

1200V SiC N-Channel MOSFET

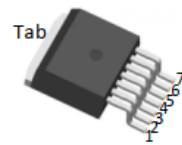
DESCRIPTION :

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(ON)}$
- Easy to Parallel
- Simple to Drive
- RoHS compliant.

V_{DS}	1200V
I_D	46A ($T_c=25^\circ\text{C}$)
$R_{DS(ON)}$	59m Ω

TYPICAL APPLICATIONS :

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC-DC Converters



TO-263-7L

MAXIMUM RATINGS (at $T_J = 25^\circ\text{C}$, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	1200	V
Continuous Drain Current	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	I_D	46 35	A
Peak Drain Current	Pulse width tp limited by T_{jmax}	I_{DM}	105	A
Gate-Source Voltage		V_{GSmax}	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Power Dissipation	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	P_{TOT}	263 131	W
Operation Junction temperature		T_J	-40~+175	$^\circ\text{C}$
Storage temperature		T_{STG}	-40~+175	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-c)}$	0.57	$^\circ\text{C/W}$



ELECTRICAL CHARACTERISTICS (at $T_J = 25^\circ\text{C}$, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage $V_{GS} = 0V, I_D = 100\mu A$	$V_{(BR)DSS}$	1200			V
Zero Gate Voltage Drain Current $V_{DS} = 1200V, V_{GS} = 0V$	I_{DSS}		1		μA
Gate-Source Leakage Current $V_{GS} = 18V, V_{DS} = 0V$	I_{GSS}			250	nA
Gate-Source Threshold Voltage $V_{DS} = V_{GS}, I_D = 5mA, T_J = 25^\circ C$ $V_{DS} = V_{GS}, I_D = 5mA, T_J = 150^\circ C$ $V_{DS} = V_{GS}, I_D = 5mA, T_J = 175^\circ C$	$V_{GS(th)}$	2.0	2.8 2.2 2.1	4.0	V
Drain-Source On-State Resistance $V_{GS} = 18V, I_D = 20A, T_J = 25^\circ C$ $V_{GS} = 18V, I_D = 20A, T_J = 175^\circ C$ $V_{GS} = 18V, I_D = 20A, T_J = 175^\circ C$	$R_{DS(on)}$		59 81 90		m Ω
Forward Transconductance $V_{DS} = 20V, I_D = 20A$	g_{fs}		13		S
Internal Gate Resistance $f = 1MHz$	$R_{G(INT)}$		0.89		Ω
Input capacitance $f = 1MHz, V_{DS} = 1000V, V_{GS} = 0V$	C_{iss}		2451		pF
Output capacitance $f = 1MHz, V_{DS} = 1000V, V_{GS} = 0V$	C_{oss}		79		pF
Reverse transfer capacitance $f = 1MHz, V_{DS} = 1000V, V_{GS} = 0V$	C_{rss}		6		pF
Coss Stored Energy $f = 1MHz, V_{DS} = 1000V, V_{GS} = 0V$	E_{oss}		47		μJ
Total Gate Charge $V_{DS} = 800V, I_D = 20A, V_{GS} = -4/18V$	Q_G		103		nC
Gate to Source Charge $V_{DS} = 800V, I_D = 20A, V_{GS} = -4/18V$	Q_{GS}		29		nC
Gate to Drain Charge $V_{DS} = 800V, I_D = 20A, V_{GS} = -4/18V$	Q_{GD}		36		nC
Turn-on Delay Time $V_{DD} = 800V, I_D = 20A, V_{GS} = -4/18V, R_G = 0\Omega$	$t_{d(ON)}$		14		ns
Rise Time $V_{DD} = 800V, I_D = 20A, V_{GS} = -4/18V, R_G = 0\Omega$	t_r		10		ns
Turn-off Delay Time $V_{DD} = 800V, I_D = 20A, V_{GS} = -4/18V, R_G = 0\Omega$	$t_{d(OFF)}$		22		ns
Fall Time $V_{DD} = 800V, I_D = 20A, V_{GS} = -4/18V, R_G = 0\Omega$	t_f		9		ns



