

## N-Channel 650 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)	Q <sub>g</sub> (Typ.)
650	34 at V <sub>GS</sub> = 10 V	62	169 nC

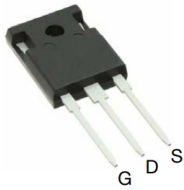
### FEATURES

- DT-SJ Power MOSFET
- 100 % Rg and UIS tested
- Low FOM RDS(ON)×QG
- Low R<sub>DS(ON)</sub>(Typ 34mΩ)@V<sub>GS</sub>=10 V

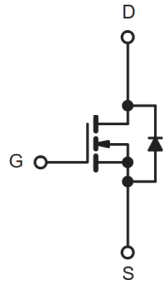
### APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- LED Light

TO-247 Pin Configuration



Top View



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>	650	V
Gate-Source Voltage		V <sub>GS</sub>	± 30	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	62	A
	T <sub>C</sub> = 100 °C		39	
Pulsed Drain Current		I <sub>DM</sub>	248	
Avalanche Current		I <sub>AS</sub>	55	
Single Avalanche Energy <sup>a</sup>		E <sub>AS</sub>	1656	mJ
Maximum Power Dissipation <sup>a</sup>	T <sub>C</sub> = 25 °C	P <sub>D</sub>	416	W
	T <sub>C</sub> = 125 °C		83.2	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) <sup>c</sup>		R <sub>thJA</sub>	35	°C/W
Junction-to-Case (Drain)		R <sub>thJC</sub>	0.3	

### Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).

