

IRF640NS-VB Datasheet

N-Channel 200 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
200	0.048 at V _{GS} = 10 V	40
	0.060 at V _{GS} = 6.5 V	35

FEATURES

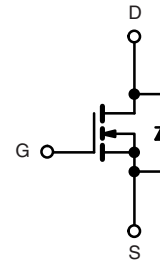
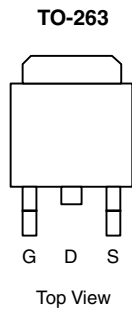
- TrenchFET[®] Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- PWM Optimized for Fast Switching
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

APPLICATIONS

- Isolated DC/DC Converters
- Primary-Side Switch



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	200	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current (T _J = 175 °C)	I _D	T _C = 25 °C	40	A
		T _C = 125 °C	25	
Pulsed Drain Current	I _{DM}	80		
Avalanche Current	I _{AR}	20		
Repetitive Avalanche Energy ^a	E _{AR}	16.2	mJ	
Maximum Power Dissipation ^a	P _D	T _C = 25 °C	200 ^b	W
		T _A = 25 °C ^c	4.5	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient	R _{thJA}	40	°C/W
Junction-to-Case (Drain)	R _{thJC}	1	

Notes:

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

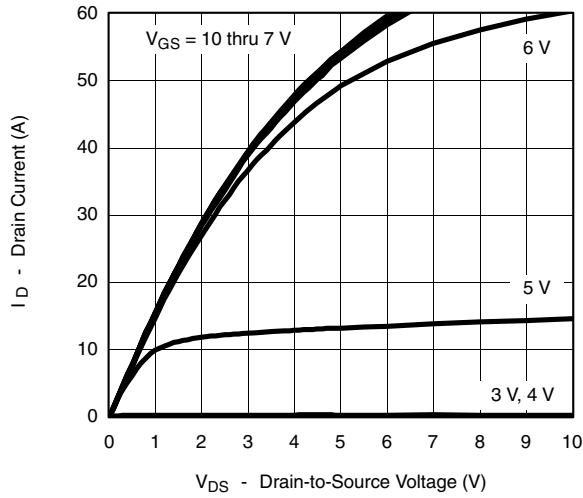
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min .	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	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}	$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 15\text{ V}, V_{GS} = 10\text{ V}$	60			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.048		Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.150		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$		0.180		
Drain-Source on State Resistance		$V_{GS} = 6.5\text{ V}, I_D = 15\text{ A}$		0.060		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	15			S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		2820		pF
Output Capacitance	C_{oss}			300		
Reverse Transfer Capacitance	C_{rss}			120		
Total Gate Charge ^c	Q_g	$V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		35		nC
Gate-Source Charge ^c	Q_{gs}			11		
Gate-Drain Charge ^c	Q_{gd}			14		
Gate Resistance	R_G			2		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 100\text{ V}, R_L = 5\text{ }\Omega$ $I_D \equiv 20\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$		15	25	ns
Rise Time ^c	t_r			35	55	
Turn-Off Delay Time ^c	$t_{d(off)}$			40	60	
Fall Time ^c	t_f			30	45	
Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^\circ\text{C}$) ^b						
Continuous Current	I_S				40	A
Pulsed Current	I_{SM}				60	
Forward Voltage ^a	V_{SD}	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		1	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		115	170	ns
Peak Reverse Recovery Charge	$I_{RM(REC)}$			7.5	12	A
Reverse Recovery Charge	Q_{rr}			0.43	1.02	μC

Notes:

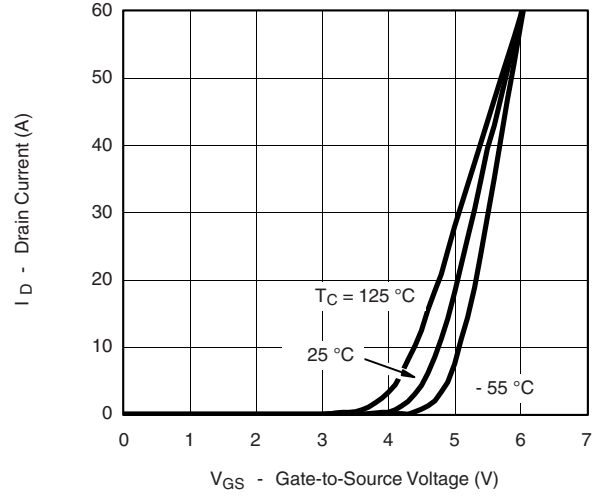
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

