

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
650V	52mΩ@18V	52A

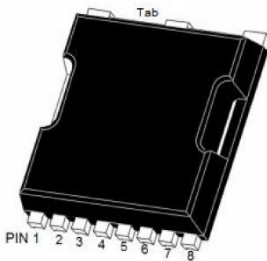
Feature

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery (Qrr)

Application

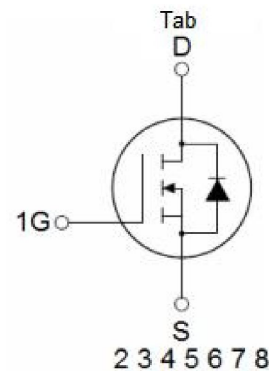
- EV Charging
- Server Power Supplies
- Solar PV Inverters
- UPS
- DC/DC Converters

Package

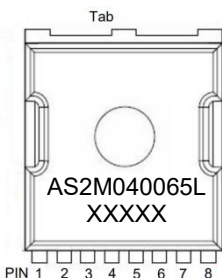


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Circuit diagram



Marking



Absolute maximum ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Value	Unit
Drain-Source Voltage	V_{DSmax}	$V_{GS} = 0V, I_D = 100\mu A$	650	V
Gate-Source Voltage	V_{GSmax}	Absolute maximum values	-8/+22	V
Gate-Source Voltage	V_{GSOP}	Recommended operational values	-4/+18	V
Continuous Drain Current	I_D	$V_{GS}=18V, T_C=25^\circ C$	52	A
	I_D	$V_{GS}=18V, T_C=100^\circ C$	37	A
Power Dissipation	P_D	$T_C=25^\circ C$	176	W
Thermal Resistance (Typ)	$R_{\theta JC}$	Junction-to-Case	0.85	$^\circ C/W$
Junction Temperature	T_J		-40 ~ +175	$^\circ C$
Storage Temperature	T_{STG}		-40 ~ +175	$^\circ C$

Electrical characteristics (Tc=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	650			V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$		1	50	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = 22V, V_{DS} = 0V$		10	250	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 7.5mA$	1.8	2.6	4.3	V
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = 18V, I_D = 20A$		40	52	m Ω
		$V_{GS} = 18V, I_D = 20A, T_J = 175^\circ C$		50		
Dynamic characteristics²⁾						
Input Capacitance	C_{iss}	$V_{DS} = 400V, V_{GS} = 0V, f = 1MHz$ $V_{AC} = 25mV$		1500		pF
Output Capacitance	C_{oss}			135		
Reverse Transfer Capacitance	C_{rss}			15		
Turn-on Switching Energy	E_{on}	$V_{DS} = 400V, V_{GS} = -4V/18V,$ $I_D = 20A, R_{G(ext)} = 2.5\Omega, L = 100\mu H$		160		μJ
Turn-off Switching Energy	E_{off}			45		
Total Gate Charge	Q_g	$V_{DS} = 400V, V_{GS} = -4V/18V,$ $I_D = 20A$		101		nC
Gate-Source Charge	Q_{gs}			28		
Gate-Drain Charge	Q_{gd}			30		
Turn-on delay time	$t_{d(on)}$	$V_{DS} = 400V, V_{GS} = -4V/18V,$ $I_D = 20A, R_{G(ext)} = 2.5\Omega, R_L = 20\Omega$		13		nS
Turn-on rise time	t_r			14		
Turn-off delay time	$t_{d(off)}$			27		
Turn-off fall time	t_f			8		
Source-Drain Diode characteristics						
Diode Forward Current	I_S	$V_{GS} = -4V, T_C = 25^\circ C$			29	A
Diode Forward voltage	V_{SD}	$V_{GS} = -4V, I_{SD} = 10A$		4.2		V
		$V_{GS} = -4V, I_{SD} = 10A, T_J = 175^\circ C$		3.8		
Reverse Recovery Time	t_{rr}	$I_{SD} = 20A, V_R = 400V$		23		nS
Reverse Recovery Charge	Q_{rr}			80		nC
Peak Reverse Recovery Current	I_{rrm}			4		A

