

N-Channel 40 V (D-S) MOSFET

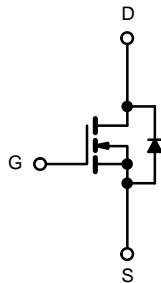
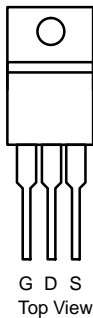
PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) TYP.	I_D (A) ^d	Q_g (TYP.)
40	0.0011 at $V_{GS} = 10$ V	220	155
	0.0018 at $V_{GS} = 4.5$ V	180	

FEATURES

- DT-Trench Power MOSFET
- Maximum 175 °C junction temperature
- Q_{gd}/Q_{gs} ratio < 0.5
- Operable with logic-level gate drive
- 100 % R_g and UIS tested


RoHS
 COMPLIANT

TO-220AB


N-Channel MOSFET

APPLICATIONS

- Power supply
- Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C 220 ^d	A
		$T_C = 70$ °C 190 ^d	
Pulsed Drain Current ($t = 100$ μ s)	I_{DM}	1320	
Avalanche Current	I_{AS}	200	
Single Avalanche Energy ^a	E_{AS}	1380	mJ
Maximum Power Dissipation ^a	P_D	$T_C = 25$ °C 450 ^b	W
		$T_C = 125$ °C 195 ^b	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) ^c	R_{thJA}	35	°C/W
Junction-to-Case (Drain)	R_{thJC}	0.4	

Notes

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

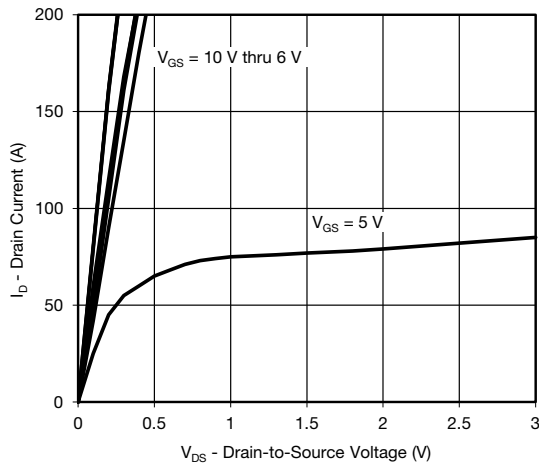
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0	-	3.0	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 250	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 125 °C	-	-	150	
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 175 °C	-	-	5	mA
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	220	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 30 A	-	0.0011	0.0015	Ω
		V _{GS} = 7.5 V, I _D = 20 A	-	0.0018	0.0026	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 30 A	-	179	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 30 V, f = 1 MHz	-	18210	-	pF
Output Capacitance	C _{oss}		-	2000	-	
Reverse Transfer Capacitance	C _{rss}		-	350	-	
Total Gate Charge ^c	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 20 A	-	155	230	nC
Gate-Source Charge ^c	Q _{gs}		-	30	-	
Gate-Drain Charge ^c	Q _{gd}		-	11	-	
Gate Resistance	R _g	f = 1 MHz		1.7		Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	-	17	30	ns
Rise Time ^c	t _r		-	22	41	
Turn-Off Delay Time ^c	t _{d(off)}		-	66	101	
Fall Time ^c	t _f		-	15	31	
Drain-Source Body Diode Ratings and Characteristics ^b (T _C = 25 °C)						
Pulsed Current (t = 100 μs)	I _{SM}		-	-	1320	A
Forward Voltage ^a	V _{SD}	I _F = 10 A, V _{GS} = 0 V	-	0.8	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 41 A, di/dt = 100 A/μs	-	130	205	ns
Peak Reverse Recovery Charge	I _{RM(REC)}		-	5	10	A
Reverse Recovery Charge	Q _{rr}		-	0.340	0.510	μC

Notes

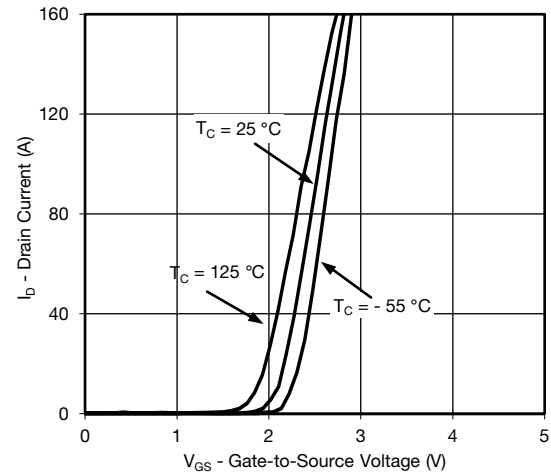
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.
 c. Independent of operating temperature.