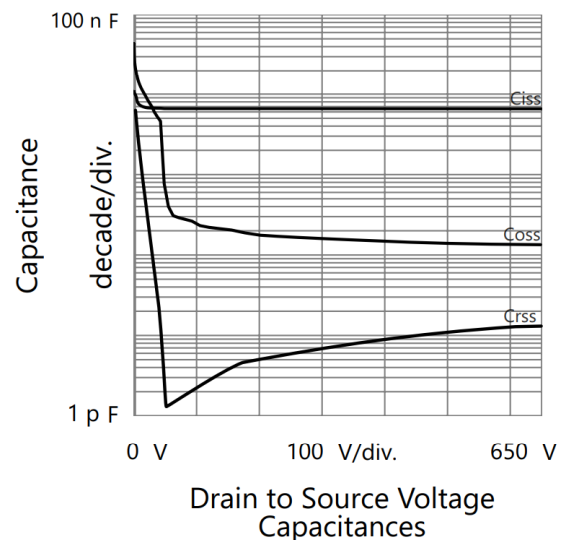
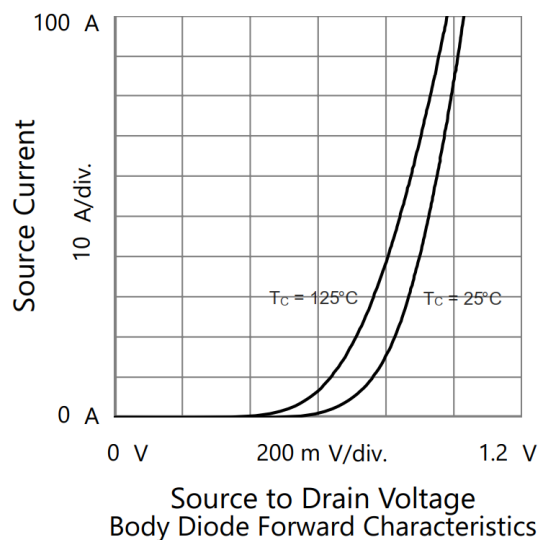
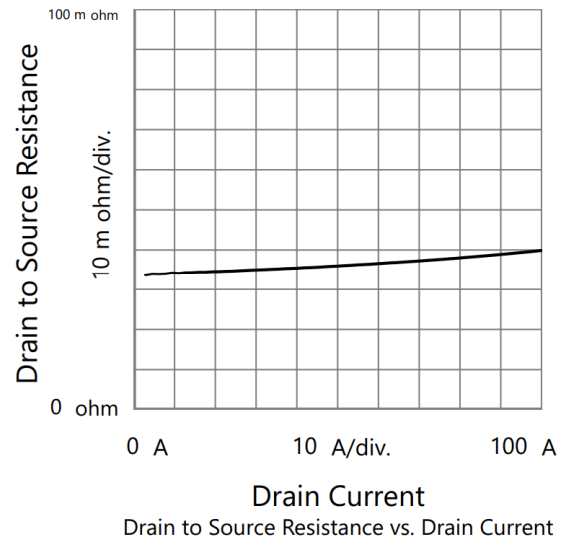
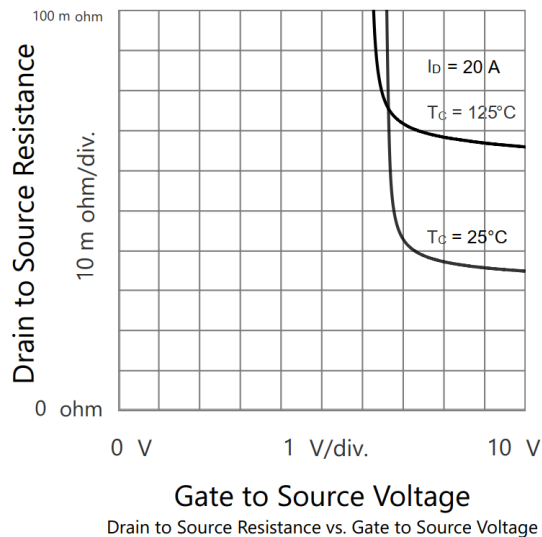
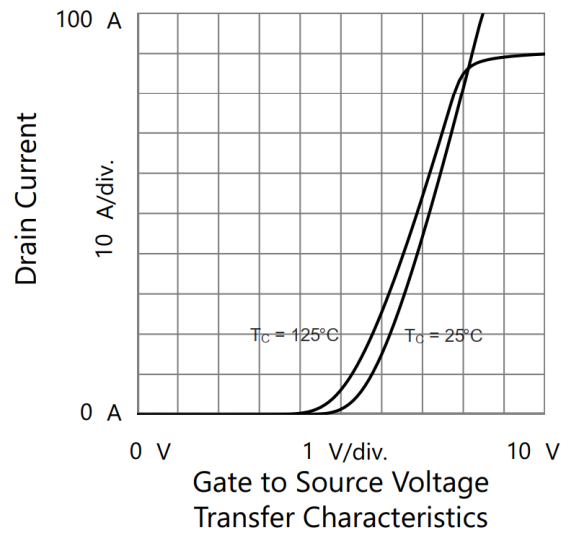
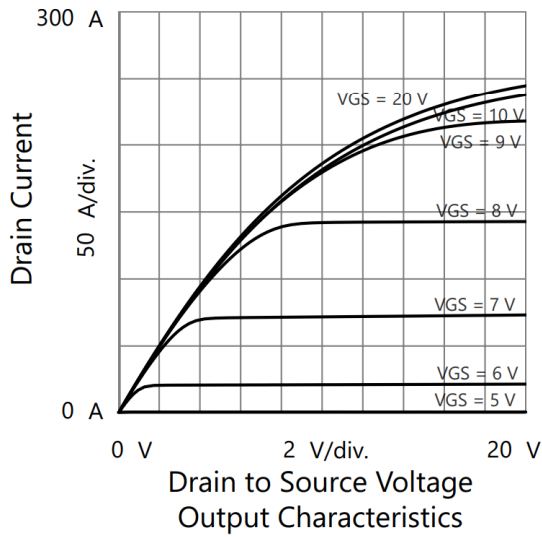
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	650	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 3.3 mA	3	-	4.5	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 30 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V	-	-	3.5	μA
		V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 100 °C	-	1000	-	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 33 A	-	34	41	mΩ
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 25 A	-	40	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 100 V, f = 1 MHz	-	6570	-	pF
Output Capacitance	C <sub>oss</sub>		-	245	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	1.36	-	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 480 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A	-	169	-	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>		-	29	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>		-	70	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz	-	1.8	-	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 400 V, I <sub>D</sub> = 20 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω	-	28	-	ns
Rise Time <sup>c</sup>	t <sub>r</sub>		-	52	-	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>		-	98	-	
Fall Time <sup>c</sup>	t <sub>f</sub>		-	40	-	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (T<sub>C</sub> = 25 °C)</b>						
Continuous Source Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	62	A
Pulsed Current (t = 100 μs)	I <sub>SM</sub>		-	-	248	A
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 50 A, V <sub>GS</sub> = 0 V	-	-	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs	-	177	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	1.29	-	μC