Typical Characteristics

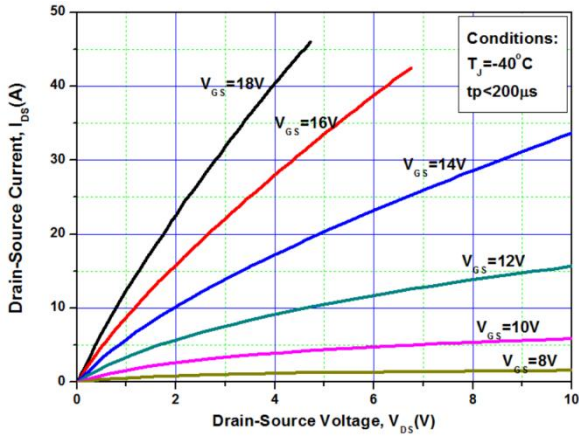


Figure 1. Output Characteristics $T_j = -40^\circ\text{C}$

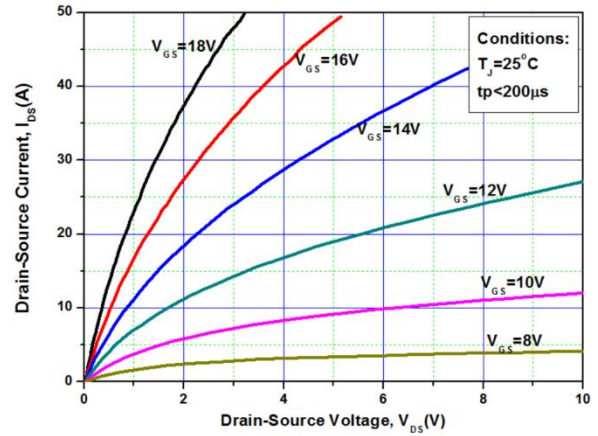


Figure 2. Output Characteristics $T_j = 25^\circ\text{C}$

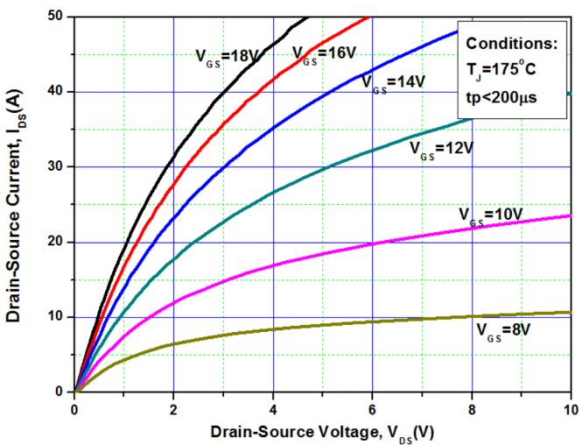


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

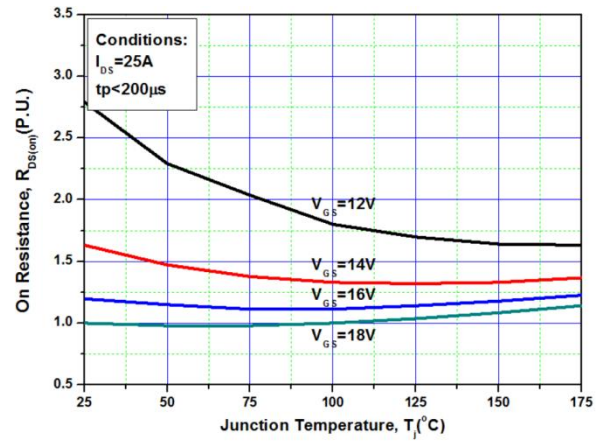


Figure 4. Normalized On-Resistance vs. Temperature