Turn-on Switching Energy VDD=800 V, ID=20A, VGS= -4/18V, RG=0Ω	E _(ON)		125		uJ
Turn-off Switching Energy VDD=800 V, ID=20A, VGS= -4/18V, RG=0Ω	E _(OFF)		25		uJ

Body Diode

ELECTRICAL CHARACTERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = -4V, ISD = 20A Tj=25°C VGS = -4V, ISD = 20A Tj=175°C	V _{SD}		4.6 4.2		V
Continuous Diode Forward Current VGS = -4V, Tc=25°C VGS = -4V, Tc=100°C	I _S		43 23		A
Revers Recovery Time VR=800 V, ISD=20A, VGS= -4V, di/dt = 3830A/us	T _{rr}		56		ns
Revers Recovery Charge VR=800 V, ISD=20A, VGS= -4V, di/dt = 3830A/us	Q _{rr}		76		nC
Peak Revers Recovery Current VR=800 V, ISD=20A, VGS= -4V, di/dt = 3830A/us	I _{rrm}		13		A

Typical Characteristics

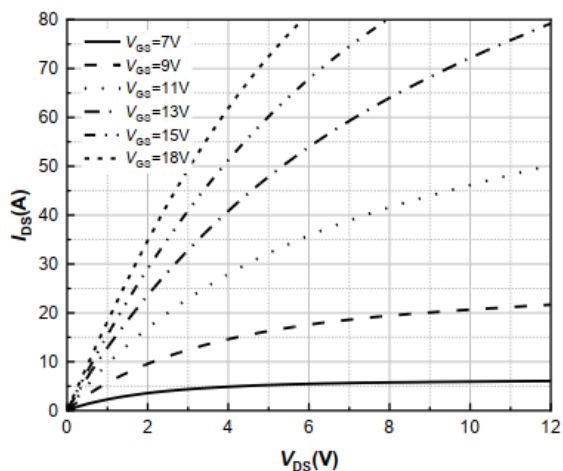


Figure 1. Typical output characteristics (Tj=25°C)

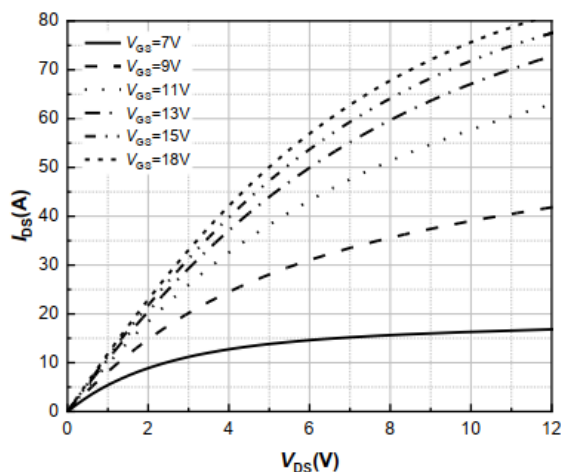


Figure 2. Typical output characteristics (Tj=175°C)

