

N-Channel 60 V (D-S) Super Junction Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (m Ω)(Typ.)	I_D (A) ^a	Q_g (Typ.)
60	1.5 at $V_{GS} = 10$ V	220	205 nC
	2 at $V_{GS} = 4.5$ V		

FEATURES

- DT-SJ Power MOSFET
- 100 % R_g and UIS Tested
- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

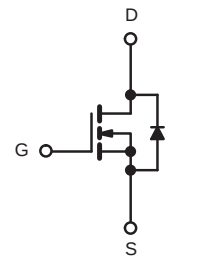

RoHS
 COMPLIANT

APPLICATIONS

- High Frequency Switching and Synchronous Rectification
- BLDC

TO-220 Pin Configuration

Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175^\circ\text{C}$) ^a	I_D	220	A
		190	
Pulsed Drain Current ^b	I_{DM}	800	
Single Avalanche Energy	E_{AS}	1900	mJ
Maximum Power Dissipation ^c	P_D	263	W
		131	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) ^d	R_{thJA}	50	$^\circ\text{C/W}$
Junction-to-Case (Drain)	R_{thJC}	0.57	

Notes

- Calculated continuous current based on maximum allowable junction temperature.
- Repetitive rating; pulse width limited by max. junction temperature.
- P_D is based on max. junction temperature, using junction-case thermal resistance.
- The value of R_{thJA} is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a = 25^\circ\text{C}$.

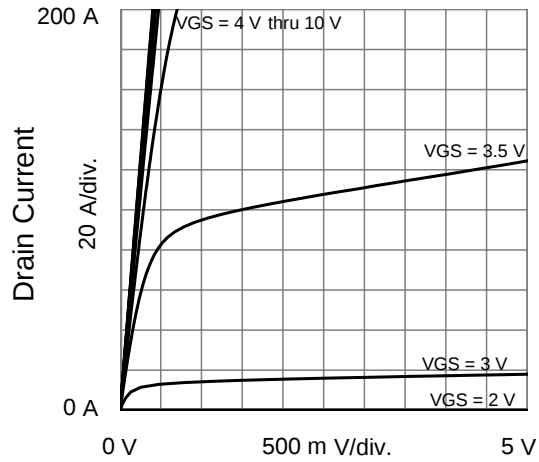
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	-	3	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 125 °C	-	-	50	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	200	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A	-	1.5	2.2	mΩ
		V _{GS} = 4.5 V, I _D = 15 A	-	2	3	
Forward Transconductance ^a	g _{fs}	V _{DS} = 5 V, I _D = 20 A	-	50	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 30 V, f = 1 MHz	-	11500	-	pF
Output Capacitance	C _{oss}		-	2480	-	
Reverse Transfer Capacitance	C _{rss}		-	205	-	
Total Gate Charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 20 A	-	205	-	nC
Gate-Source Charge ^c	Q _{gs}		-	25	-	
Gate-Drain Charge ^c	Q _{gd}		-	43	-	
Gate Resistance	R _g	f = 1 MHz	-	0.8	-	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, I _D = 20 A, R _g = 2.5 Ω V _{GS} = 10 V , R _L = 1.5 Ω	-	40	-	ns
Rise Time ^c	t _r		-	24	-	
Turn-Off Delay Time ^c	t _{d(off)}		-	108	-	
Fall Time ^c	t _f		-	30	-	
Drain-Source Body Diode Ratings and Characteristics ^b (T _C = 25 °C)						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	-	-	220	A
Pulsed Current	I _{SM}		-	-	800	A
Forward Voltage ^a	V _{SD}	I _F = 1 A, V _{GS} = 0 V	-	-	1.2	V
Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs	-	33	-	ns
Reverse Recovery Charge	Q _{rr}		-	80	-	nC