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.

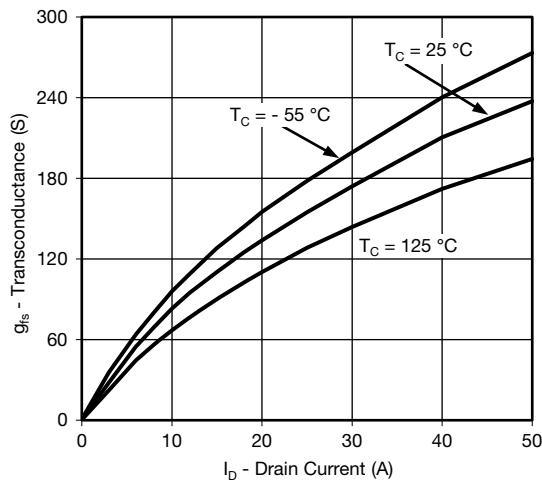
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



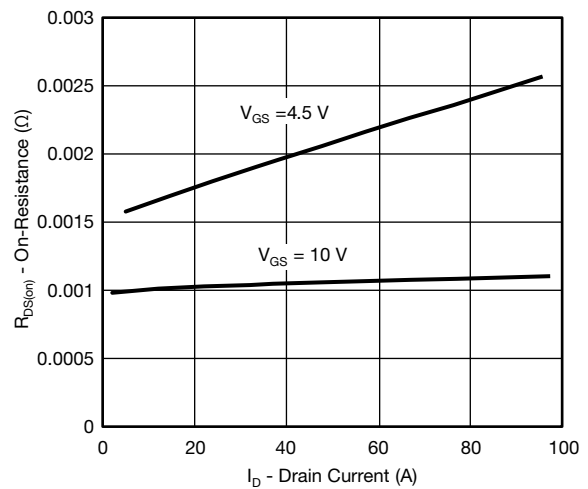
Output Characteristics



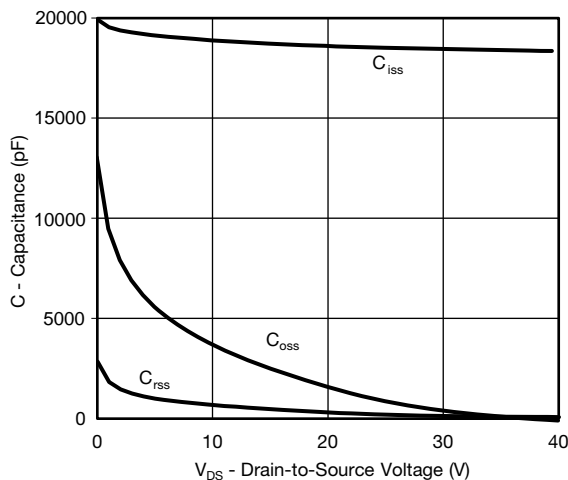
Transfer Characteristics



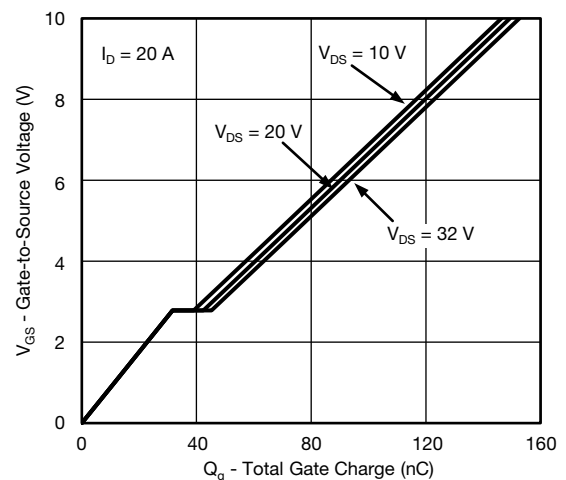
