

## N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
20	0.0046 at $V_{GS} = 4.5$ V	65
	0.0062 at $V_{GS} = 2.5$ V	40

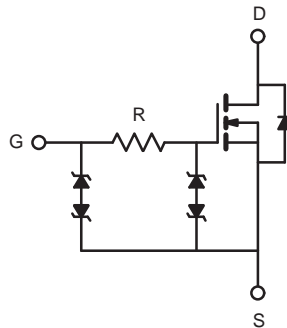
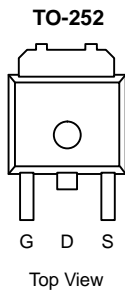
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature
- 100 %  $R_g$  Tested
- 100 % UIS Tested
- Typical ESD Protection 4000 V



### APPLICATIONS

- OR-ing



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$		
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	65 <sup>a</sup>	A
		$T_C = 100$ °C	45 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	210		
Single Pulse Avalanche Current	$I_{AS}$	L = 0.1 mH	50	mJ
Single Pulse Avalanche Energy			$E_{AS}$	
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	120 <sup>c</sup>	W
		$T_A = 25$ °C <sup>d</sup>	3.75	
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) <sup>d</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case	$R_{thJC}$	1.25	

Notes:

- Package limited.
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

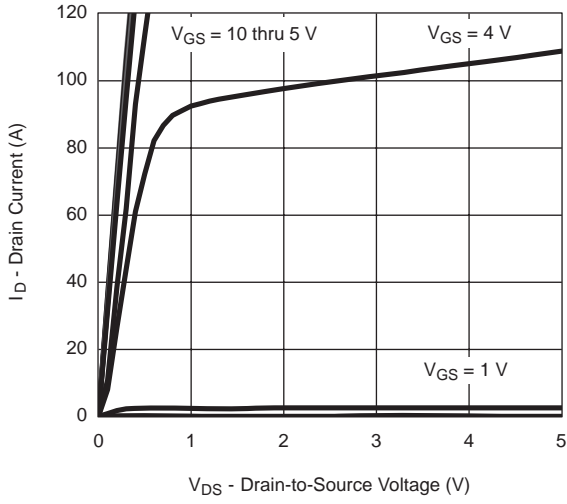
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.5		1.2	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 10$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	100			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		0.0046	0.0060	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.007	
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.008	
		$V_{GS} = 2.5\text{ V}, I_D = 10\text{ A}$		0.0062	0.0083	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$		95		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 10\text{ V}, f = 1\text{ MHz}$		2050		$\mu\text{F}$
Output Capacitance	$C_{oss}$			485		
Reverse Transfer Capacitance	$C_{rss}$			205		
Total Gate Charge <sup>b</sup>	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		27	50	nC
Gate-Source Charge <sup>b</sup>	$Q_{gs}$			6.5		
Gate-Drain Charge <sup>b</sup>	$Q_{gd}$			7		
Gate Resistance	$R_g$		0.75	1.5	2.3	$\Omega$
Turn-On Delay Time <sup>b</sup>	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1.0\text{ }\Omega$		15	25	ns
Rise Time <sup>b</sup>	$t_r$			7	11	
Turn-Off Delay Time <sup>b</sup>	$t_{d(off)}$			35	55	
Fall Time <sup>b</sup>	$t_f$			8	12	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>c</sup>						
Continuous Current	$I_S$				65	A
Pulsed Current	$I_{SM}$				210	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		0.85	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		25	55	ns
Peak Reverse Recovery Current	$I_{RM}$			1.7	3.4	A
Reverse Recovery Charge	$Q_{rr}$			0.024	0.105	$\mu\text{C}$

**Notes:**

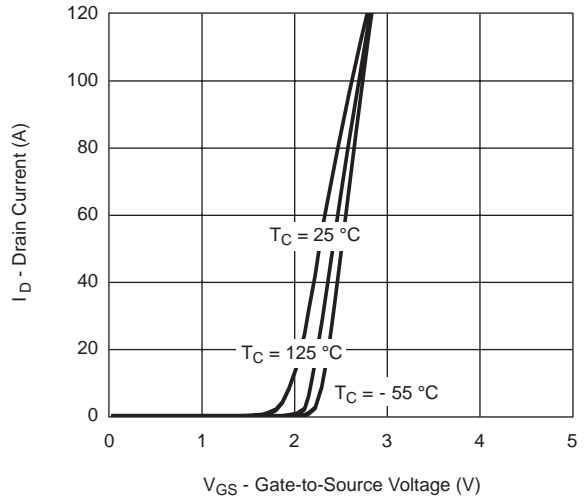
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- Independent of operating temperature.
- Guaranteed by design, not subject to production testing.

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.