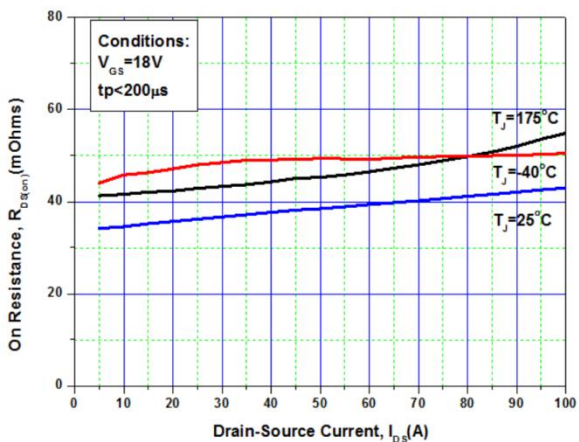


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

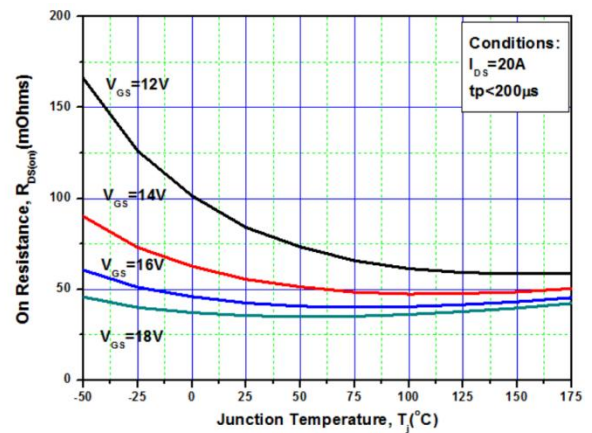


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Characteristics

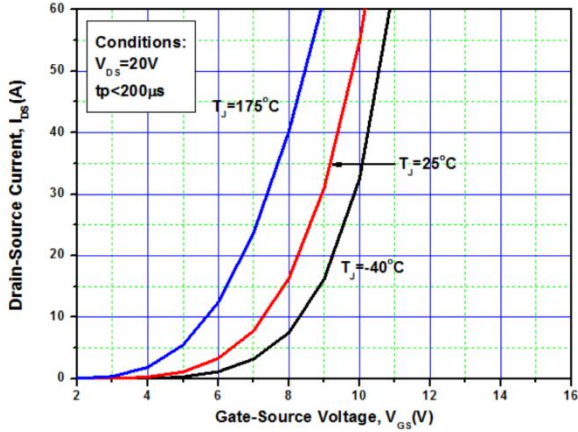


Figure 7. Transfer Characteristic for Various Junction Temperatures

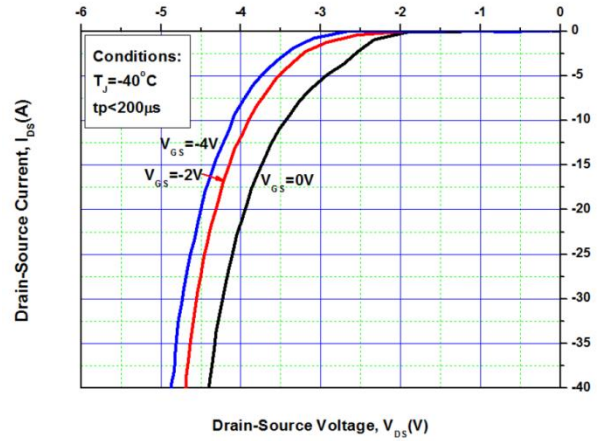


Figure 8. Body Diode Characteristic at -40°C

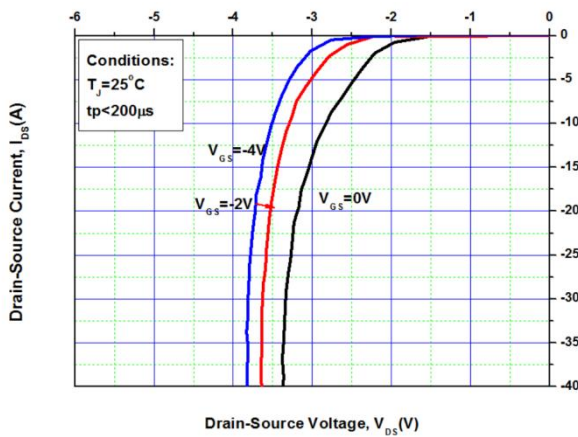