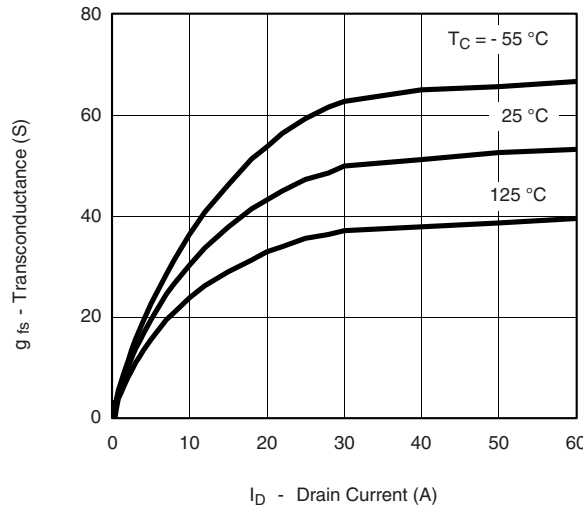
TYPICAL CHARACTERISTICS (25 °C unless noted)



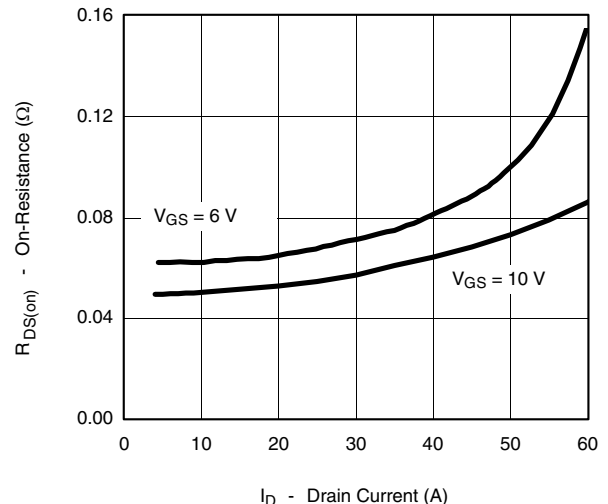
Output Characteristics



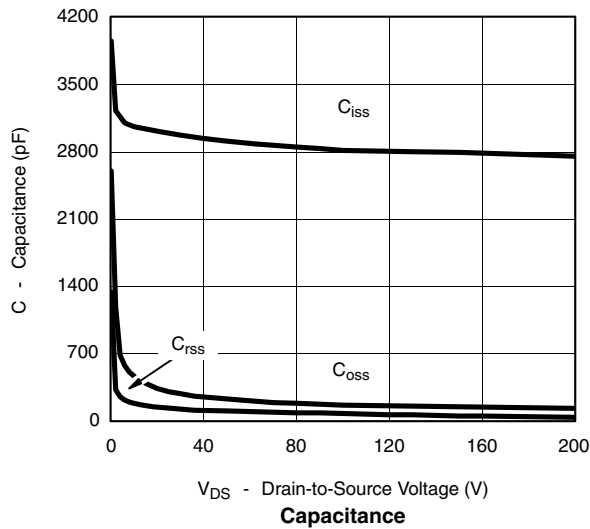
Transfer Characteristics



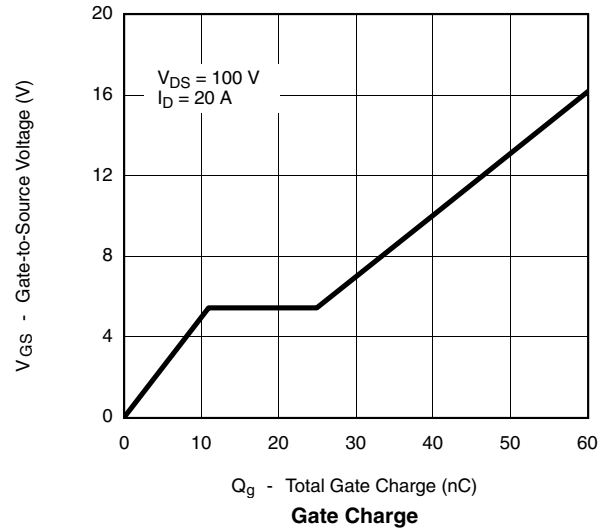
Transconductance



On-Resistance vs. Drain Current

