

N-Channel 650 V (D-S) Super Junction MOSFET

PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω) TYP.	I _D (A)	Q _g (Typ.)
650	0.173 at V _{GS} = 10 V	20	18

FEATURES

- Super Junction MOSFET
- 100 % R_g and UIS Tested
- Easy to use/drive

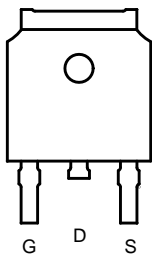


RoHS
COMPLIANT

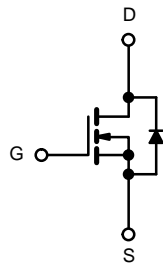
APPLICATIONS

- Computing
 - PC silver box / ATX power supplies
- Lighting
 - Two stage LED lighting
- Consumer electronics
- Applications using hard switched topologies
 - Power factor correction (PFC)
 - Two switch forward converter
 - Flyback converter
- Switch mode power supplies (SMPS)

TO-252



Top View



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	650	V	
Gate-Source Voltage	V _{GS}	± 30		
Continuous Drain Current	I _D	T _C = 25 °C	20	A
		T _C = 100 °C	15	
Pulsed Drain Current (t = 300 μs)	I _{DM}	72		
Avalanche Current	I _{AS}	18.9		
Single Avalanche Energy ^a	E _{AS}	57	mJ	
Maximum Power Dissipation ^a	P _D	T _C = 25 °C	97 ^b	W
		T _A = 25 °C ^c	2.1	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) ^c	R _{thJA}	65	°C/W
Junction-to-Case (Drain)	R _{thJC}	2	

Notes:

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).
- Base on T_C = 25 °C.

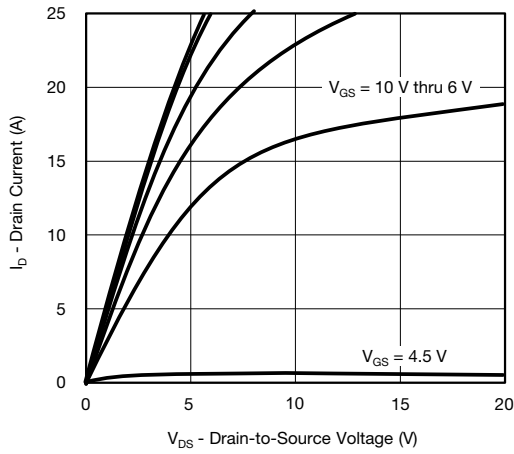
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	650			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}, T_J = 25\text{ }^\circ\text{C}$		0.173	0.195	Ω
		$V_{GS} = 10\text{ V}, I_D = 5\text{ A}, T_J = 150\text{ }^\circ\text{C}$		0.438		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$		15		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1010		μF
Output Capacitance	C_{oss}			25		
Reverse Transfer Capacitance	C_{rss}			11		
Total Gate Charge ^c	Q_g	$V_{DS} = 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		18		nC
Gate-Source Charge ^c	Q_{gs}			6.6		
Gate-Drain Charge ^c	Q_{gd}			8.1		
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.5		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 400\text{ V}, R_L = 9.6\text{ }\Omega$ $I_D \cong 5.2\text{ A}, V_{GEN} = 10\text{ V}, R_g = 10\text{ }\Omega$		8		ns
Rise Time ^c	t_r			11		
Turn-Off Delay Time ^c	$t_{d(off)}$			18		
Fall Time ^c	t_f			5		
Drain-Source Body Diode Ratings and Characteristics^b $T_C = 25\text{ }^\circ\text{C}$						
Continuous Current	I_S				20	A
Pulsed Current	I_{SM}				72	
Forward Voltage ^a	V_{SD}	$I_F = 5\text{ A}, V_{GS} = 0\text{ V}$		0.9		V
Reverse Recovery Time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		926		ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			22		A
Reverse Recovery Charge	Q_{rr}			6		μC

Notes:

