

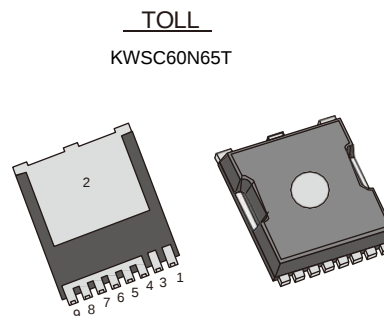
650V 41A N-Channel SiC Power MOSFET

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Wide bandgap SiC MOSFET technology
- Halogen free, RoHS compliant

Mechanical Data

- Case:TOLL Package



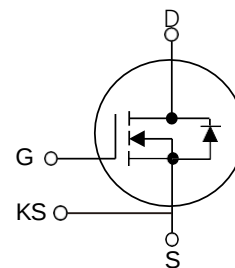
Application

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

Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Kelvin Source
- 4/5/6/7/8/9. Source



Product Summary			
V _{DS}	R _{DS(on)} (mΩ)Typ	I _D (A)	Q _g (Typ)
650V	60@ 18V 13.2A	41	50nc

Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V _{DS}	650	V
Gate-Source Voltage(Max)	V _{GS(max)}	-8/+22	V
Recommend Gate-Source Voltage	V _{GSop}	-4/+18	V
Continuous Drain Current	T _C =25°C	41	A
	T _C =100°C	31	
Pulsed Drain Current (Note 1)	I _{DM}	99	A
Power Dissipation T _C =25°C	P _D	166	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	KWSC60N65T	Unit
Thermal resistance Junction to Case	R _{θJC}	0.9	°C/W
Thermal resistance Junction to Ambient	R _{θJA}	40	°C/W

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =100μA	650	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V,V _{GS} =0V	-	1	50	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =18V,V _{DS} =0V	-	10	250	nA
	Reverse		V _{GS} =-4V,V _{DS} =0V	-	-10	-250	nA
On Characteristics							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =5mA	1.8	2.6	4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =18V,I _D =13.2A,T _J =25°C	-	60	79	mΩ
			V _{GS} =18V,I _D =13.2A,T _J =175°C	-	75	-	
Gate Resisitance		R _G	f=1MHz	-	6	-	Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =600V,V _{GS} =0V, f=1MHz,V _{AC} =25mV	-	830	-	pF
Output Capacitance		C _{OSS}		-	82	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	14	-	pF
Coss stored energy		E _{OSS}		-	17	-	μJ
Turn-on switching energy		E _{ON}	V _{DS} =400V,I _D =13.2A V _{GS} =-4/18V,R _G =2.5Ω, L=200μH,T _J =25°C	-	140	-	mJ
Turn-off switching energy		E _{OFF}		-	52	-	mJ
Turn-On Delay Time		td(on)		-	8	-	ns
Turn-On Rise Time		tr		-	9	-	ns
Turn-Off Delay Time		td(off)		-	21	-	ns
Turn-Off Fall Time		tf		-	8	-	ns
Total Gate Charge		Q _G	V _{DD} =400V,I _D =13.2A, V _{GS} =-4/18V	-	50	-	nC
Gate-Source Charge		Q _{GS}		-	13	-	nC
Gate-Drain Charge		Q _{GD}		-	12	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =-4V,I _S =6.6A	-	4.2	-	V
Reverse Recovery Time		trr	V _R =400V I _{SD} =13.2A	-	28	-	ns
Recovered charge		Qrr		-	47	-	nC
Peak reverse recovery current		Irrm		-	3	-	A

Notes: 1 RepetitiveRating: Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width $\leq 300\mu S$, Duty cycle $\leq 2\%$