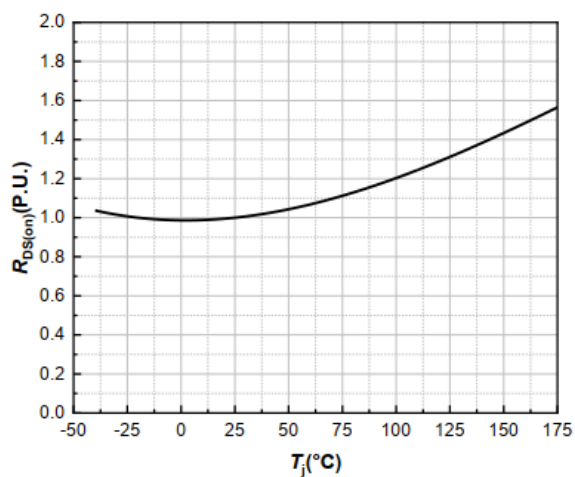


Figure 3. Normalized Resistance v/s Temperature

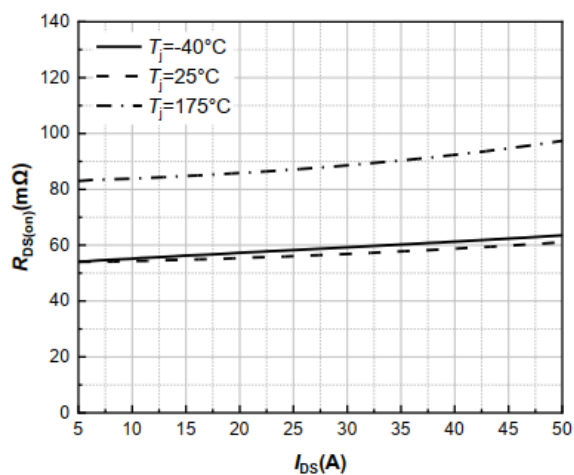


Figure 4. On-Resistance vs. Drain Current For Various Temperatures

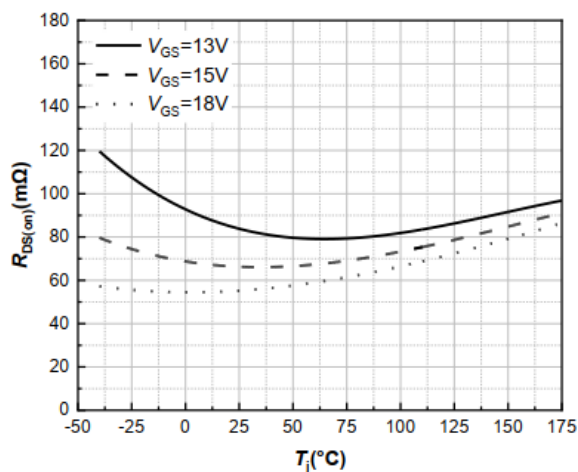


Figure 5. On-Resistance vs. Temperature For Various Gate Voltage

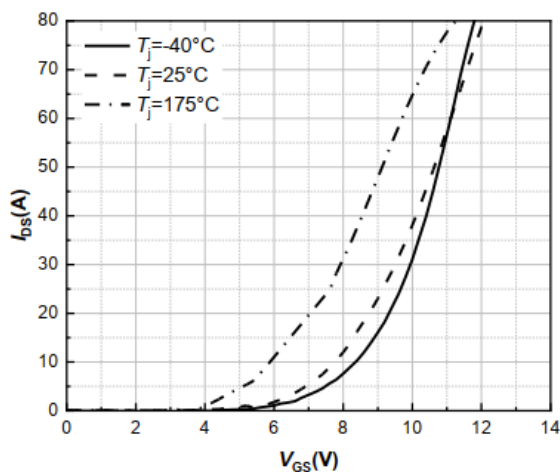


Figure 6. Transfer Characteristic for Various Junction Temperatures VDS=20V

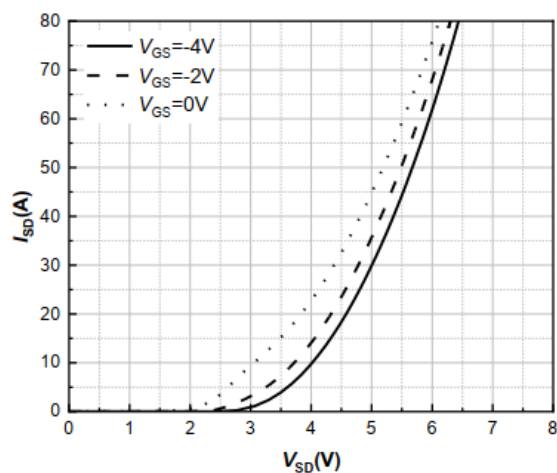


