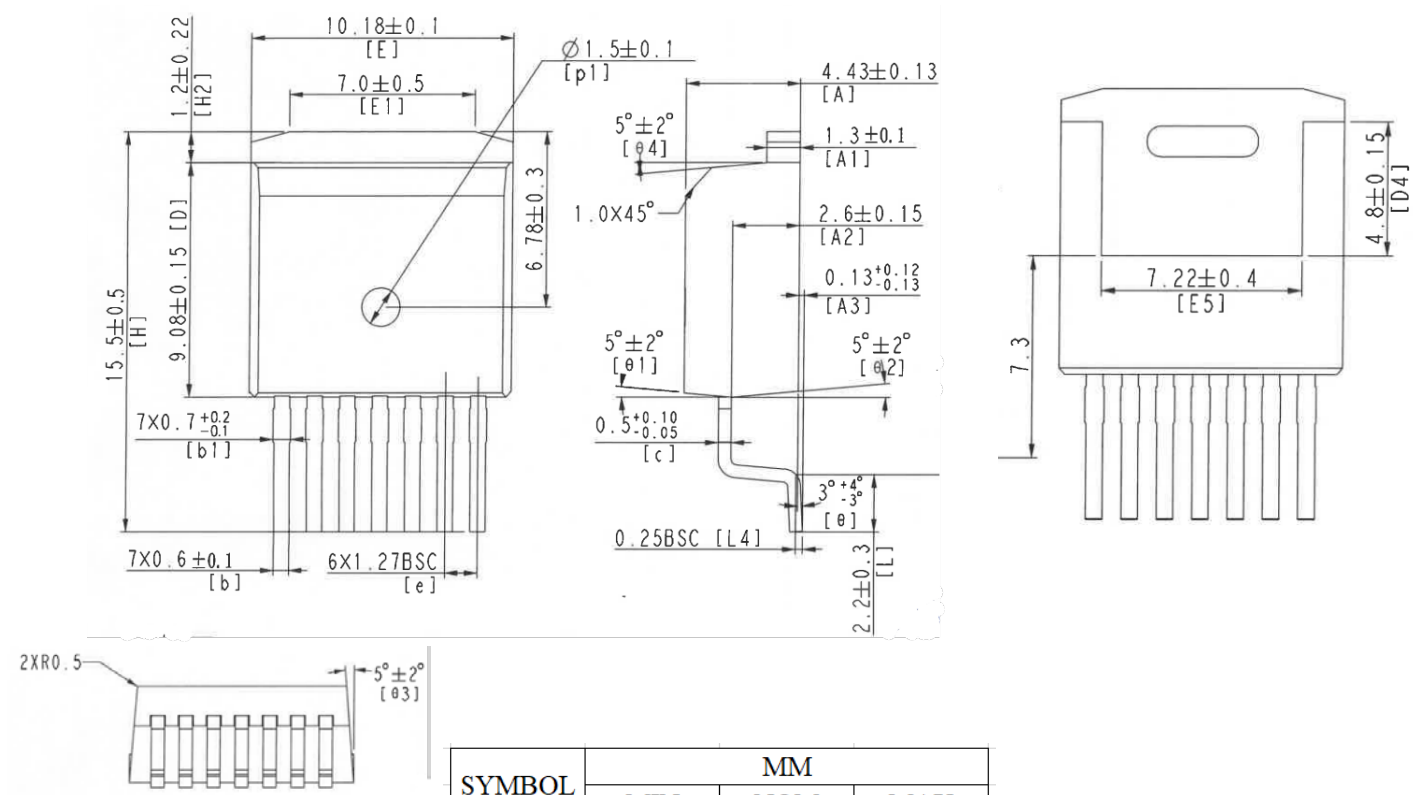


Figure 18. Safe Operating Area

Package Dimensions



SYMBOL	MM		
	MIN	NOM	MAX
D	8.93	9.08	9.23
E	10.08	10.18	10.28
A	4.30	4.43	4.56
H	15.00	15.50	16.00
E1	6.50	7.00	7.50
E2	6.82	7.22	7.62
D4	4.65	4.80	4.95
A1	1.20	1.30	1.40
A2	2.45	2.60	2.75
A3	0.00	0.13	0.25
c	0.45	0.50	0.60
L	2.00	2.20	2.50
b	0.50	0.60	0.70
b1	0.60	0.70	0.90
e	1.27BSC		
E5	6.82	7.22	7.62
L4	0.258BSC		
ΦP1	1.40	1.50	1.60
θ	0.00	3°	7°
θ1	3°	5°	7°
θ2	3°	5°	7°
θ3	3°	5°	7°
θ4	3°	5°	7°
H2	0.98	1.20	1.42

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