**Notes**

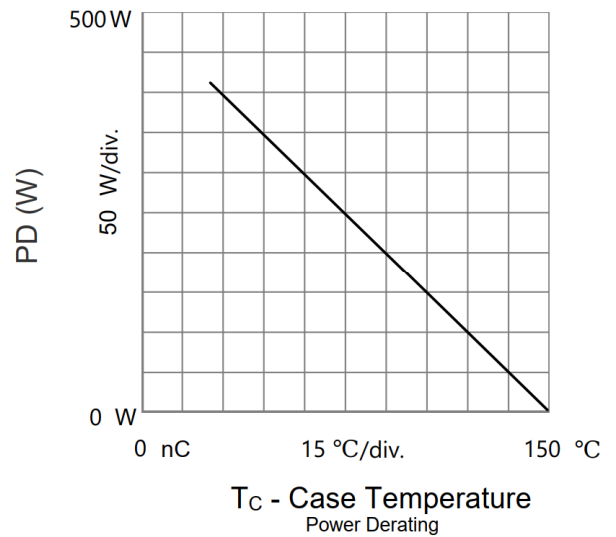
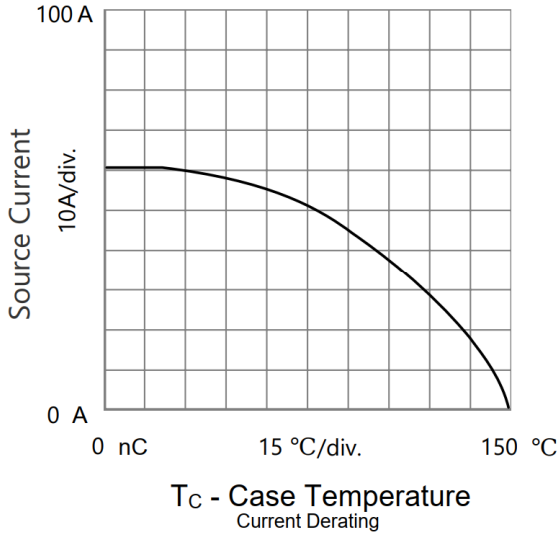
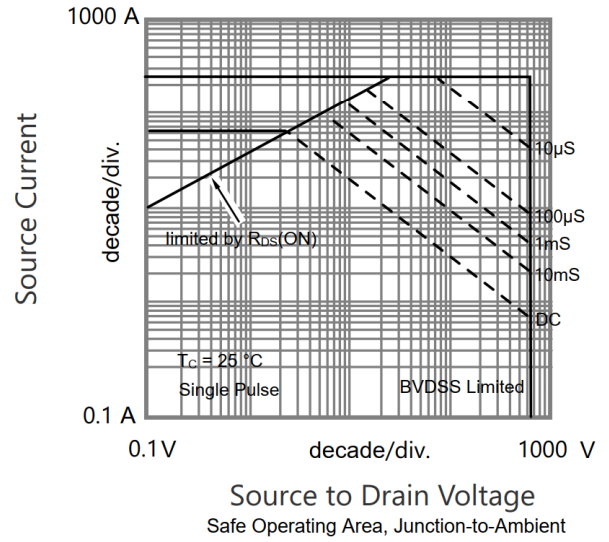
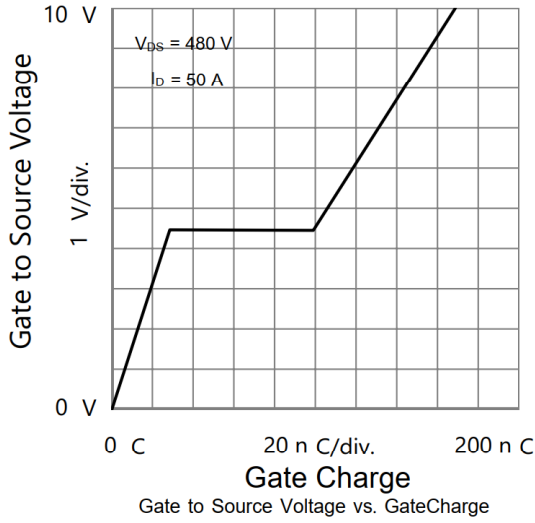
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