Notes

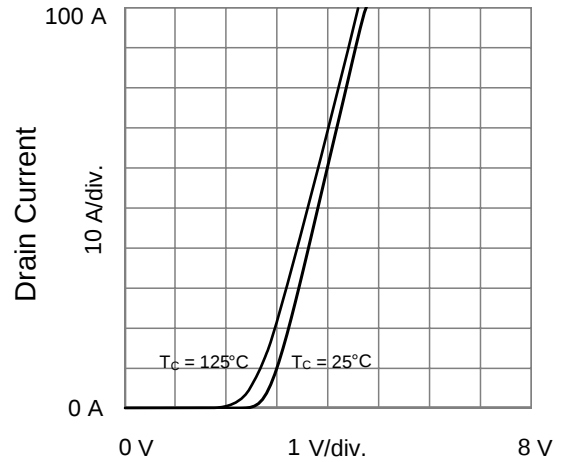
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.
 c. Independent of operating temperature.

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.

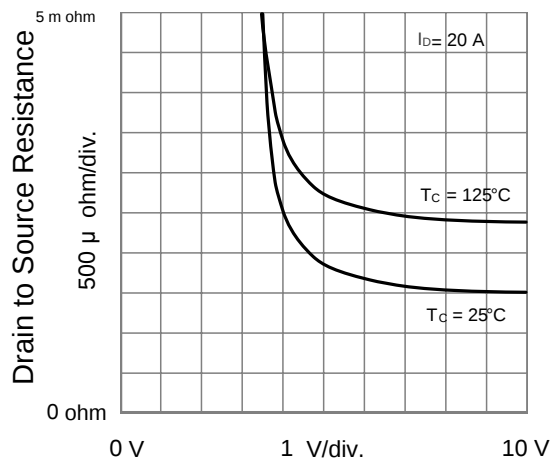
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



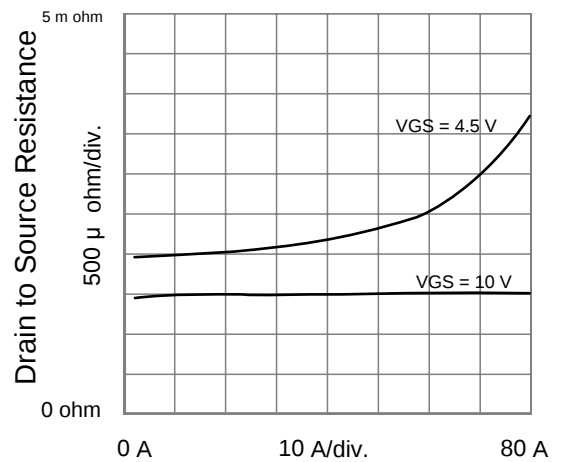
**Drain to Source Voltage
Output Characteristics**



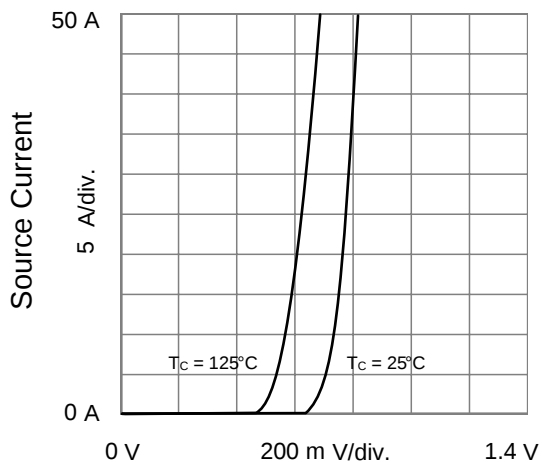
**Gate to Source Voltage
Transfer Characteristics**



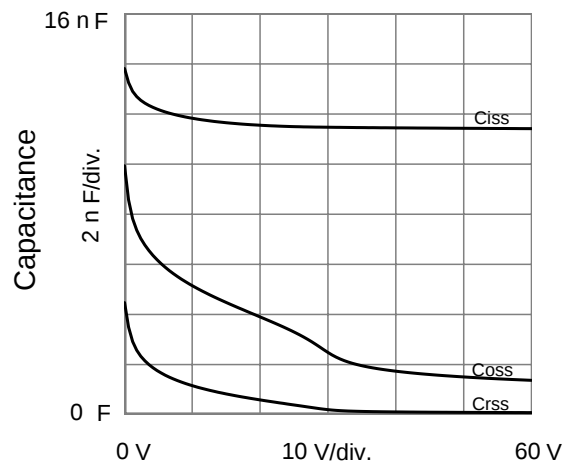
**Gate to Source Voltage
Drain to Source Resistance vs. Gate to Source Voltage**