Figure 7. Body Diode Characteristic $T_j=25^{\circ}\text{C}$

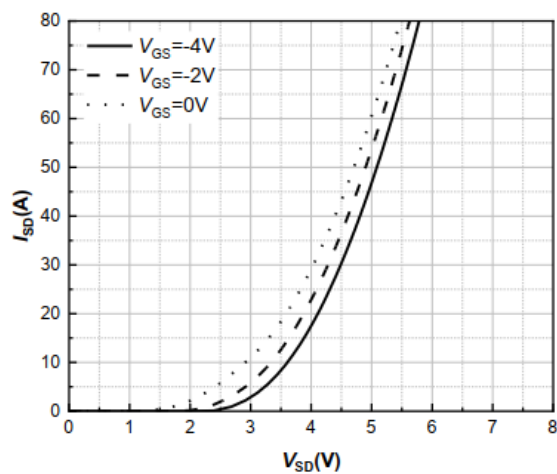


Figure 8. Body Diode Characteristic $T_j=175^{\circ}\text{C}$

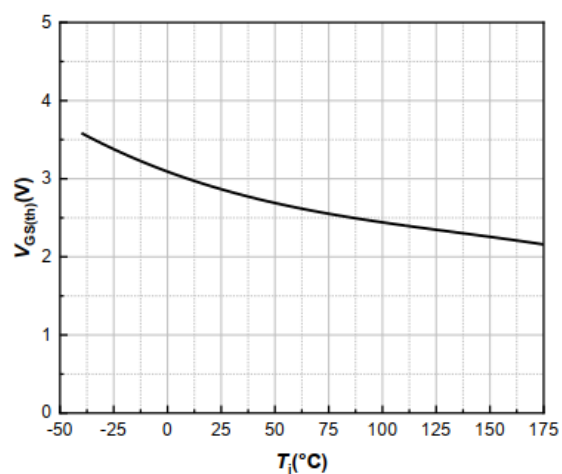


Figure 9. Threshold Voltage vs. Temperature

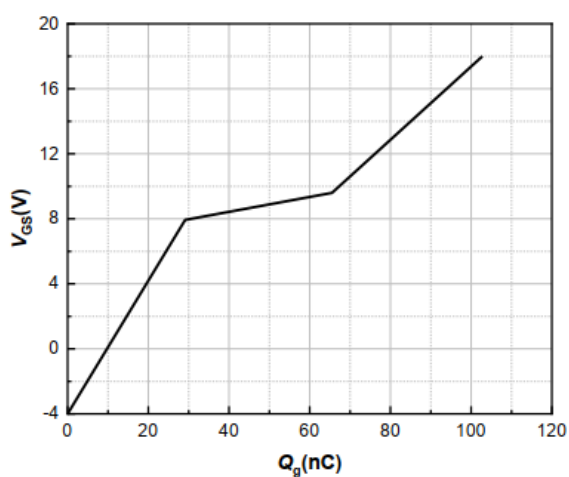


Figure 10. Gate Charge Characteristics

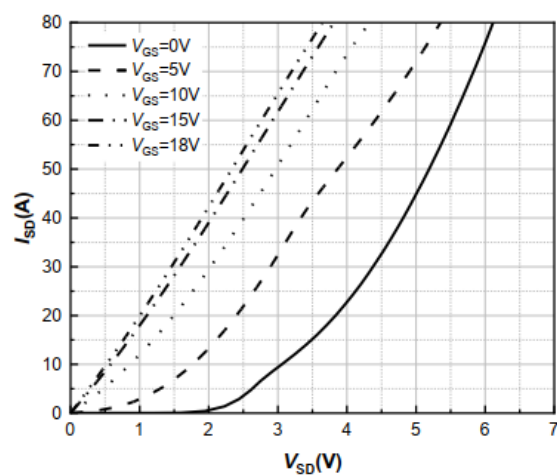


Figure 11. 3rd Quadrant Characteristic $T_j=25^{\circ}\text{C}$

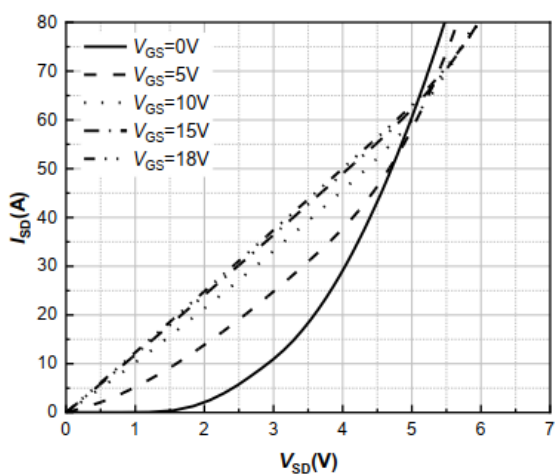