Figure 9. Body Diode Characteristic at 25°C

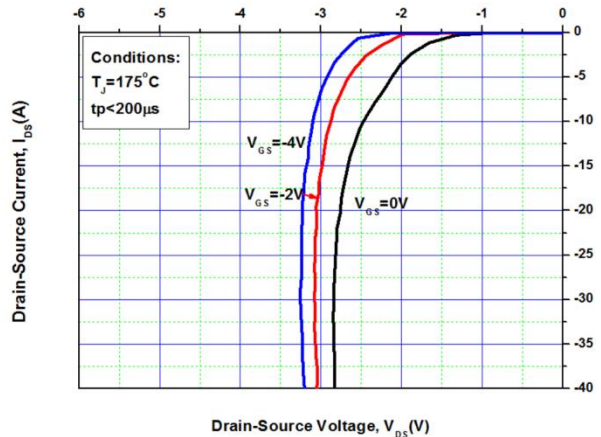


Figure 10. Body Diode Characteristic at 175°C

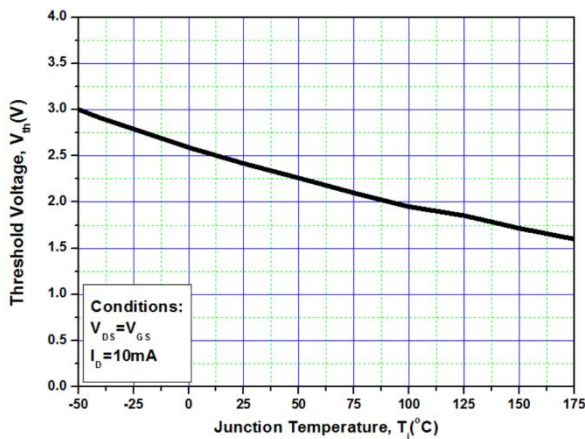


Figure 11. Threshold Voltage vs. Temperature

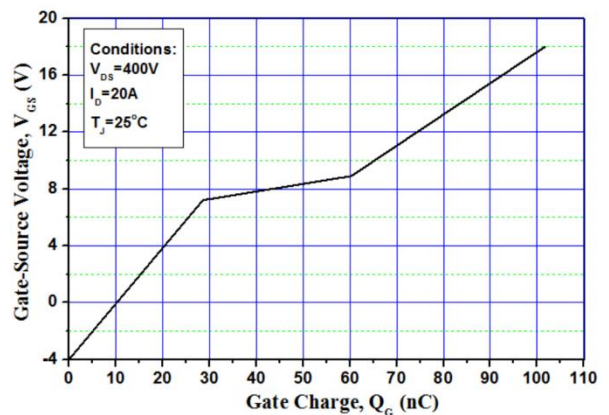


Figure 12. Gate Charge Characteristics

Typical Characteristics

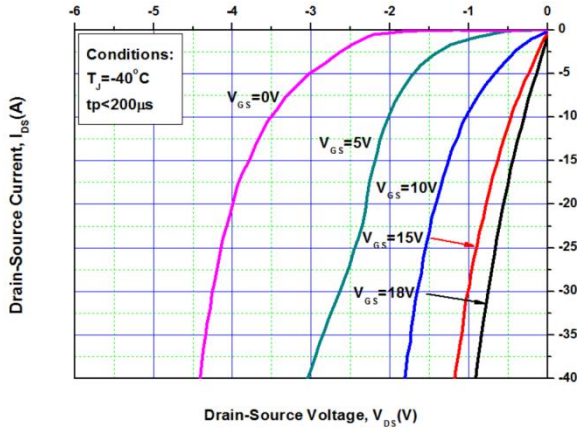


Figure 13. 3rd Quadrant Characteristic at -40°C

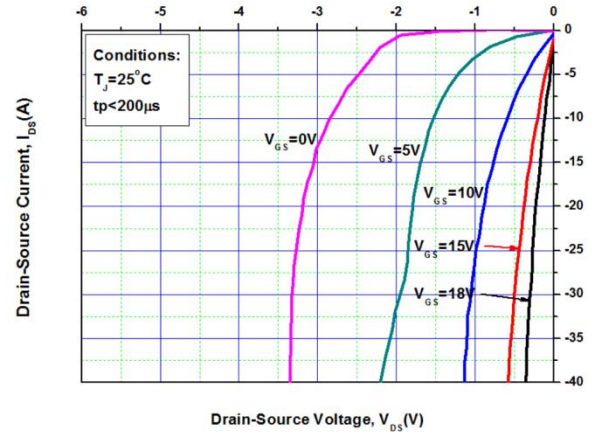


