

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

PRODUCT SUMMARY

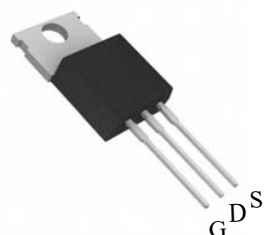
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a
60	0.0015 at $V_{GS} = 10$ V	240

FEATURES

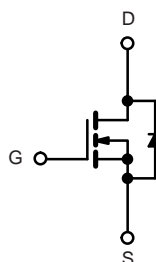
- 175 °C Junction Temperature
- DT-Trench Power MOSFET
- Material categorization:


RoHS
 COMPLIANT

TO-220 Pin Configuration



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175$ °C) ^b	$T_C = 25$ °C	I_D	240	A
	$T_C = 100$ °C		220 ^a	
Pulsed Drain Current		I_{DM}	960	
Continuous Source Current (Diode Conduction)		I_S	240 ^a	
Avalanche Current		I_{AS}	220	
Single Avalanche Energy (Duty Cycle ≤ 1 %)	$L = 0.1$ mH	E_{AS}	614	mJ
Maximum Power Dissipation	$T_C = 25$ °C	P_D	285	W
	$T_A = 25$ °C		2.5 ^{b, c}	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10$ sec	R_{thJA}	13	20	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	0.55	1.0	

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

 c. $t \leq 10$ s.

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

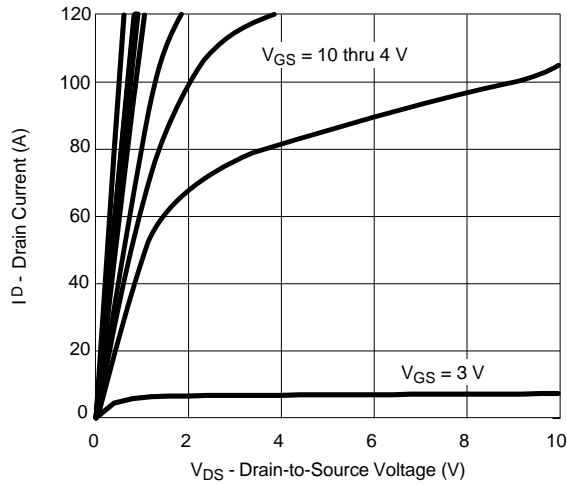
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1		3	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 48 V, V _{GS} = 0 V			1	μA
		V _{DS} = 48 V, V _{GS} = 0 V, T _J = 125 °C			50	
		V _{DS} = 48 V, V _{GS} = 0 V, T _J = 175 °C			250	
On-State Drain Current ^b	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	240			A
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		0.0015	0.0020	Ω
		V _{GS} = 10 V, I _D = 20 A, T _J = 125 °C		0.0022	0.0032	
		V _{GS} = 10 V, I _D = 10 A, T _J = 175 °C		0.0029	0.0043	
Forward Transconductance ^b	g _{fs}	V _{DS} = 48 V, I _D = 20 A		68		S
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 30 V, f = 1 MHz		11580		pF
Output Capacitance	C _{oss}			1346		
Reverse Transfer Capacitance	C _{rss}			43		
Total Gate Charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 20 A		135	163	nC
Gate-Source Charge ^c	Q _{gs}			51		
Gate-Drain Charge ^c	Q _{gd}			20		
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 0.6 Ω I _D ≅ 20 A, V _{GEN} = 10 V, R _g = 2.5 Ω		31		ns
Rise Time ^c	t _r			116		
Turn-Off Delay Time ^c	t _{d(off)}			81		
Fall Time ^c	t _f			53		
Source-Drain Diode Ratings and Characteristics (T _C = 25 °C)						
Pulsed Current	I _{SM}				960	A
Diode Forward Voltage	V _{SD}	I _F = 20 A, V _{GS} = 0 V		0.8	1.2	V
Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs		75	150	ns

Notes:

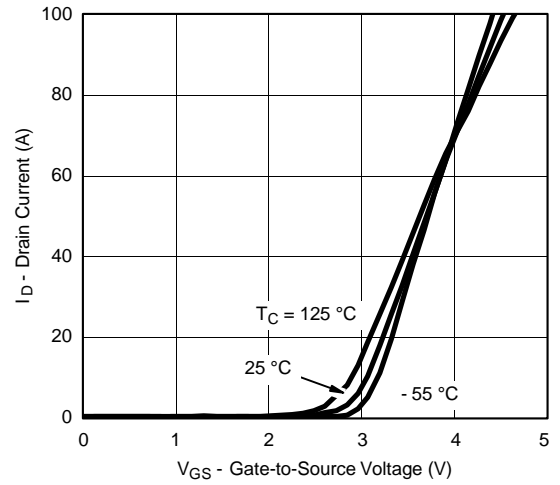
- a. For design aid only; not subject to production testing.
 b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 c. Independent of operating temperature.