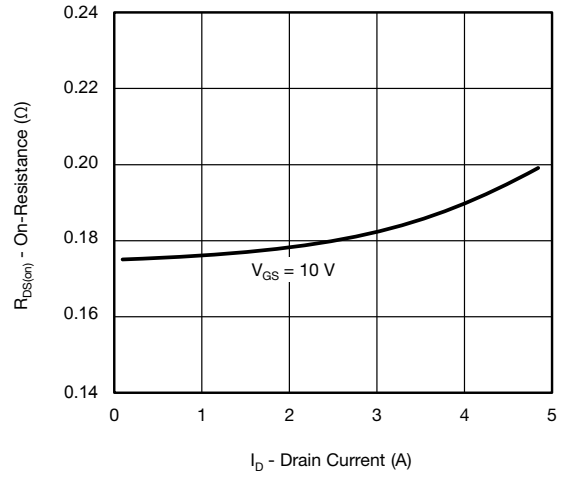
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

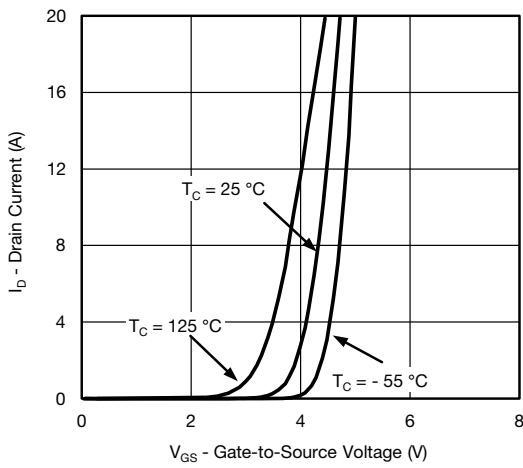
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