Typical Characteristics Diagrams

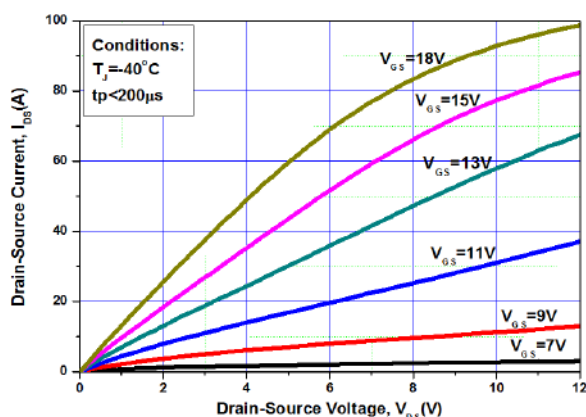


Figure 1. Output Characteristics $T_j = -40\text{ }^{\circ}\text{C}$

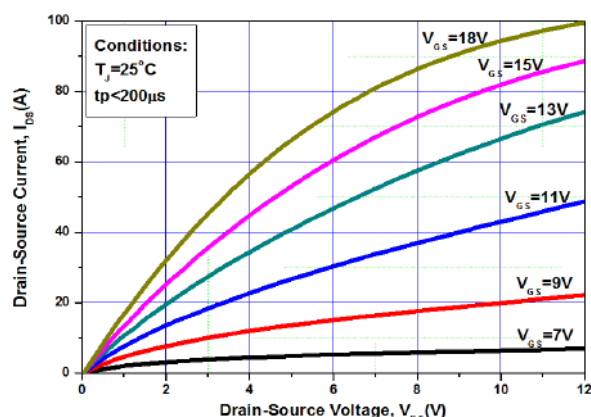


Figure 2. Output Characteristics $T_j = 25\text{ }^{\circ}\text{C}$

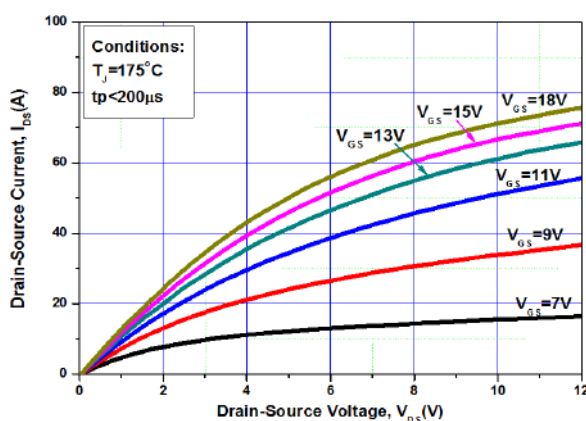


Figure 3. Output Characteristics $T_j = 175\text{ }^{\circ}\text{C}$

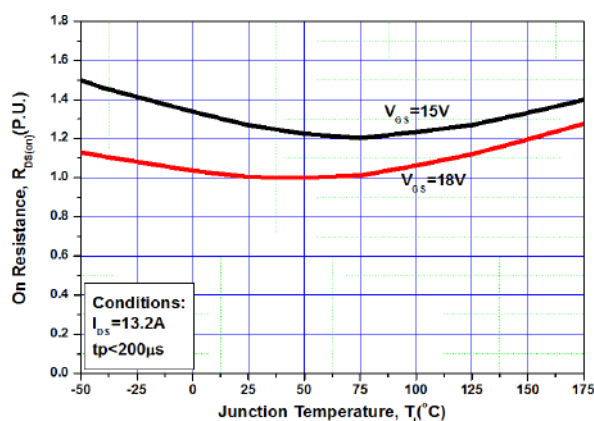