Figure 12. 3rd Quadrant Characteristic $T_j=175^{\circ}\text{C}$

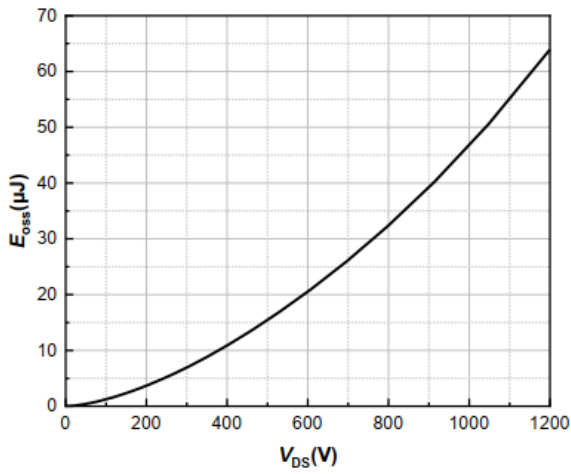


Figure 13. Output Capacitor Stored Energy

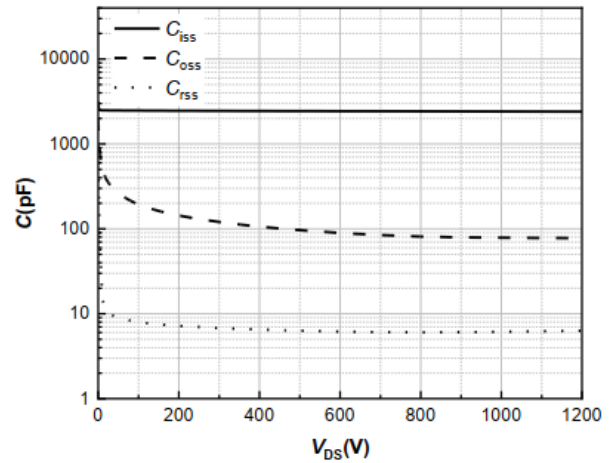


Figure 14. Capacitances vs. Drain-Source

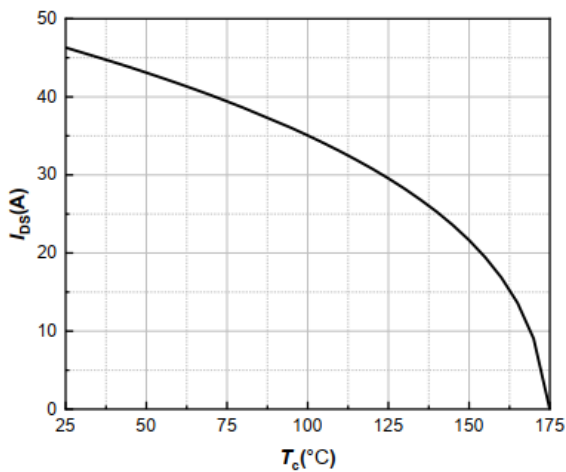


Figure 15. Continuous Drain Current Derating vs. Case Temperature

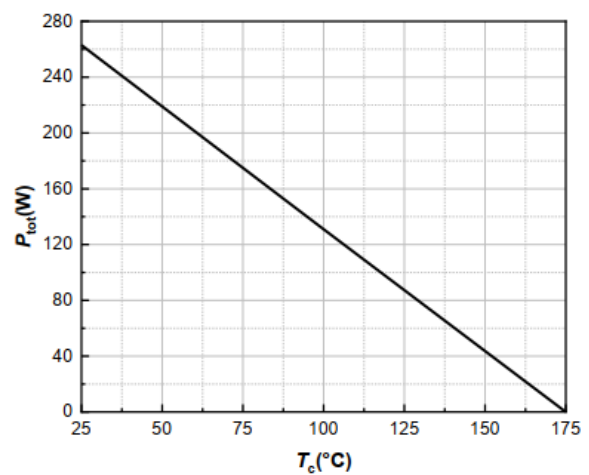


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

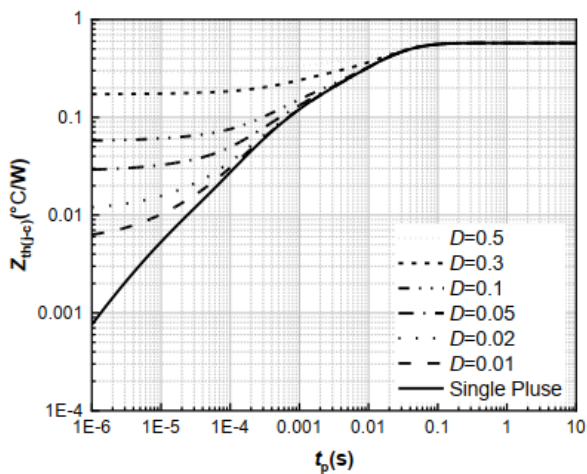