Figure 14. 3rd Quadrant Characteristic at 25°C

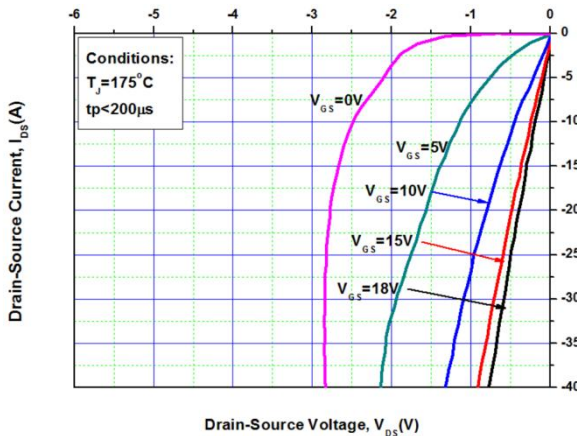


Figure 15. 3rd Quadrant Characteristic at 175°C

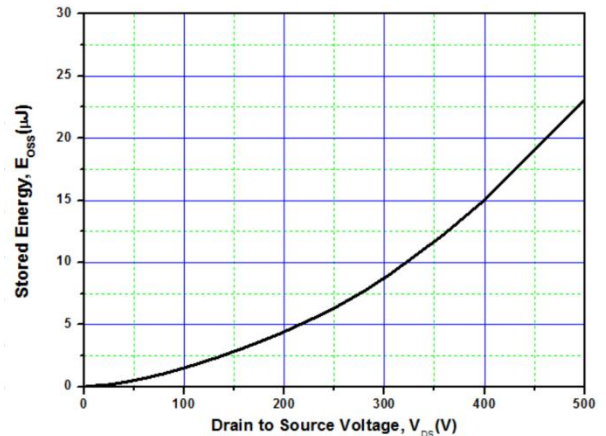


Figure 16. Output Capacitor Stored Energy

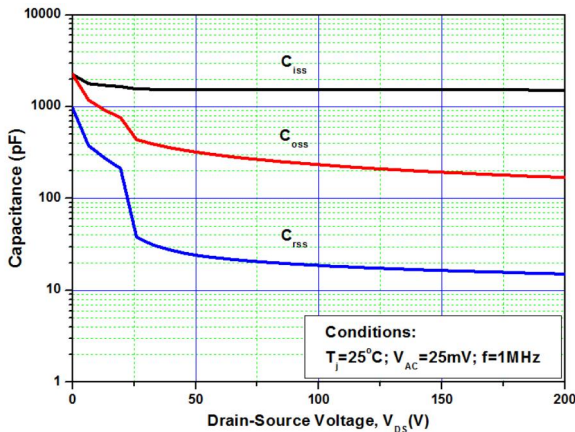


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

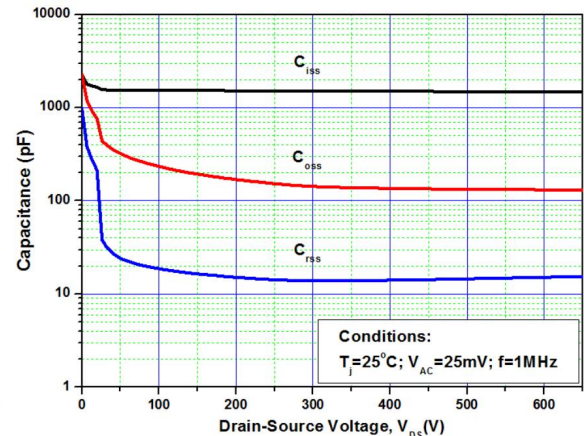


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 650V)