Figure 4. Normalized On-Resistance vs. Temperature

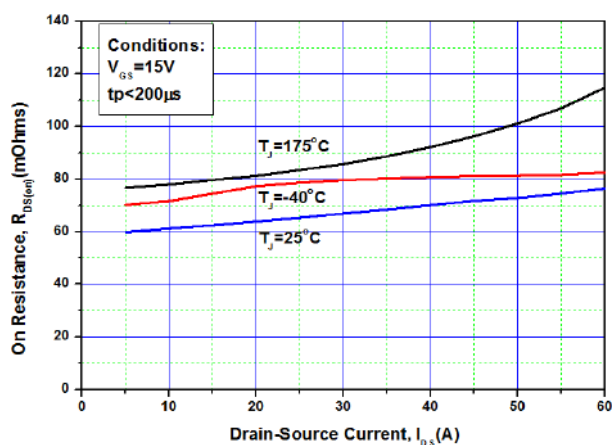


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

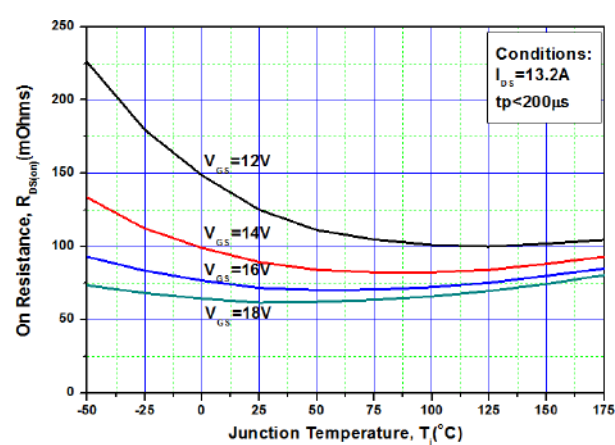


Figure 6. On-Resistance vs. Temperature for Various Gate Voltages

Typical Characteristics Diagrams

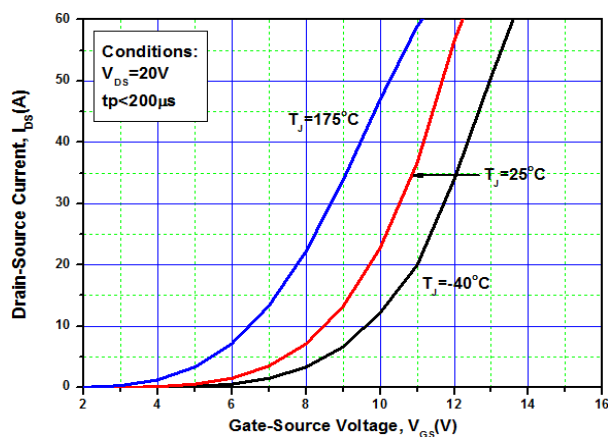


Figure 7. Transfer Characteristics for Various Junction Temperatures

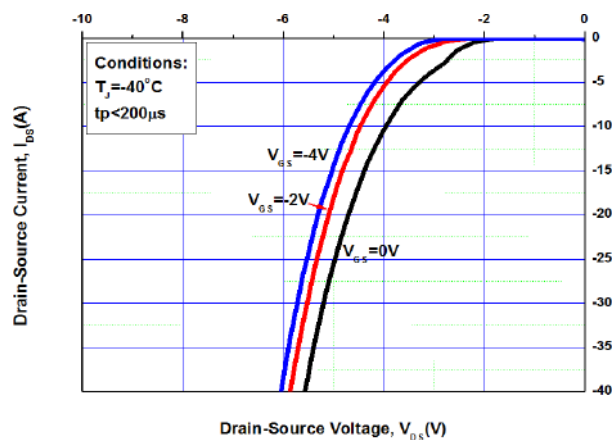


