

## N-Channel 400 V (D-S) Super Junction Power MOSFET



**RoHS**  
COMPLIANT

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ) (Typ.)	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)
400	24.5 at V <sub>GS</sub> = 10 V	95	196 nC

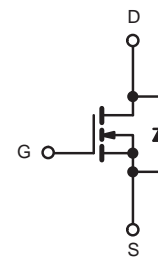
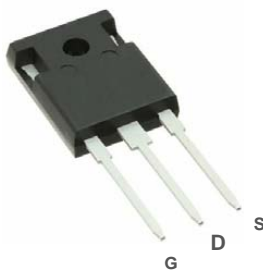
### FEATURES

- DT-SJ Power MOSFET
- 100 % R<sub>g</sub> and UIS tested
- Better EMI
- Low FOM RDS(ON)
- RoHS compliant

### APPLICATIONS

- High Frequency Switching
- PC/Server/Telecom power supply

TO-247 Pin Configuration



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V <sub>DS</sub>	400	V
Gate-Source Voltage	V <sub>GS</sub>	± 30	
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>C</sub> = 25 °C	95
		T <sub>C</sub> = 100 °C	65
Pulsed Drain Current <sup>b</sup>	I <sub>DM</sub>	285	A
Single Avalanche Energy	E <sub>AS</sub>	2500	mJ
Maximum Power Dissipation <sup>c</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C	625
		T <sub>C</sub> = 100 °C	312
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) <sup>d</sup>	R <sub>thJA</sub>	28	°C/W
Junction-to-Case (Drain)	R <sub>thJC</sub>	0.24	

### Notes

- Calculated continuous current based on maximum allowable junction temperature.
- Repetitive rating; pulse width limited by max. junction temperature.
- P<sub>d</sub> is based on max. junction temperature, using junction-case thermal resistance.
- The value of R<sub>thJA</sub> is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25 °C.

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	400	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 2\text{ mA}$	3	-	4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	-	-	3.5	$\mu\text{A}$
		$V_{DS} = 320\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	100	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	95	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 40\text{ A}$	-	24.5	29	m $\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 40\text{ A}$	-	55	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 200\text{ V}, f = 1\text{ MHz}$	-	8120	-	pF
Output Capacitance	$C_{oss}$		-	120	-	
Reverse Transfer Capacitance	$C_{rss}$		-	6	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 200\text{ V}, V_{GS} = 10\text{ V}, I_D = 40\text{ A}$	-	196	-	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$		-	45	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		-	87	-	
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	-	2.5	-	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 200\text{ V}, I_D = 40\text{ A}, R_g = 2\text{ }\Omega$ $V_{GS} = 10\text{ V}$	-	55	-	ns
Rise Time <sup>c</sup>	$t_r$		-	84	-	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$		-	190	-	
Fall Time <sup>c</sup>	$t_f$		-	58	-	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (<math>T_C = 25\text{ }^\circ\text{C}</math>)</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	95	A
Pulsed Current	$I_{SM}$		-	-	285	A
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 1\text{ A}, V_{GS} = 0\text{ V}$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = 40\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	170	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	1.4	-	$\mu\text{C}$

**Notes**

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** (25°C, unless otherwise noted)