Typical Characteristics

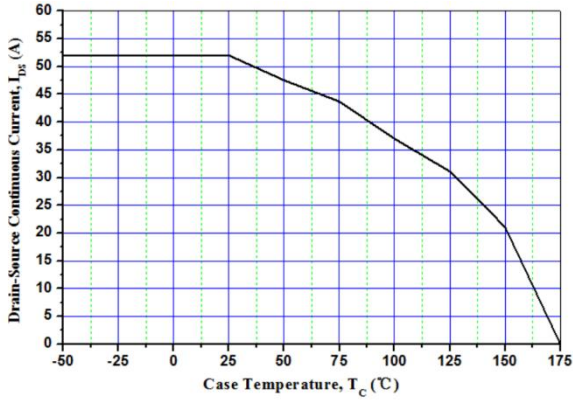


Figure 19. Continuous Drain Current Derating vs. Case Temperature

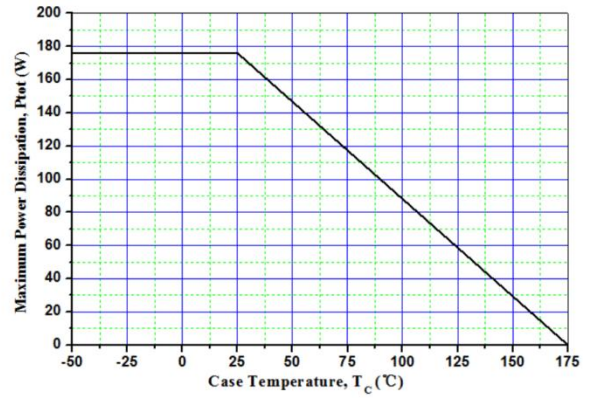


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

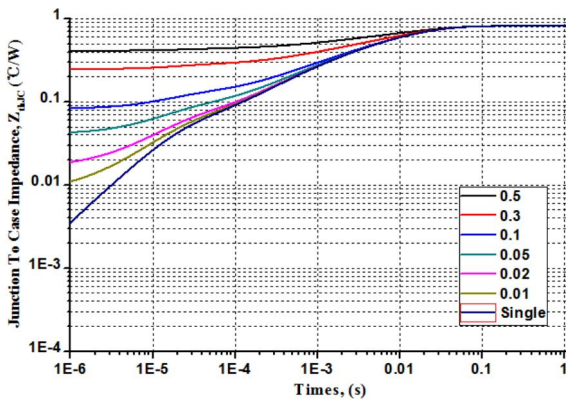


Figure 21. Transient Thermal Impedance (Junction - Case)

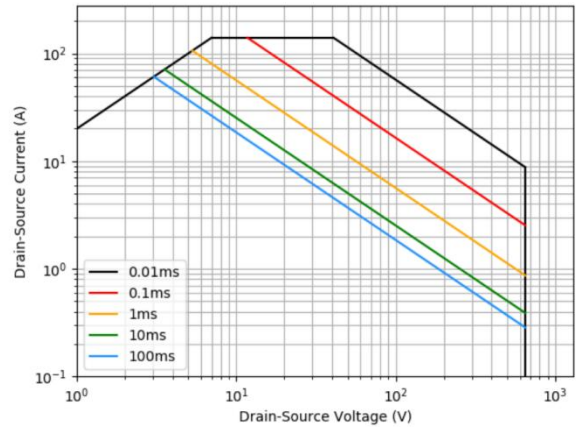
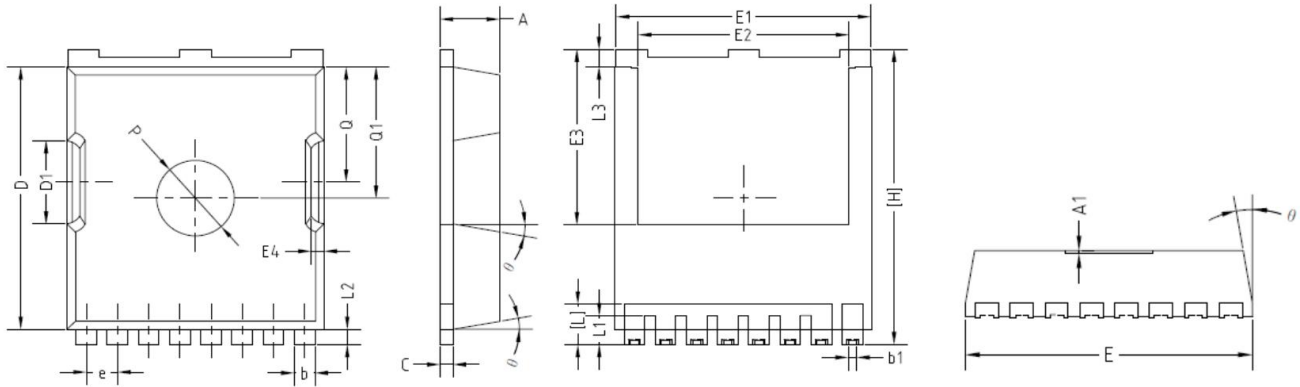


Figure 22. Safe Operating Area

TOLL Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.050	0.150	0.002	0.006
b	0.700	0.900	0.028	0.035
b1	0.350	0.450	0.014	0.018
C	0.400	0.650	0.016	0.026
D	10.400	10.700	0.409	0.421
D1	3.200	3.400	0.126	0.134
E	9.800	10.000	0.386	0.394
E1	9.700	9.900	0.382	0.390
E2	7.950	8.250	0.313	0.325
E3	6.800	7.200	0.268	0.283
E4	0.300	0.750	0.012	0.030
e	1.150	1.250	0.045	0.049
L	1.400	1.800	0.055	0.071
L1	1.050	1.350	0.041	0.053
L2	0.500	0.700	0.020	0.028
L3	0.600	0.800	0.024	0.031
θ	8°	12°	8°	12°
P	2.900	3.100	0.114	0.122
Q	4.500	4.700	0.177	0.185
Q1	5.100	5.300	0.201	0.209
H	11.550	11.900	0.455	0.469