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.

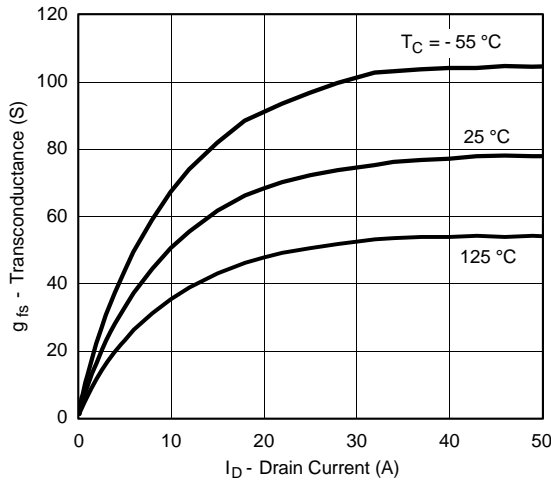
TYPICAL CHARACTERISTICS (25 °C unless noted)



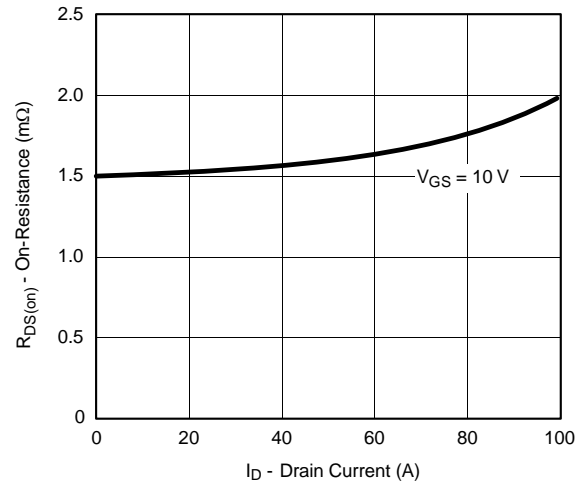
Output Characteristics



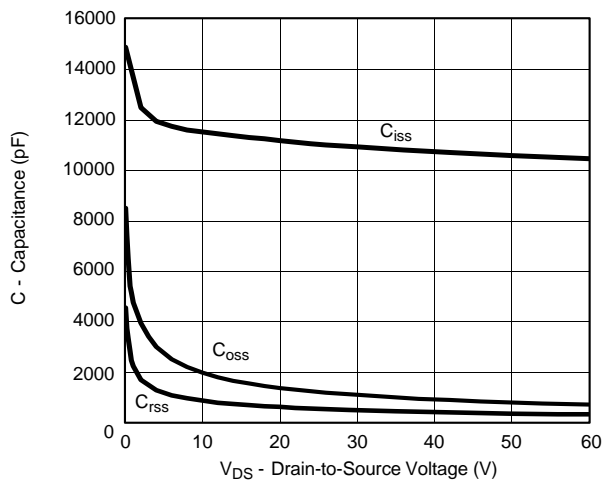
Transfer Characteristics



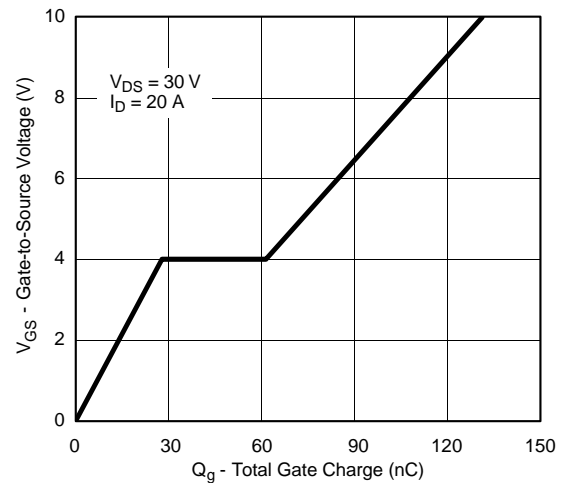
Transconductance