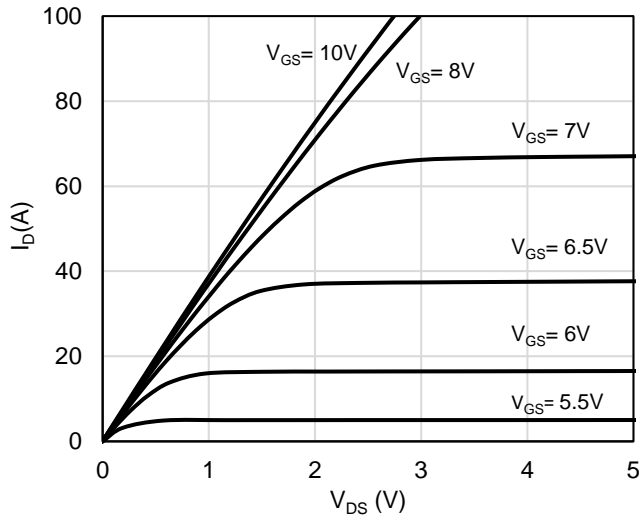


Figure 1: On-Region Characteristics

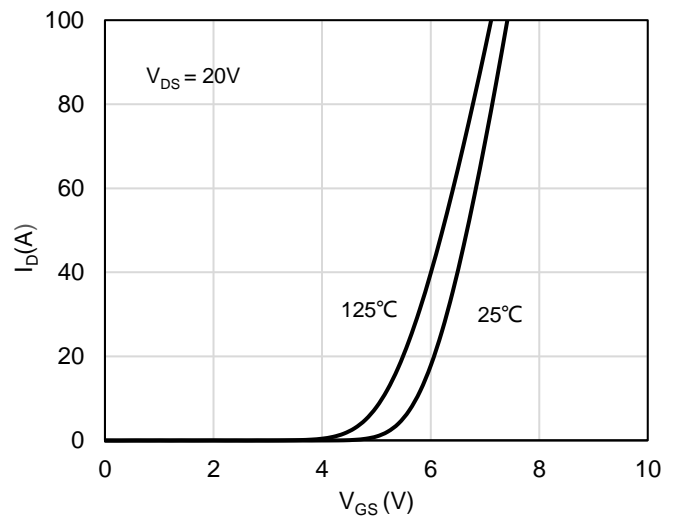


Figure 2: Transfer Characteristics

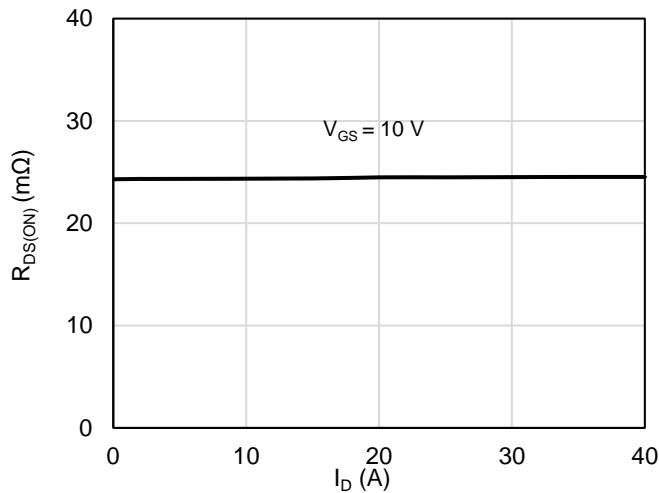


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

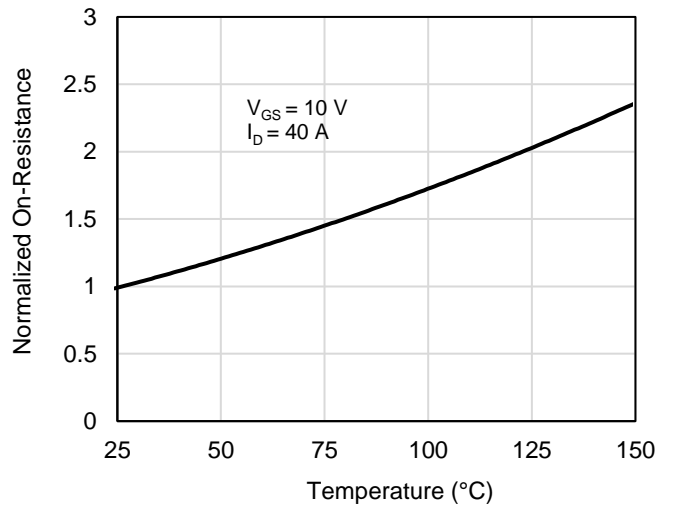


Figure 4: On-Resistance vs. Junction Temperature

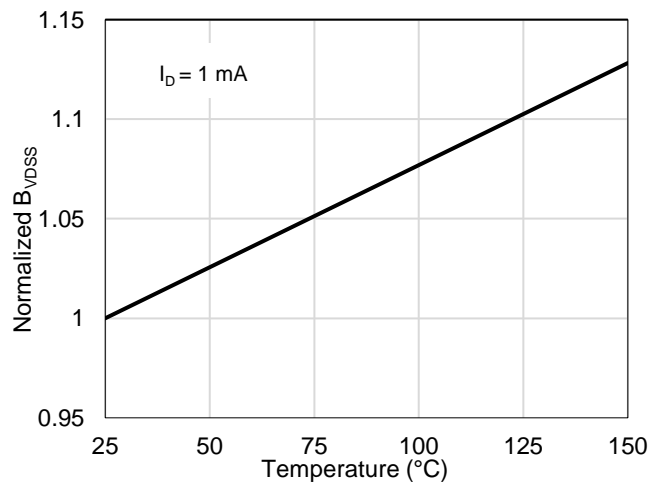