Figure 8. Body Diode Characteristics at -40 °C

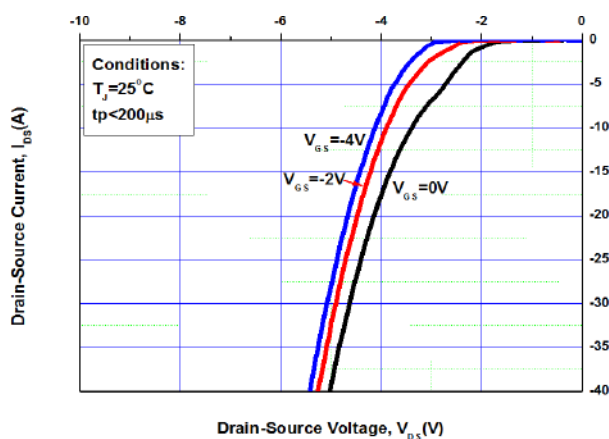


Figure 9. Body Diode Characteristics at 25 °C

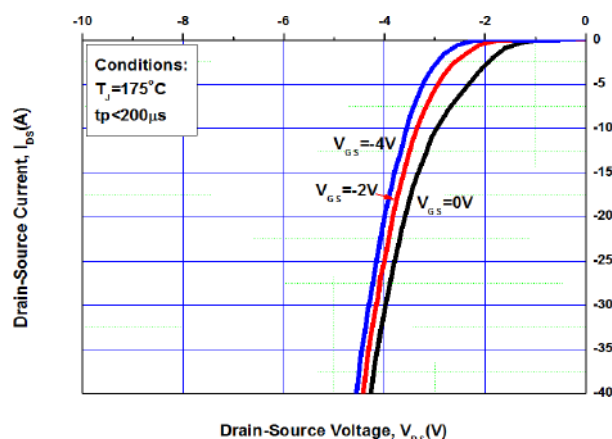


Figure 10. Body Diode Characteristics at 150 °C

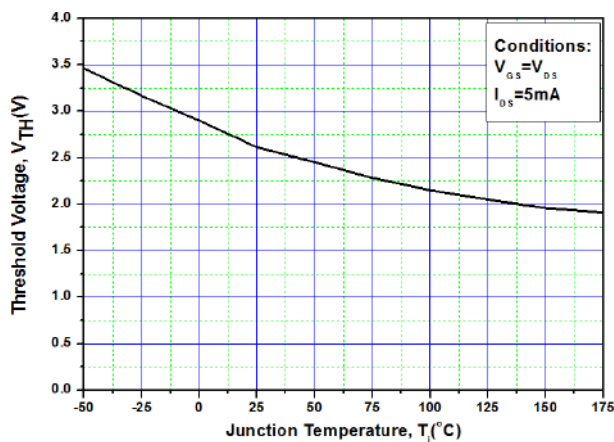


Figure 11. Threshold Voltage vs. Temperature

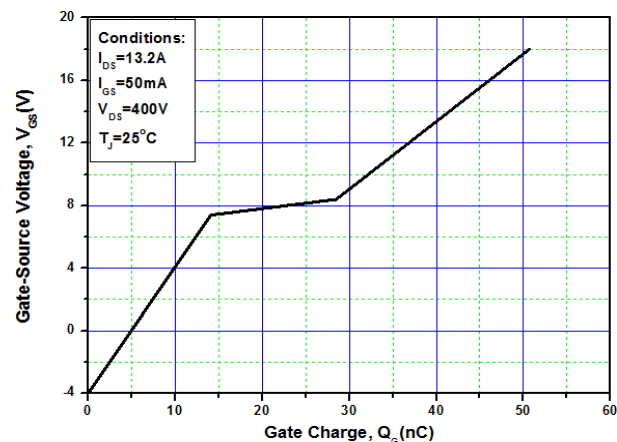


Figure 12. Gate Charge Characteristics

Typical Characteristics Diagrams