On-Resistance vs. Drain Current

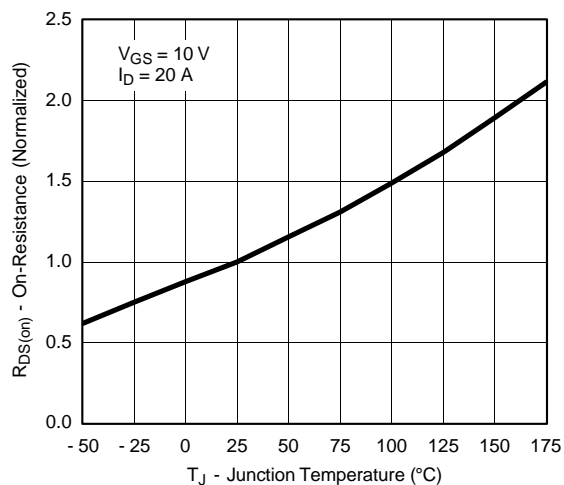


Capacitance

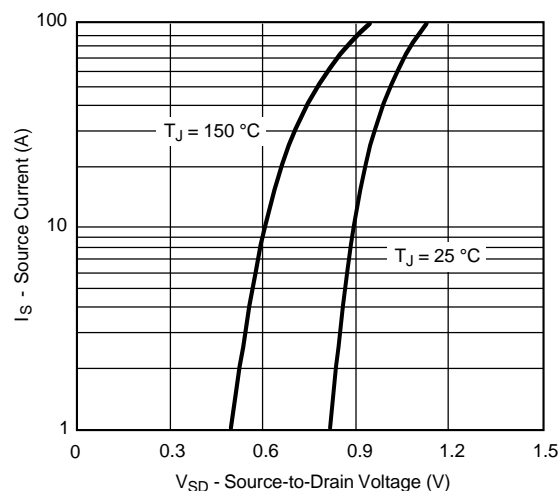


Gate Charge

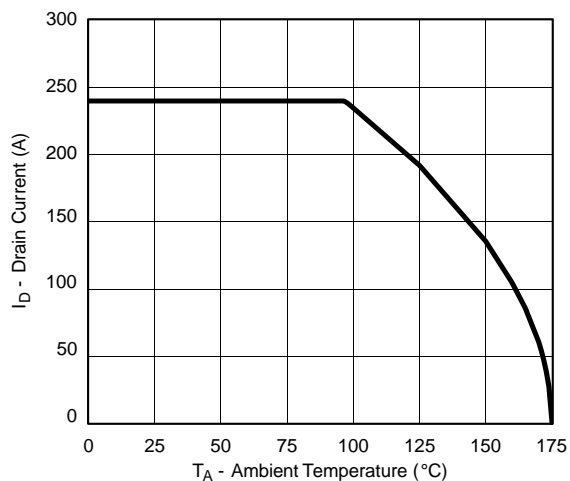
TYPICAL CHARACTERISTICS (25 °C unless noted)



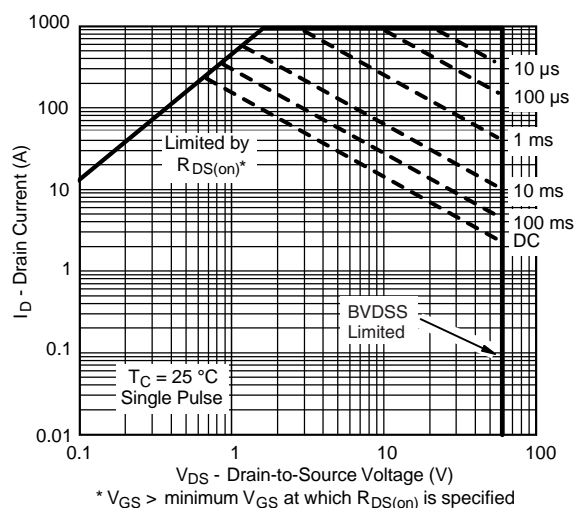
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