Figure 5: Breakdown Voltage vs. Junction Temperature

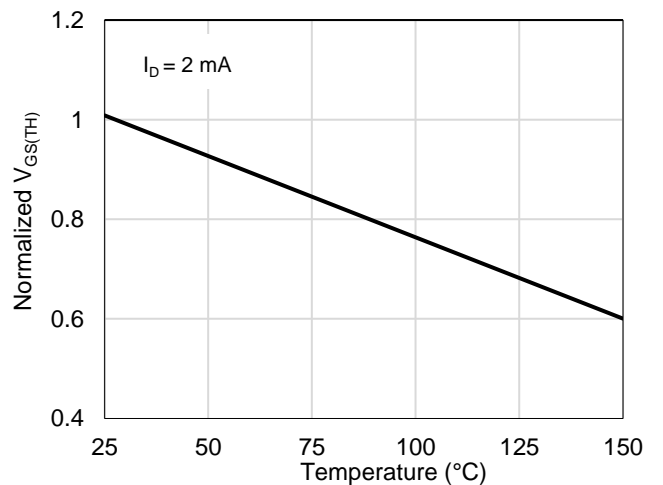


Figure 6: Threshold Voltage vs. Junction Temperature

**TYPICAL CHARACTERISTICS** (25°C, unless otherwise noted)

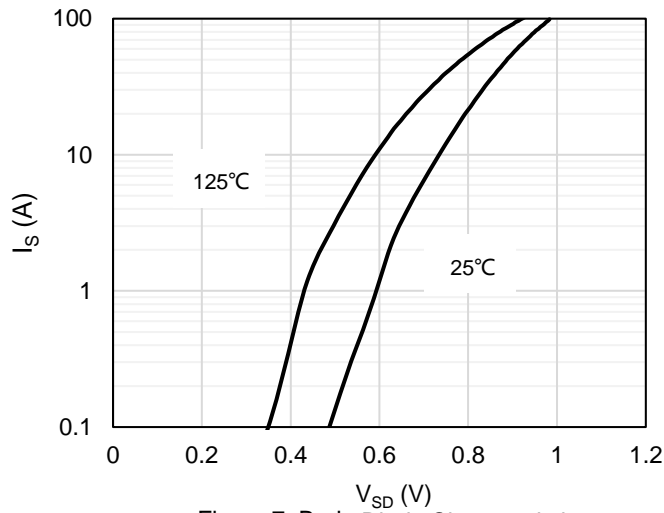


Figure 7: Body-Diode Characteristics

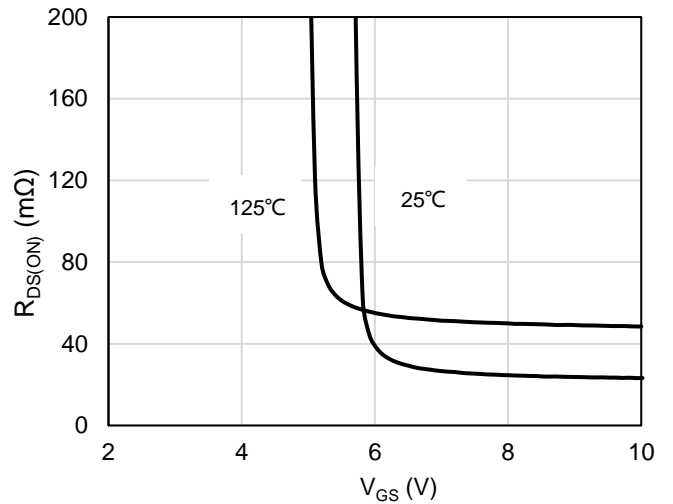


Figure 8: On-Resistance vs. Gate-Source Voltage

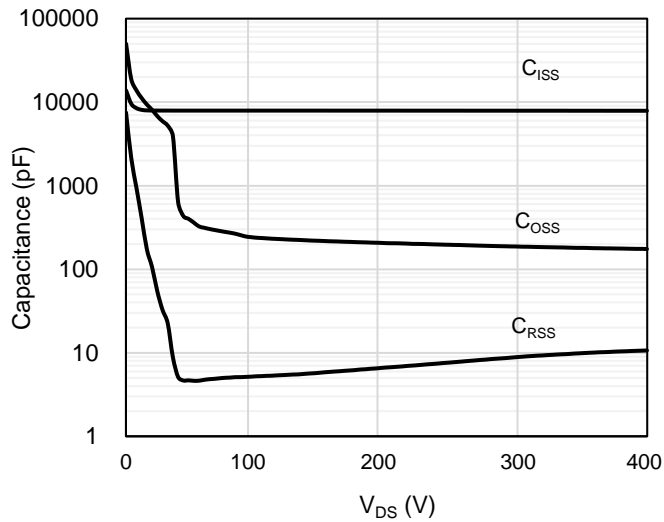