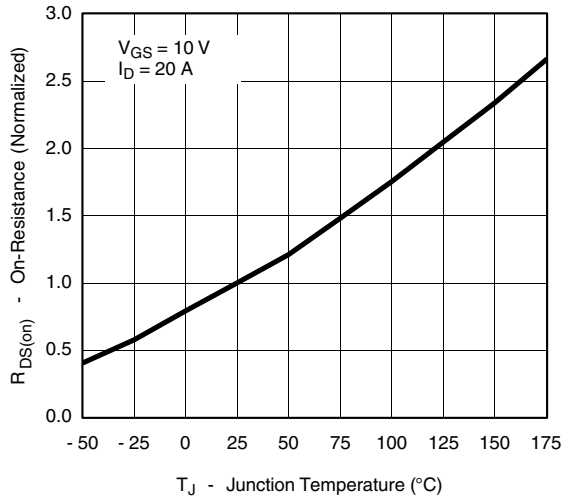


Capacitance

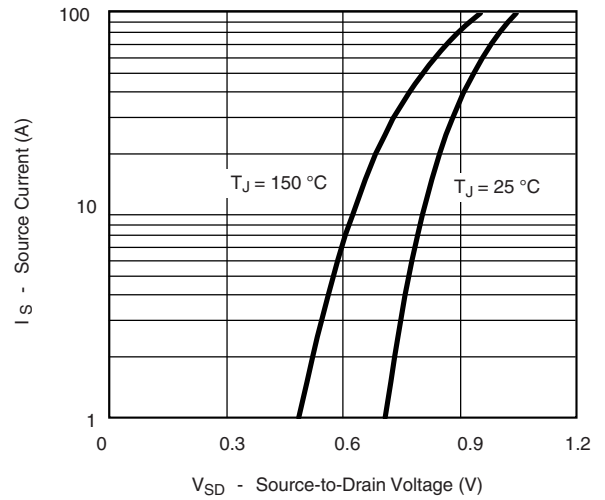


Gate Charge

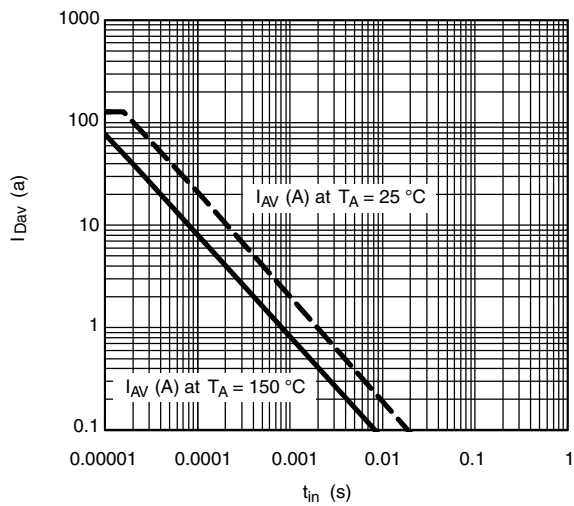
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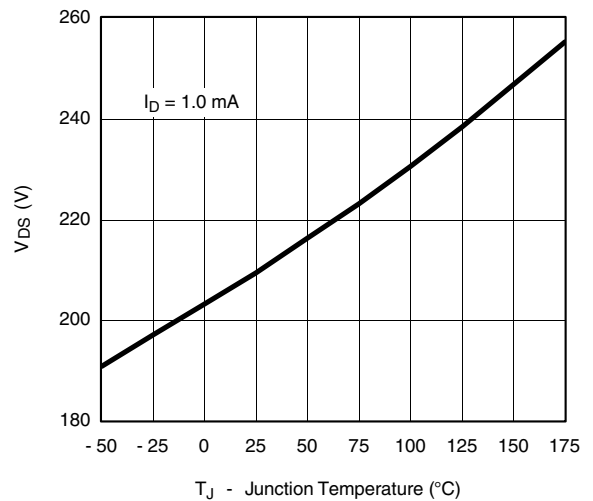
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