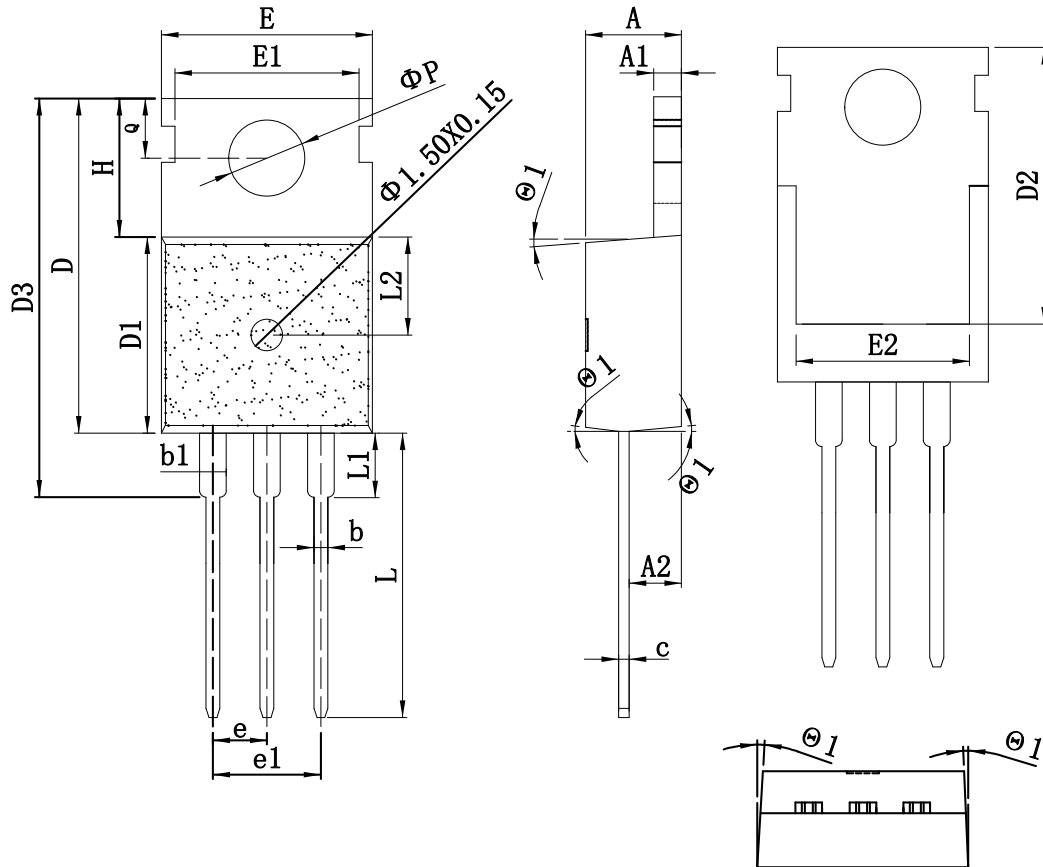


Maximum Drain Current vs. Ambient Temperature



Safe Operating Area

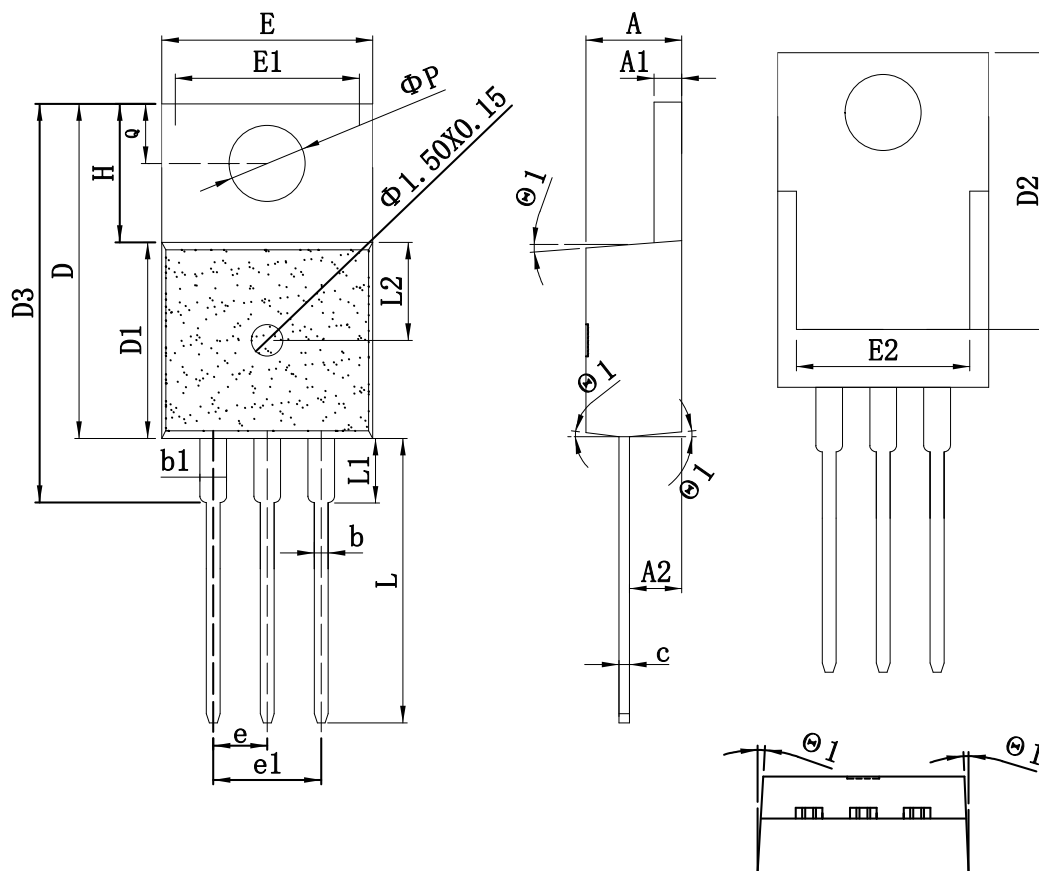
TO-220_3L-A PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

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	5.08REF		
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=MILLIMETER)

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	5.08REF		
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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