Drain Current

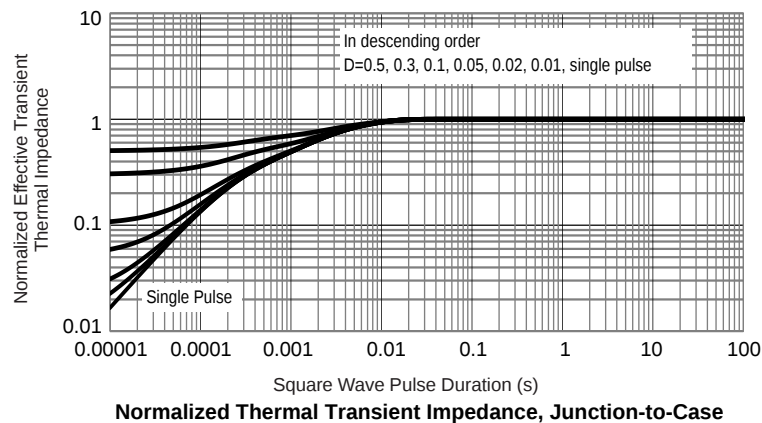
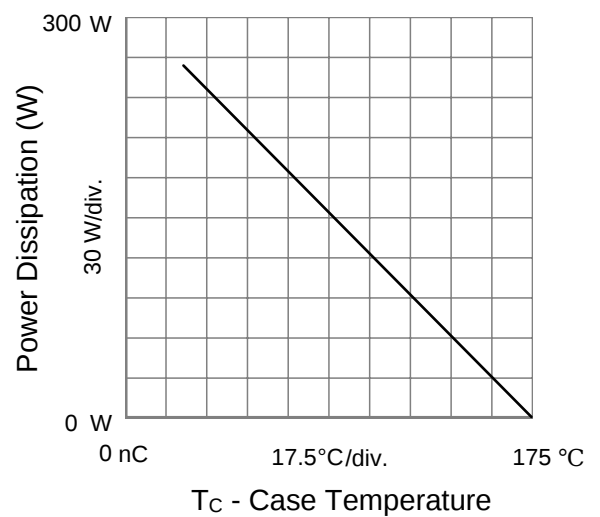
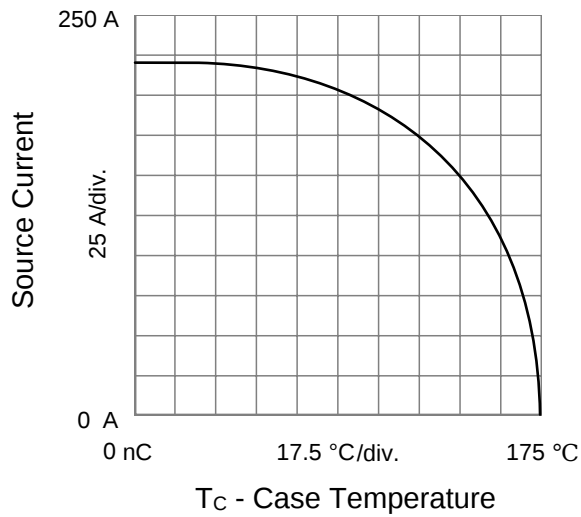
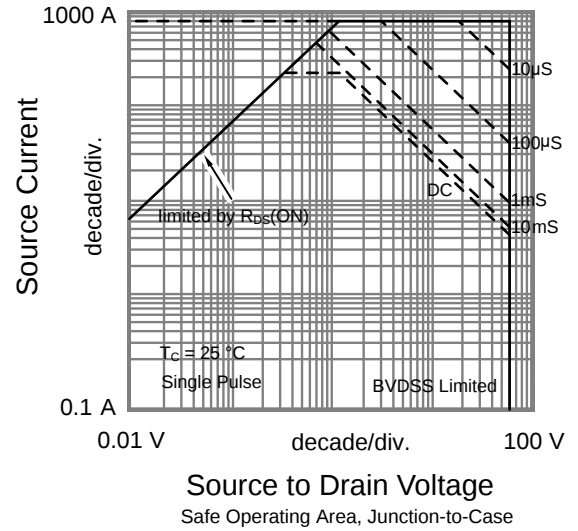
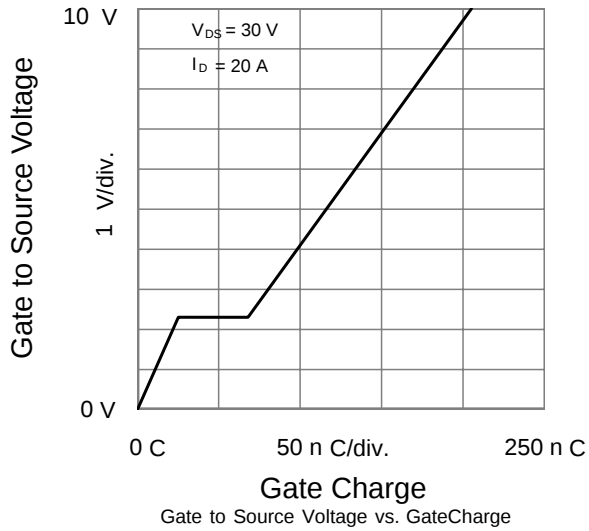