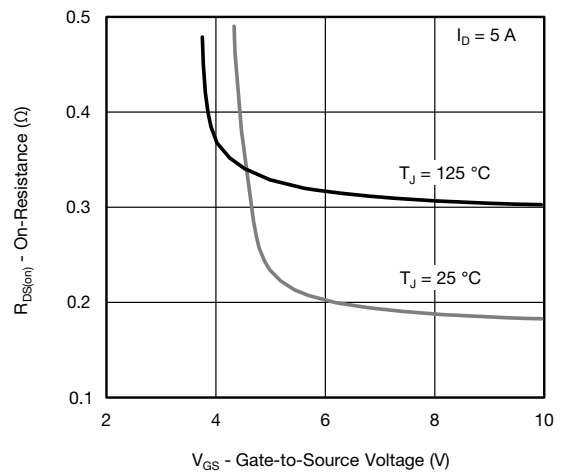
Output Characteristics



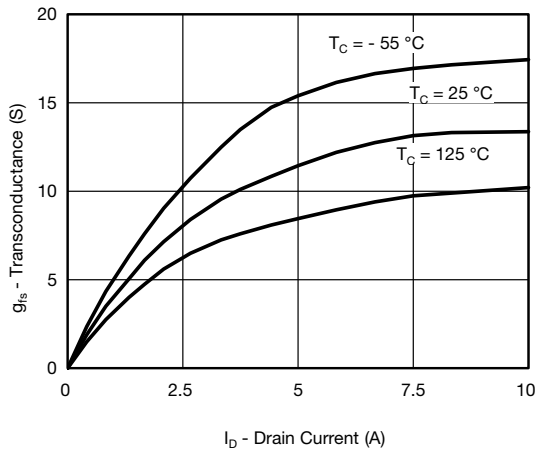
On-Resistance vs. Drain Current



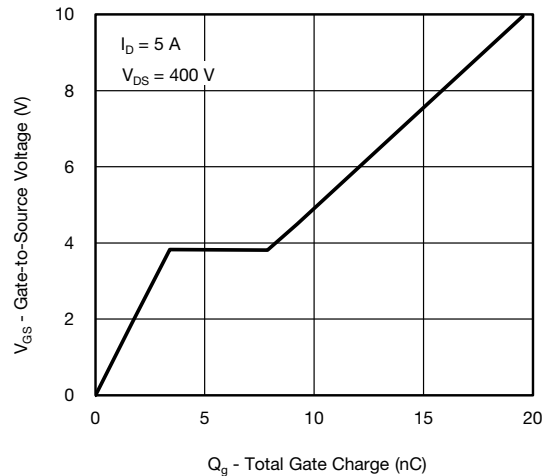
Transfer Characteristics



On-Resistance vs. Gate-to-Source Voltage

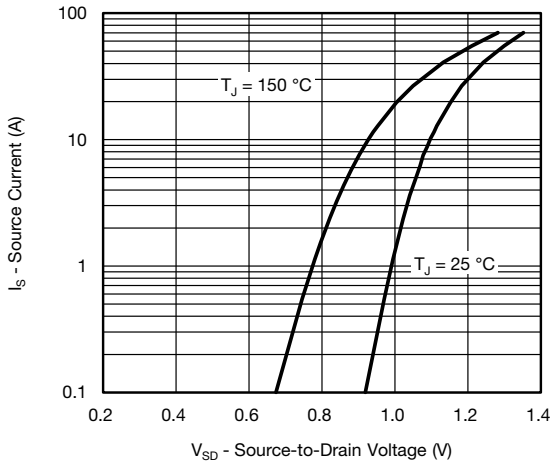


Transconductance

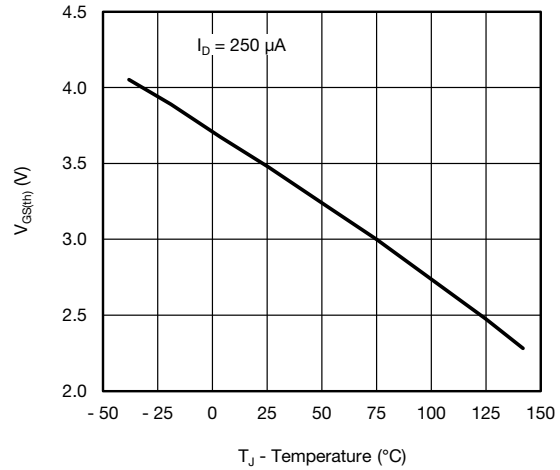


Gate Charge

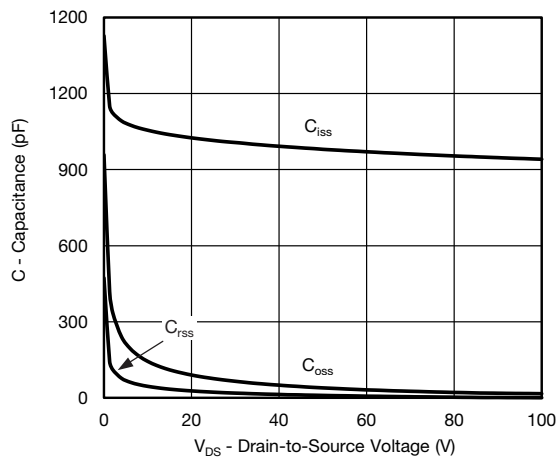
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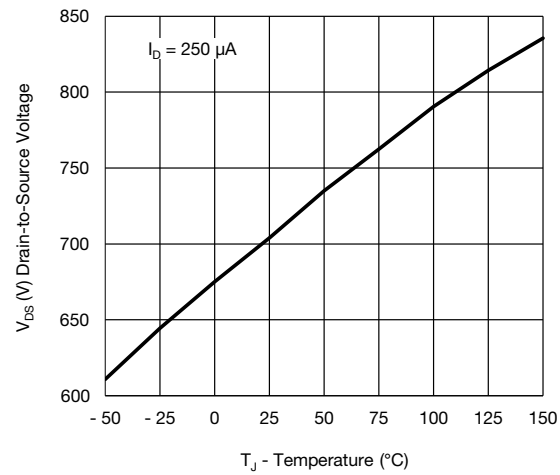
Source-Drain Diode Forward Voltage