Transconductance



On-Resistance vs. Drain Current

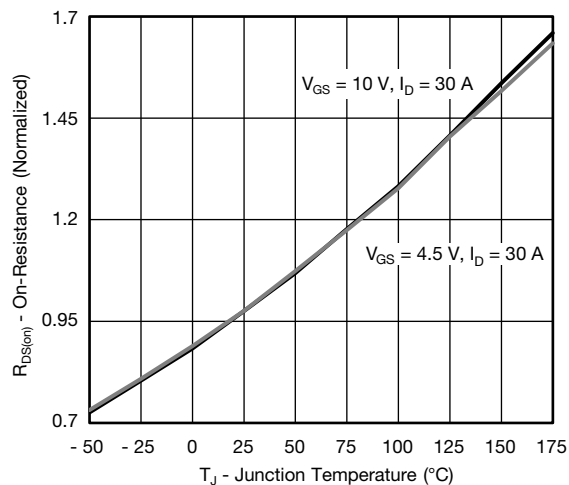


Capacitance

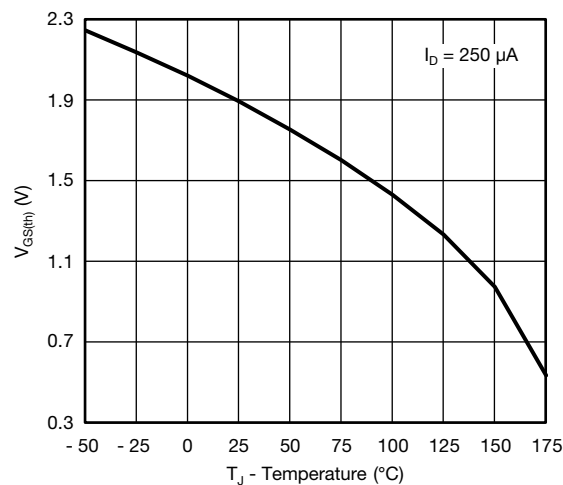


Gate Charge

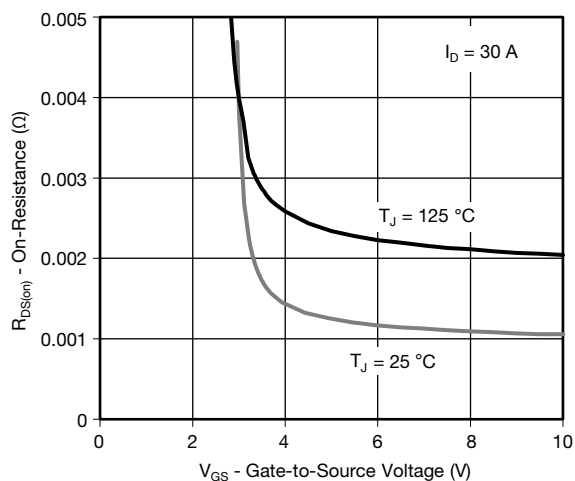
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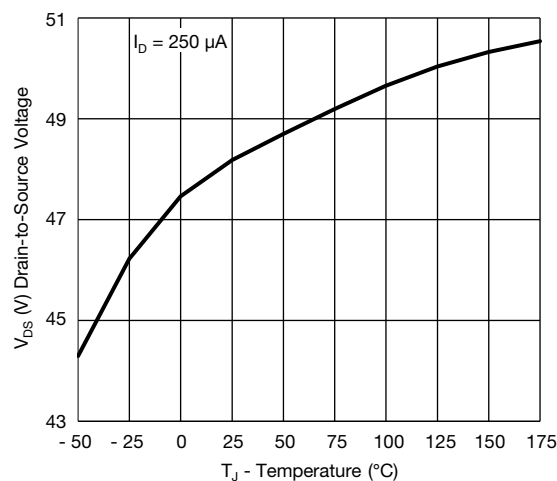
On-Resistance vs. Junction Temperature