**Source to Drain Voltage
Body Diode Forward Characteristics**

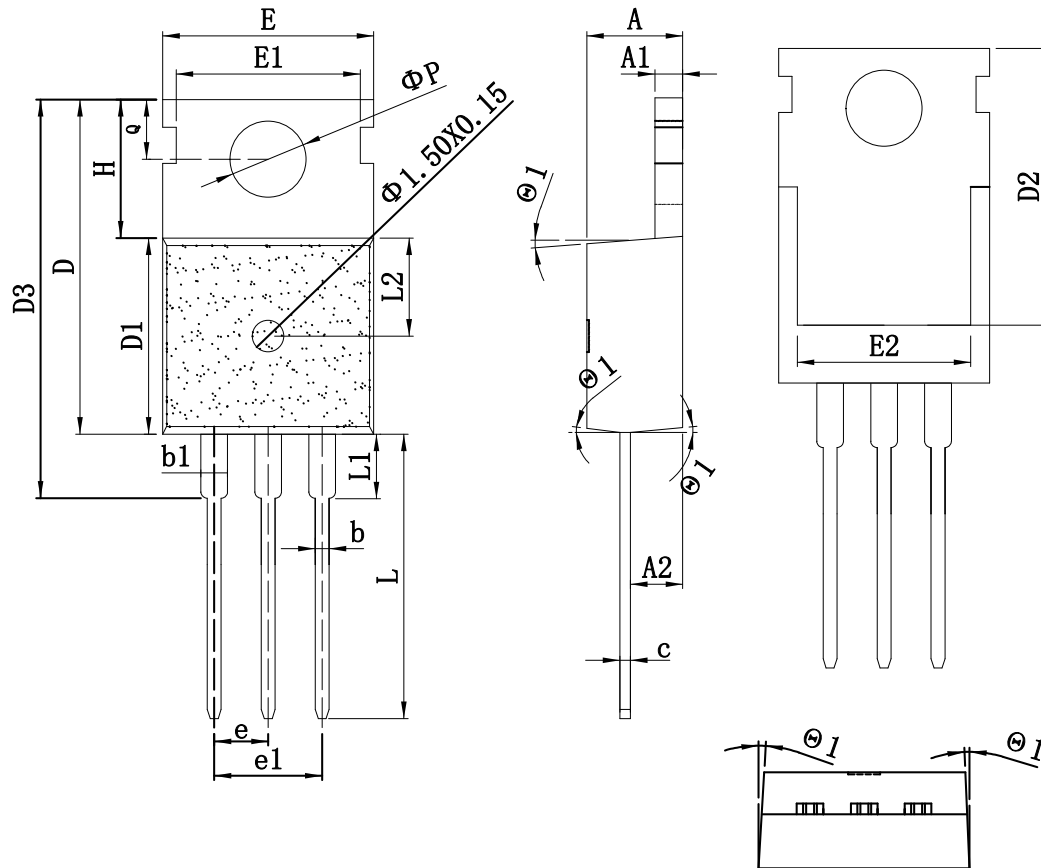


**Drain to Source Voltage
Capacitances**

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



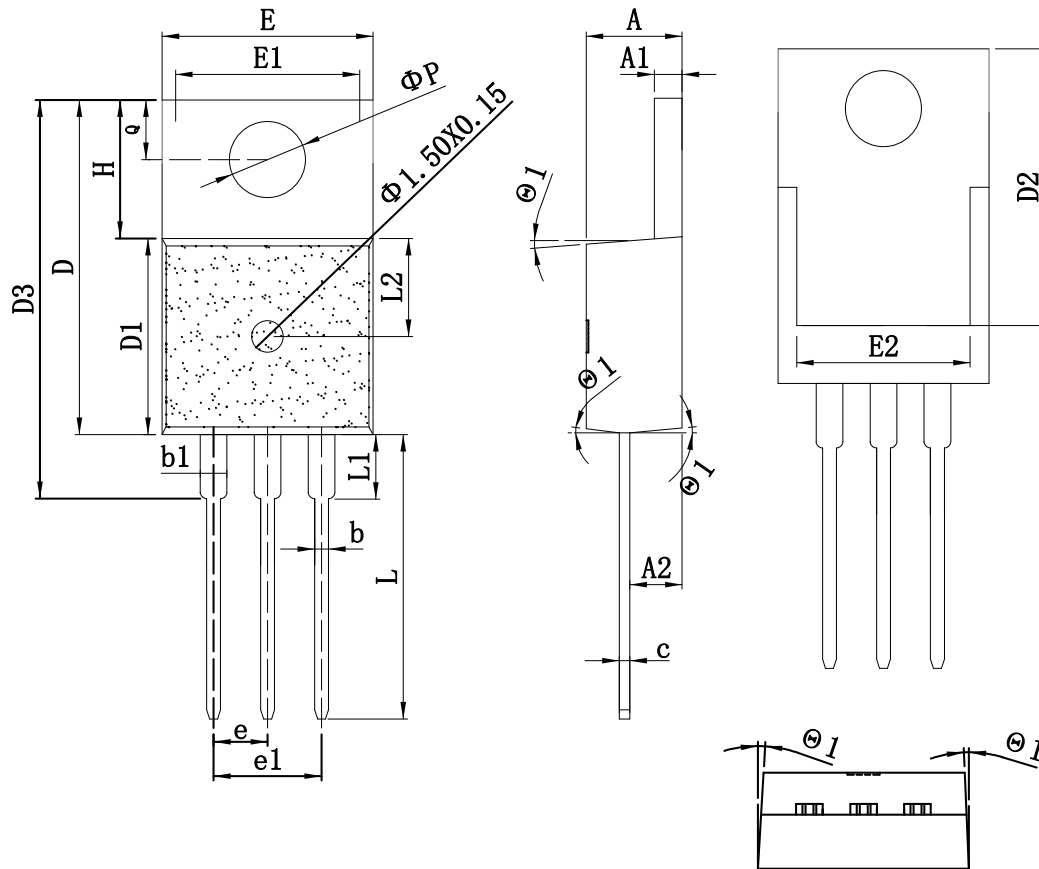
TO-220_3L-A PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.07 REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	ϕP	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	θ	2°	-	7°

TO-220_3L-B PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.08 REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	ϕP	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	θ	2°	-	7°

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