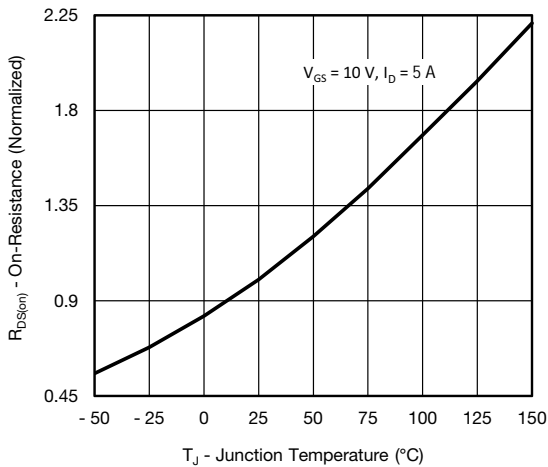
Threshold Voltage



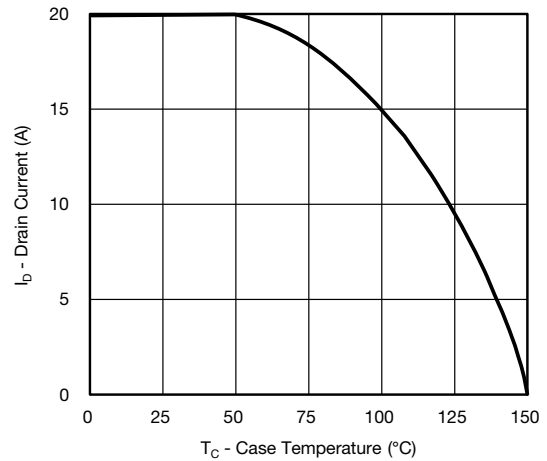
Capacitance



Drain Source Breakdown vs. Junction Temperature

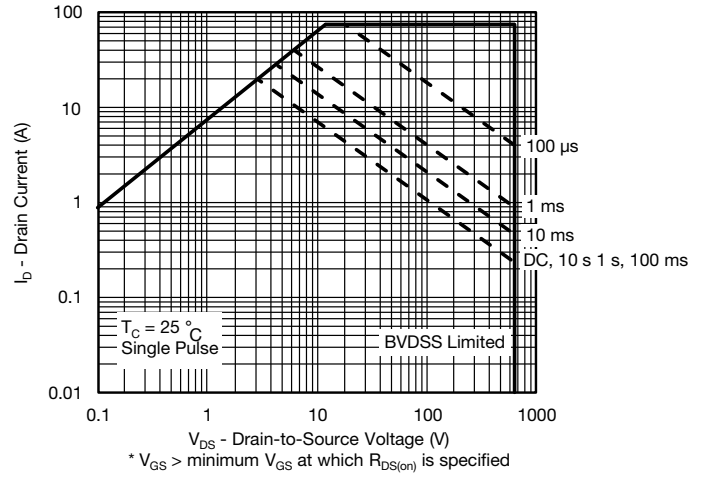
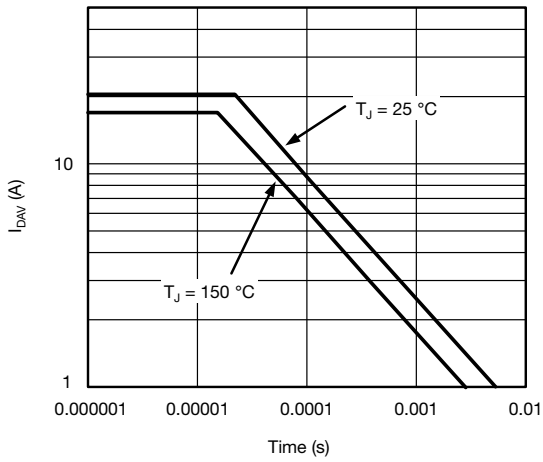