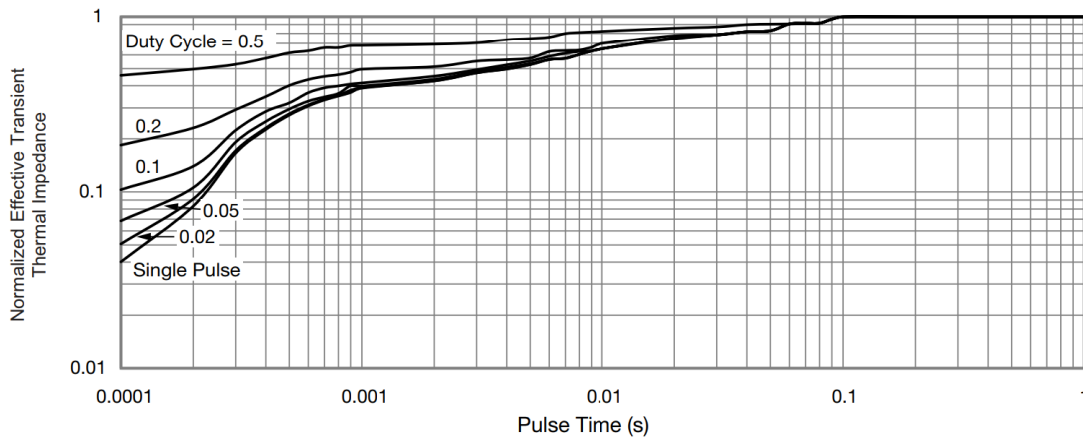
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



**TYPICAL CHARACTERISTICS** ( $T_c = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

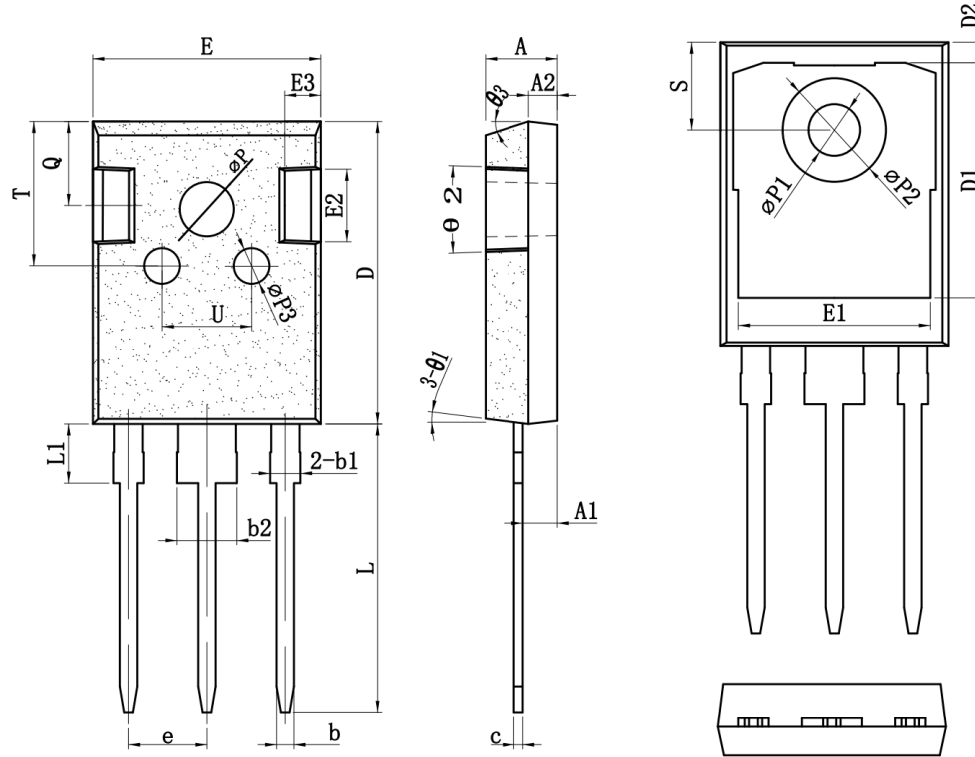


**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^\circ\text{C}$ )
  - Normalized Transient Thermal Impedance Junction to Case ( $25\text{ }^\circ\text{C}$ )
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

**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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