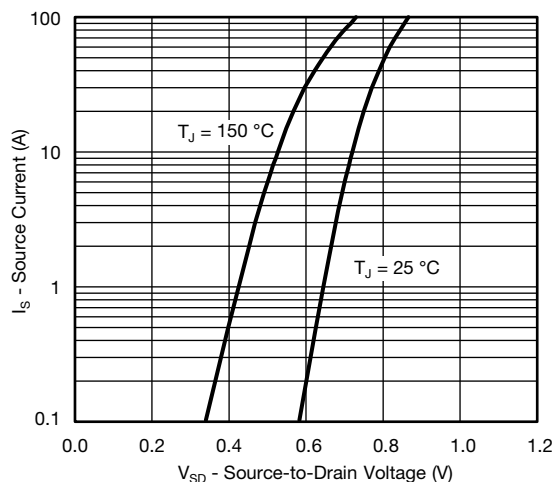
Threshold Voltage



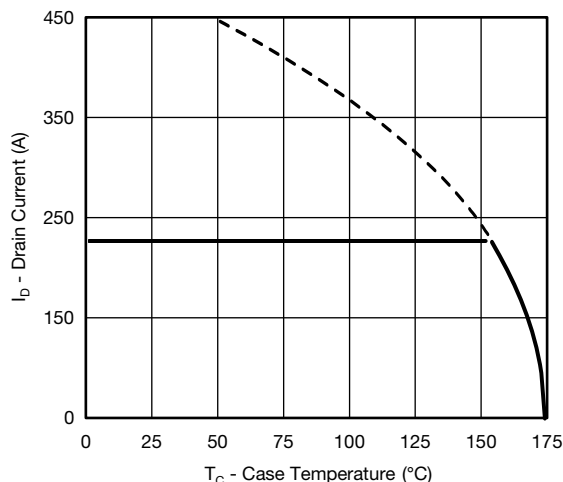
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature