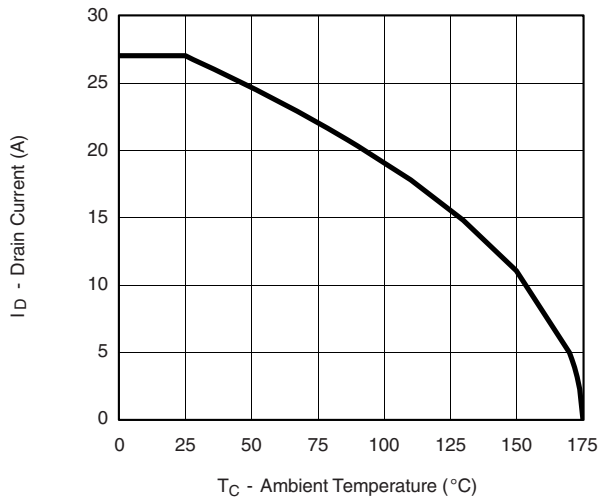


Avalanche Current vs. Time

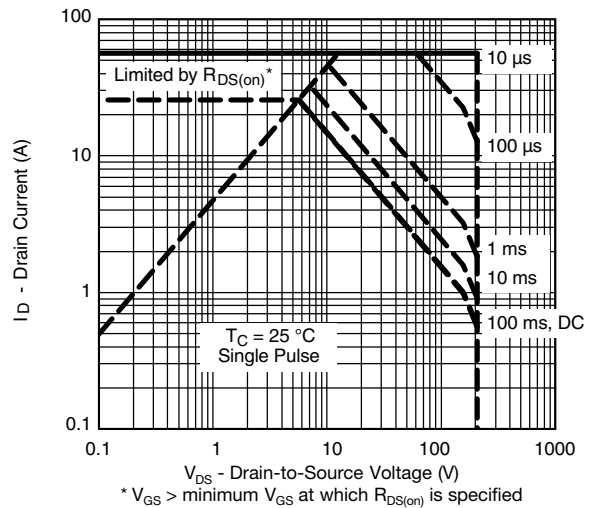


Drain Source Breakdown vs. Junction Temperature

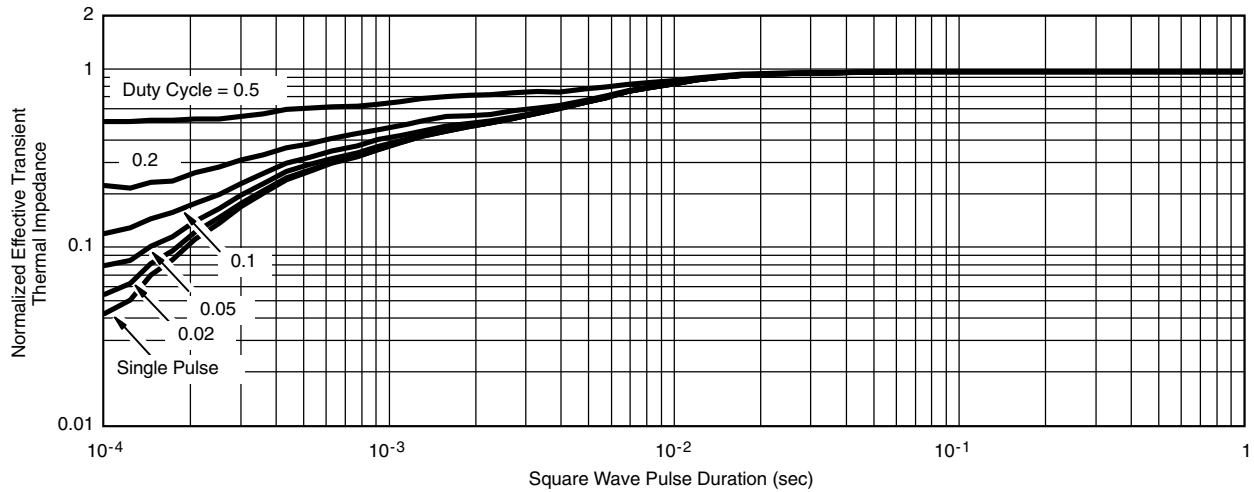
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



Normalized Thermal Transient Impedance, Junction-to-Case

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