Figure 9: Capacitance Characteristics

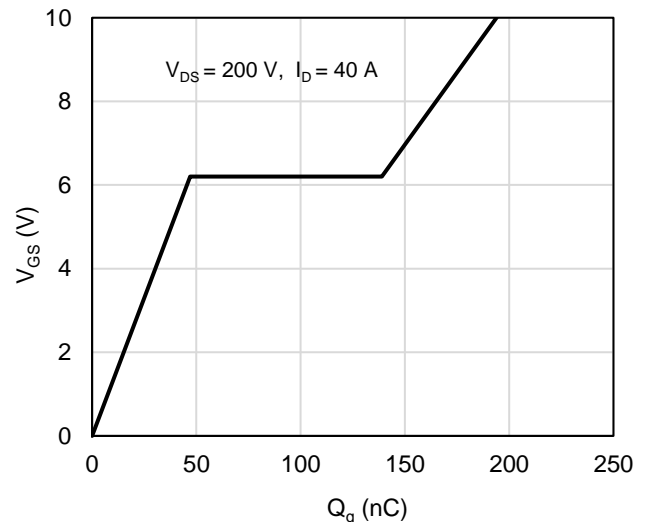


Figure 10: Gate-Charge Characteristics

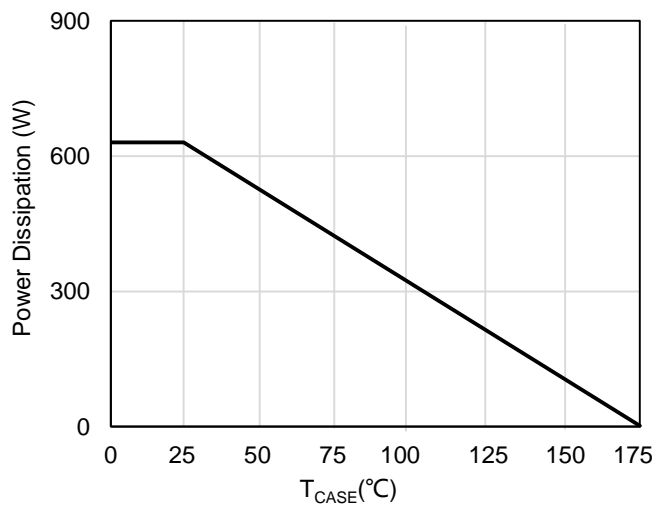


Figure 11: Power De-rating

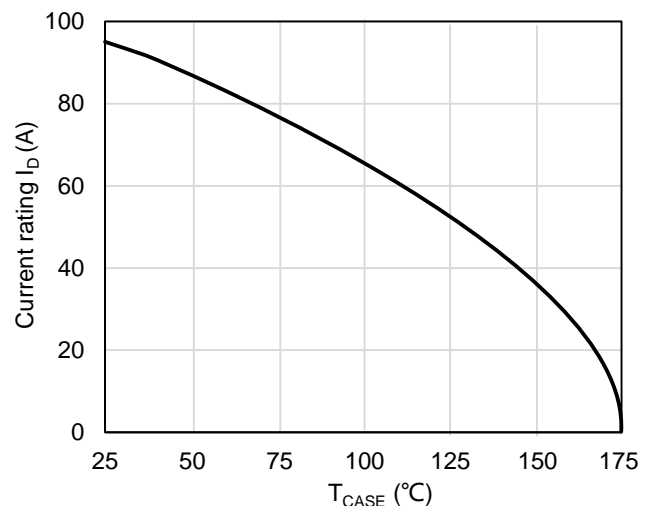


Figure 12: Current De-rating

**TYPICAL CHARACTERISTICS** (25°C, unless otherwise noted)

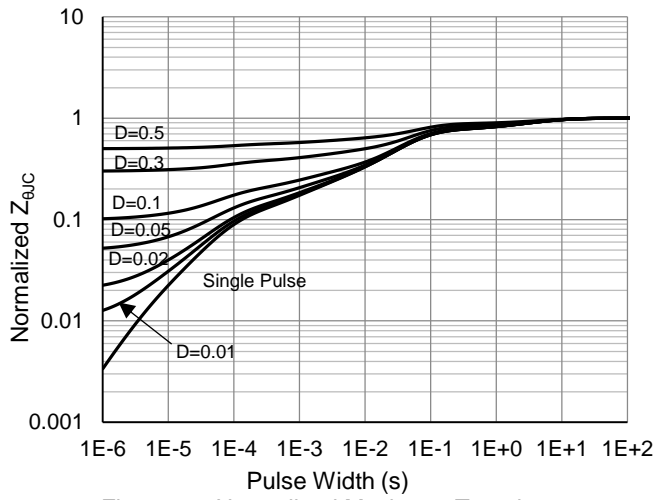


Figure 13: Normalized Maximum Transient Thermal Impedance