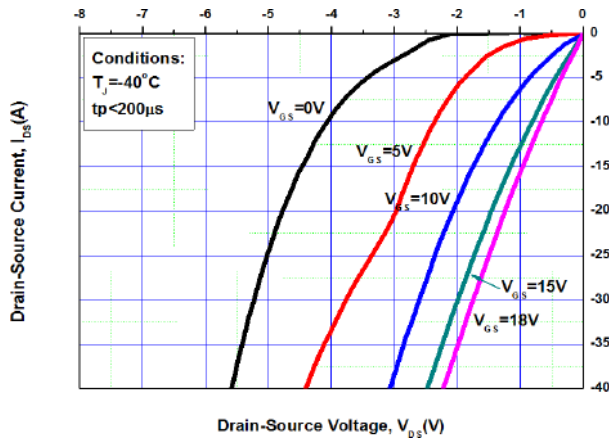


Figure 13. 3rd Quadrant Characteristics at -40 °C

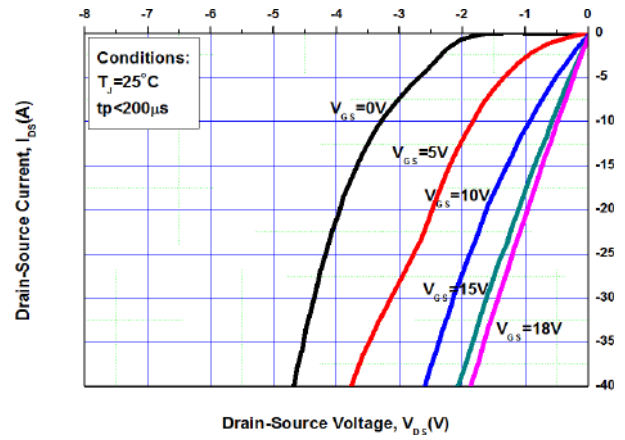


Figure 14. 3rd Quadrant Characteristics at 25 °C

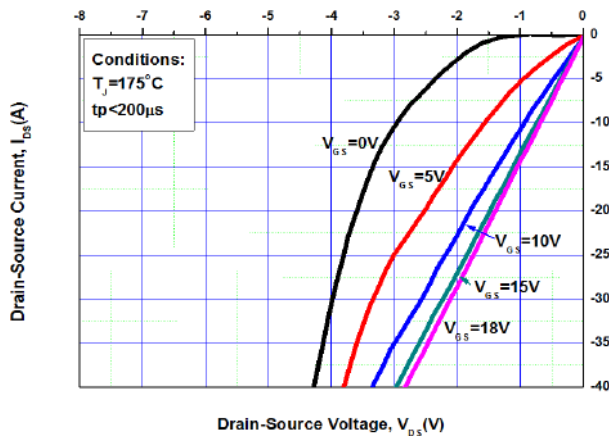


Figure 15. 3rd Quadrant Characteristics at 175 °C

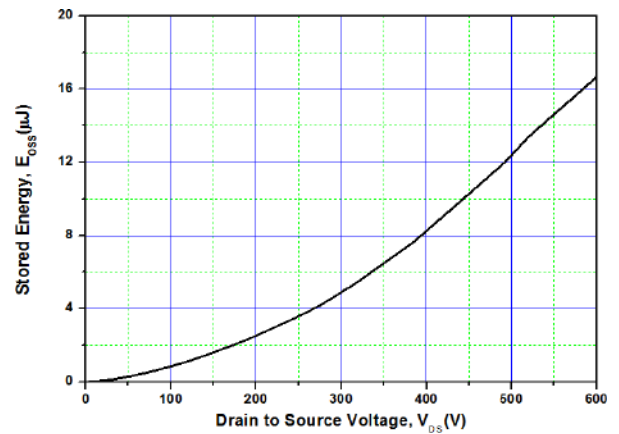


Figure 16. Output Capacitor Stored Energy

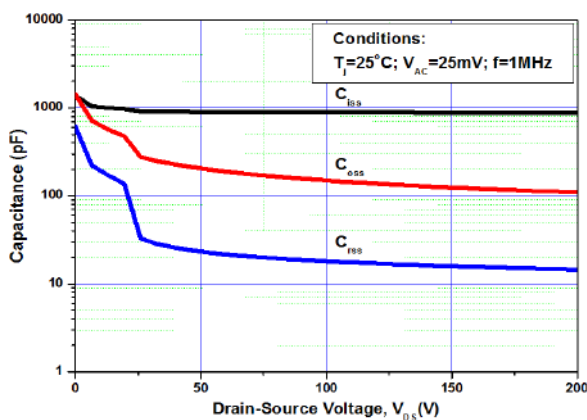


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