On-Resistance vs. Junction Temperature



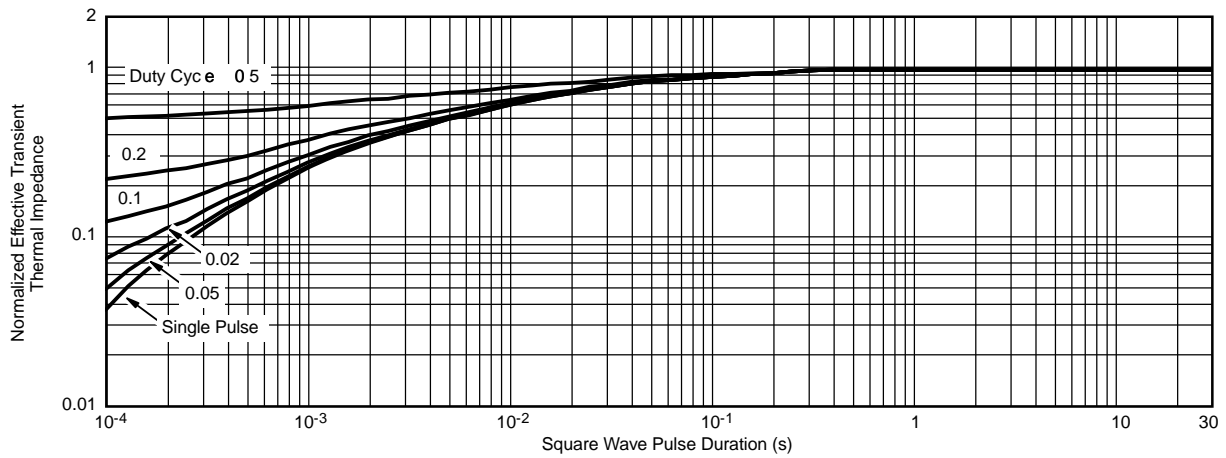
Current Derating

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



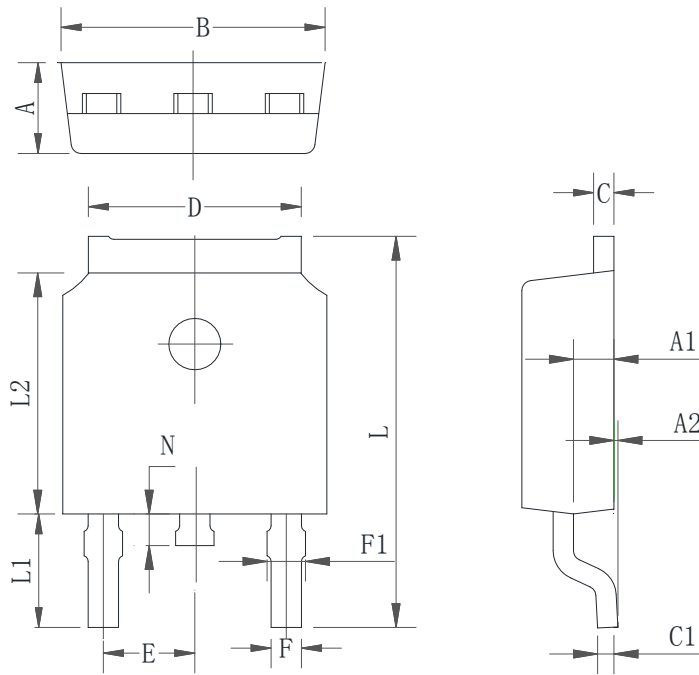
Single Pulse Avalanche Current Capability vs. Time

Safe Operating Area



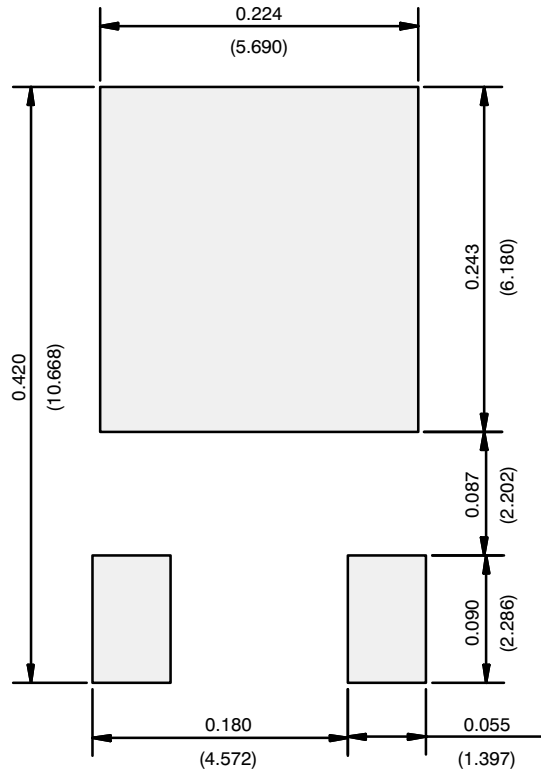
Normalized Thermal Transient Impedance, Junction-to-Case

TO-252 CASE OUTLINE



Symbol	Min	Typ	Max
A	2.20	2.30	2.40
A1	0.91	1.01	1.11
A2	0.05	0.15	0.25
B	6.45	6.60	6.75
C	0.45	0.50	0.58
C1	0.45	0.50	0.58
D	5.12	5.32	5.52
E	2.286 TYP		
F	0.66	0.76	0.86
F1	0.66	0.86	1.06
L	9.60	9.90	10.20
L1	2.6	2.8	3.0
L2	5.95	6.10	6.25
N	0.60	0.80	1.00

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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