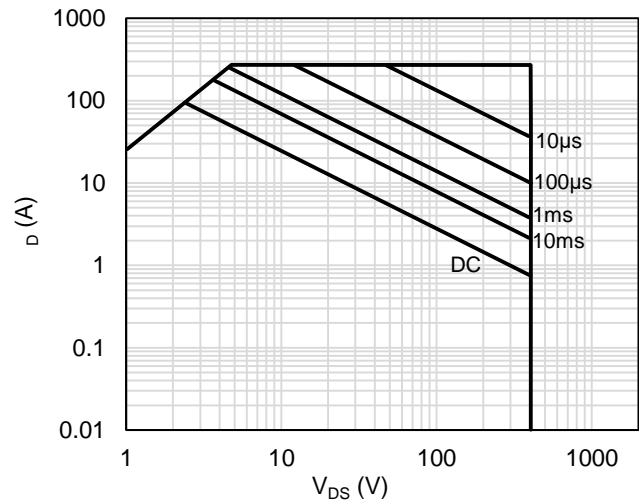
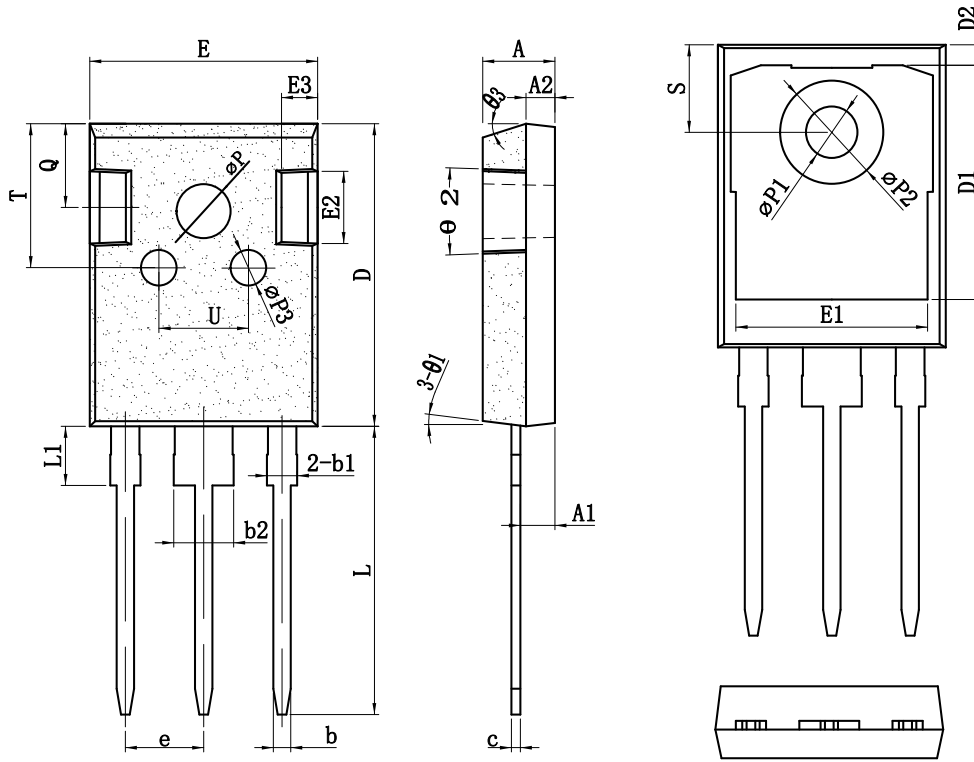


Figure 14: Maximum Forward Biased Safe Operating Area

**TO-247\_3L PACKAGE OUTLINE**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.60	5.00	5.40	e	2.10	5.44	5.70
A1	2.10	2.41	2.70	L	19.00	19.98	21.00
A2	1.70	2.00	2.30	L1	-	-	4.50
b	1.00	1.20	1.40	$\Phi P$	3.30	3.70	4.00
b1	1.80	2.10	2.40	$\Phi P1$	3.25	3.55	3.85
b2	2.80	3.10	3.40	$\Phi P2$	6.80	7.18	7.60
C	0.45	0.60	0.75	$\Phi P3$	2.30	2.50	3.30
D	19.00	21.00	23.00	Q	5.50	5.80	6.30
D1	16.00	16.55	17.00	S	5.60	6.15	6.30
D2	0.95	1.20	1.45	T	9.50	10.00	10.50
E	15.70	15.80	16.50	U	6.00	-	8.00
E1	12.80	13.25	13.70	$\theta 1$	5°	7°	9°
E2	4.20	5.00	5.30	$\theta 2$	1°	3°	5°
E3	2.20	2.50	2.80	$\theta 3$	13°	15°	17°

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