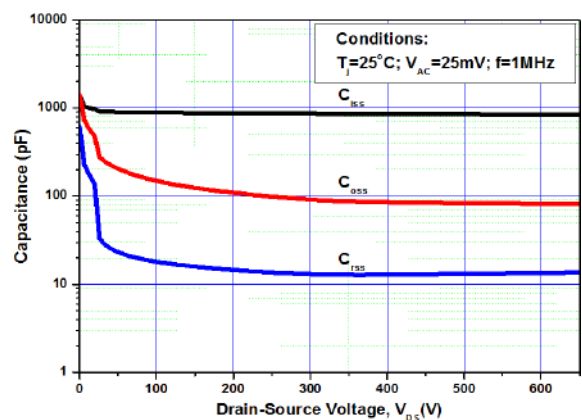


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 650V)

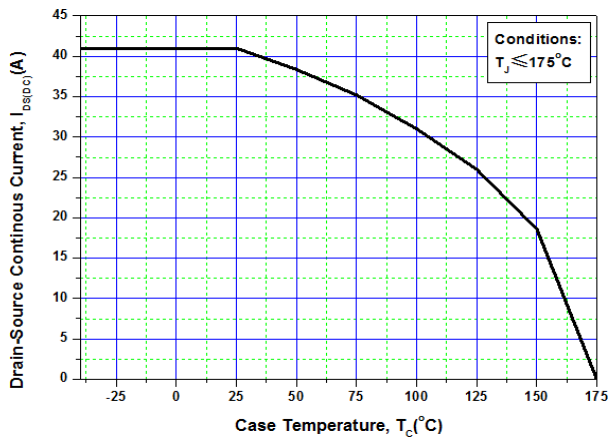


Figure 19. Continuous Drain Current Derating vs. Case Temperature

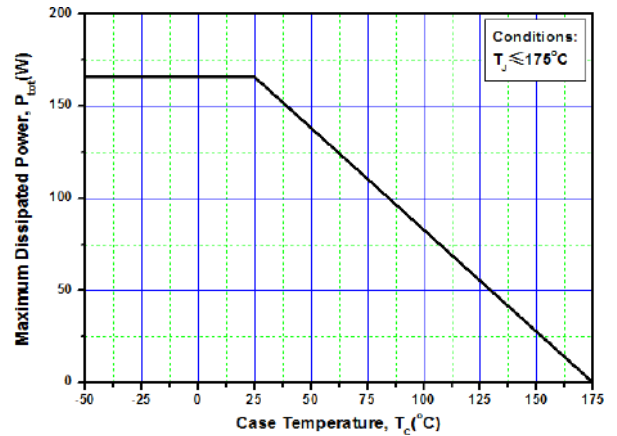


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

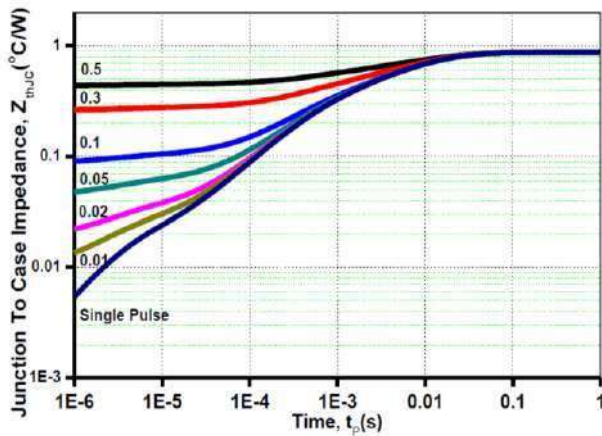


Figure 21. Transient Thermal Impedance (Junction - Case)