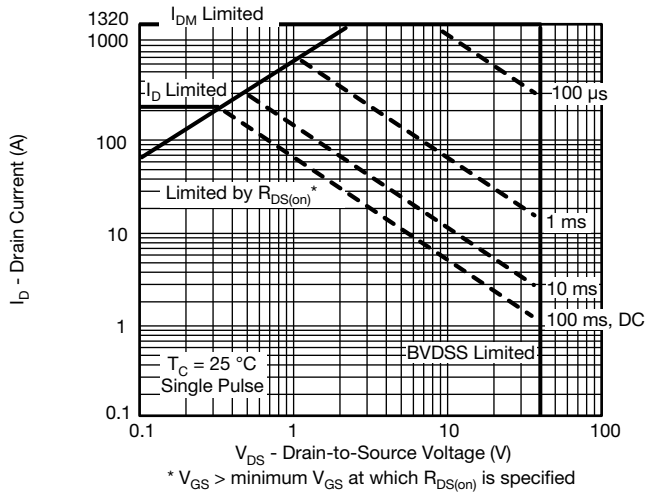


Source Drain Diode Forward Voltage

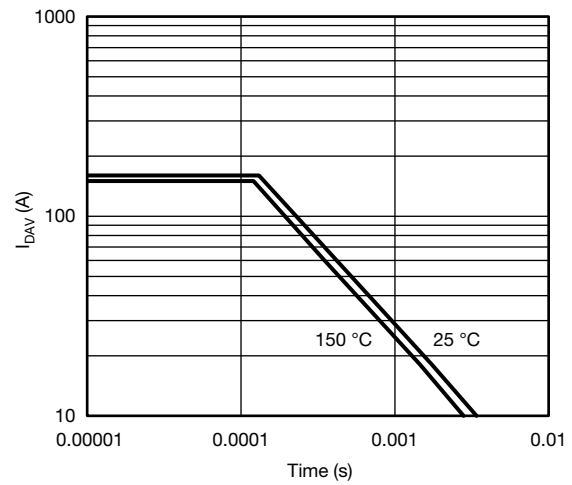


Current De-rating

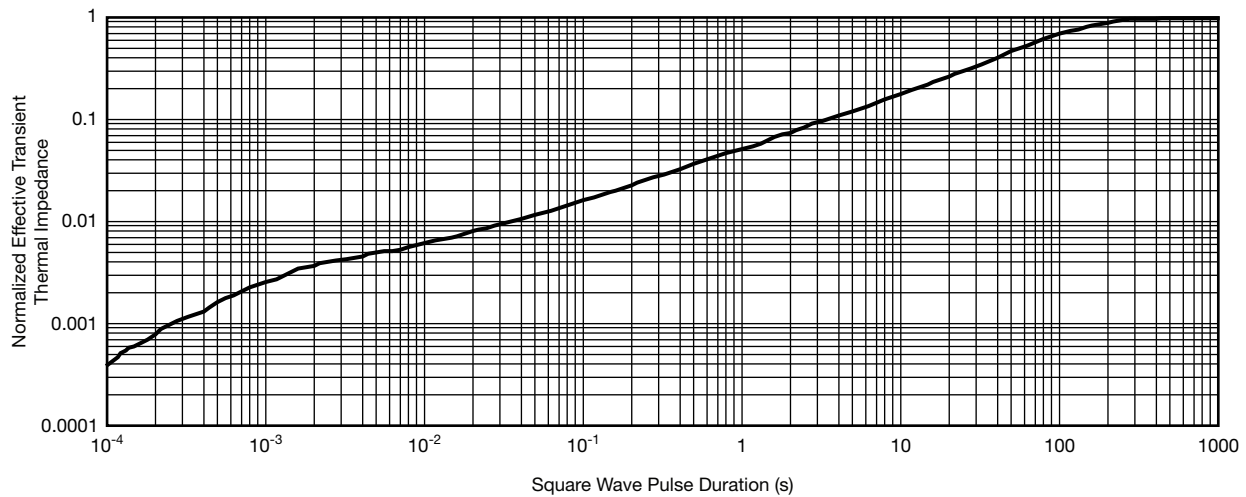
THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Safe Operating Area

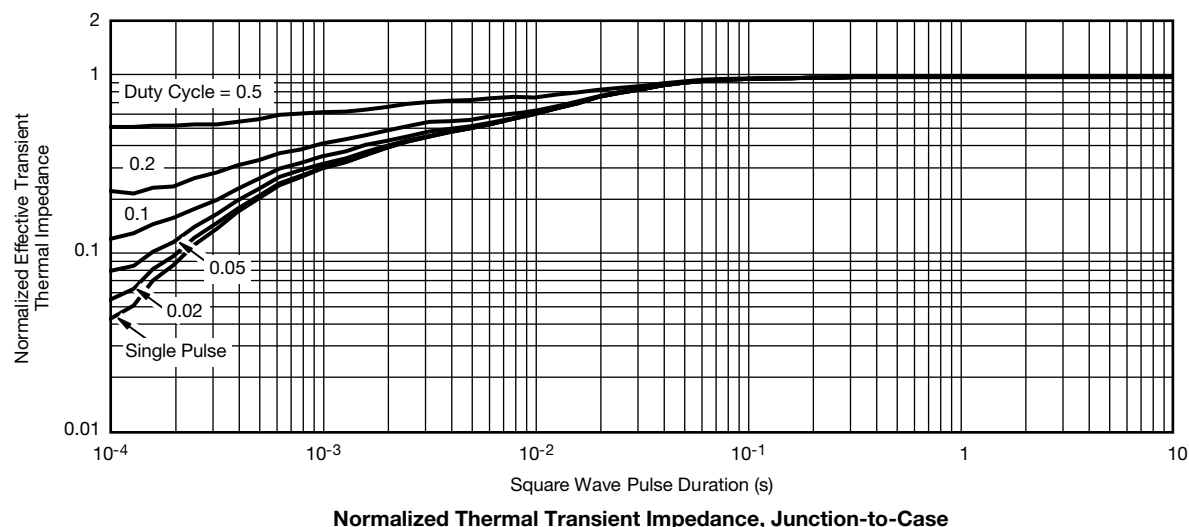


Single Pulse Avalanche Current Capability vs. Time



Normalized Thermal Transient Impedance, Junction-to-Ambient

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



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.

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