Figure 17. Transient Thermal Impedance

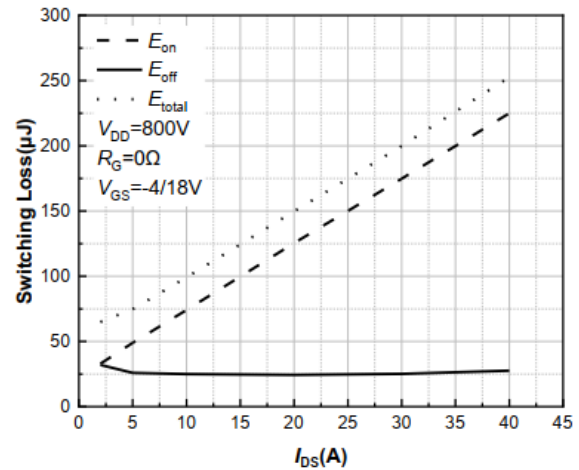


Figure 18. Clamped Inductive Switching Energy vs. Drain Current

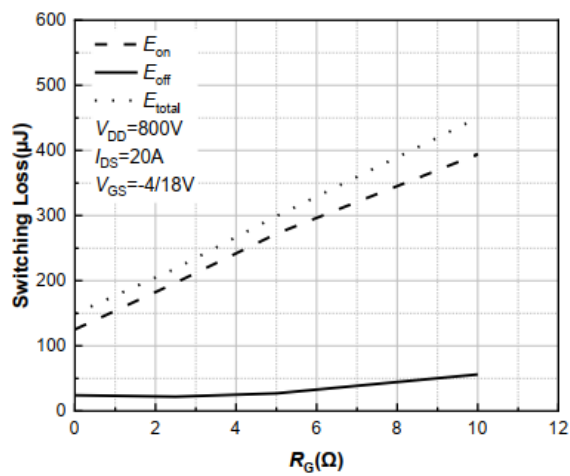


Figure 19. Clamped Inductive Switching Energy vs. R_G

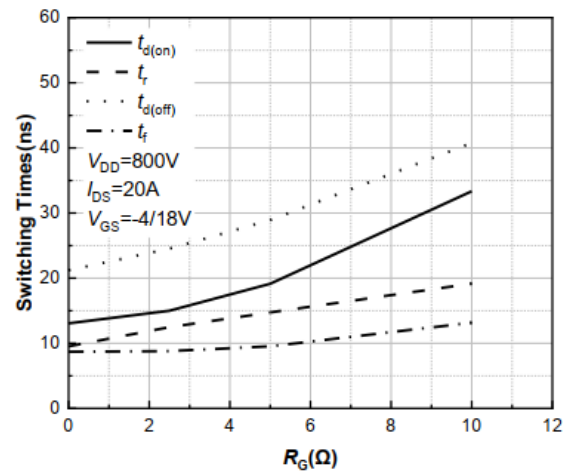


Figure 20. Switching Times vs. R_G

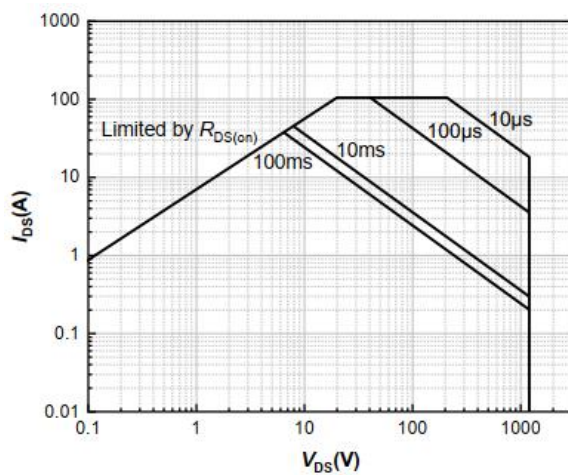
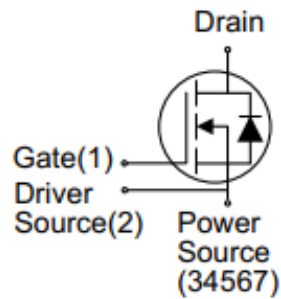
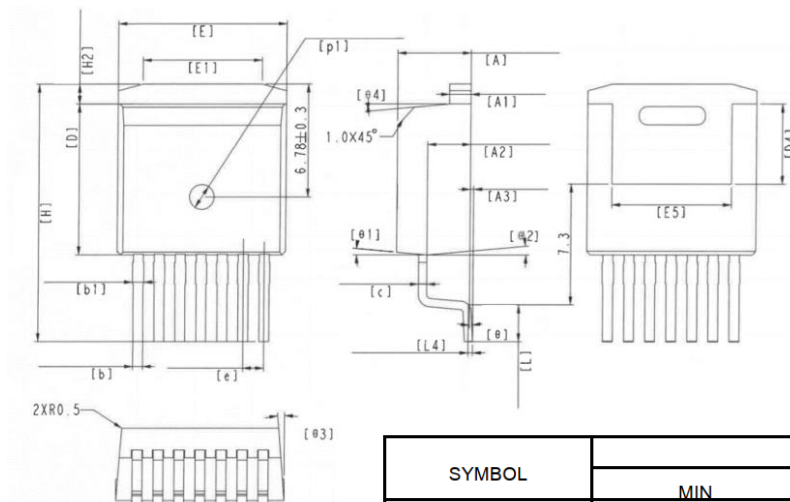


Figure 21. Safe Operating Area

·Circuit diagram



·TO-263-7L Package outlines : Dimensions in (mm)



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	4.30	4.43	4.56
A1	1.2	1.3	1.4
A2	2.45	2.60	2.75
A3	0.00	0.13	0.25
b	0.5	0.6	0.7
b1	0.6	0.7	0.9
c	0.45	0.50	0.60
D	8.93	9.08	9.23
D4	4.65	4.80	4.95
E	10.08	10.18	10.28
E1	6.5	7.0	7.5
E5	6.82	7.22	7.62
e	1.27BSC		
H	15.0	15.5	16.0
H2	0.98	1.20	1.42
L	1.9	2.2	2.5
L4	0.25BSC		
p1	1.4	1.5	1.6
θ	0°	3°	7°
θ1	3°	5°	7°
θ2	3°	5°	7°
θ3	3°	5°	7°
θ4	3°	5°	7°