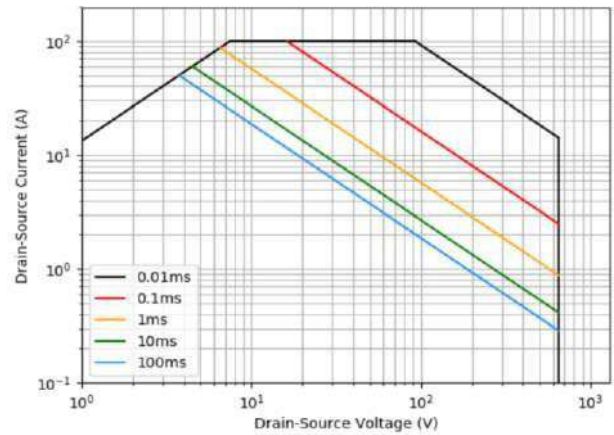
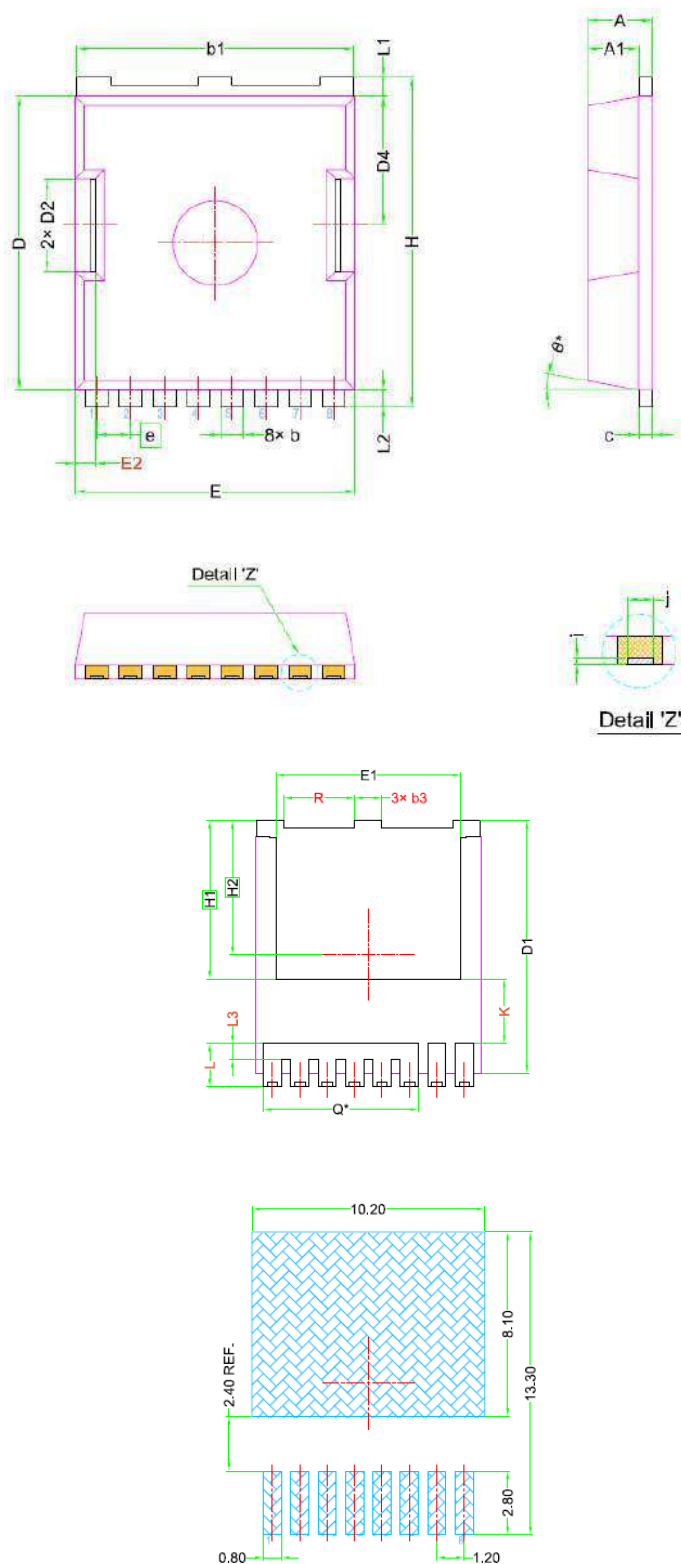


Figure 22. Safe Operating Area

Dimensions

Package TOLL



	mm		
	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.		