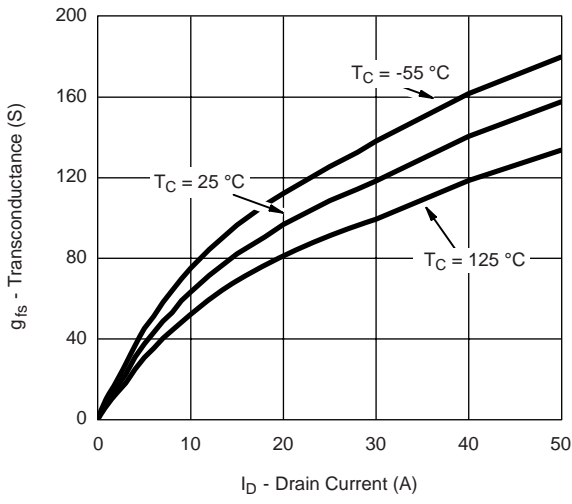
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



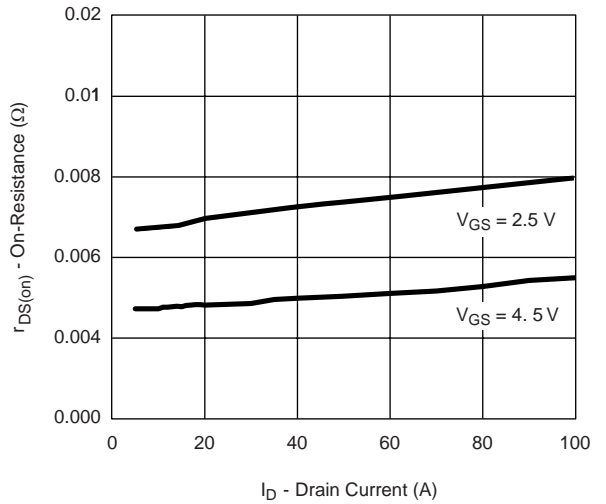
**Output Characteristics**



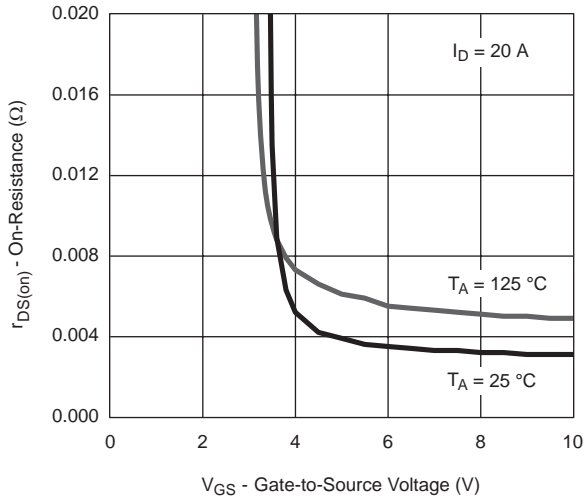
**Transfer Characteristics**



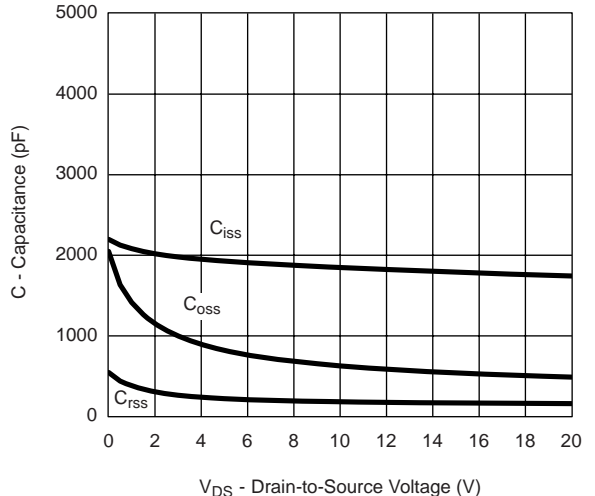
**Transconductance**



**On-Resistance vs. Drain Current**

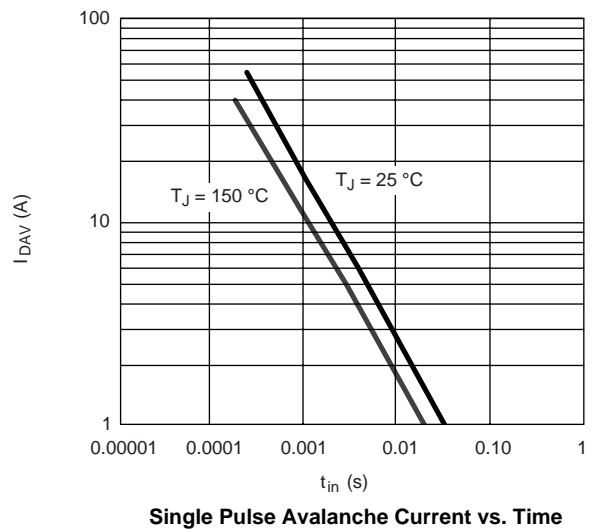
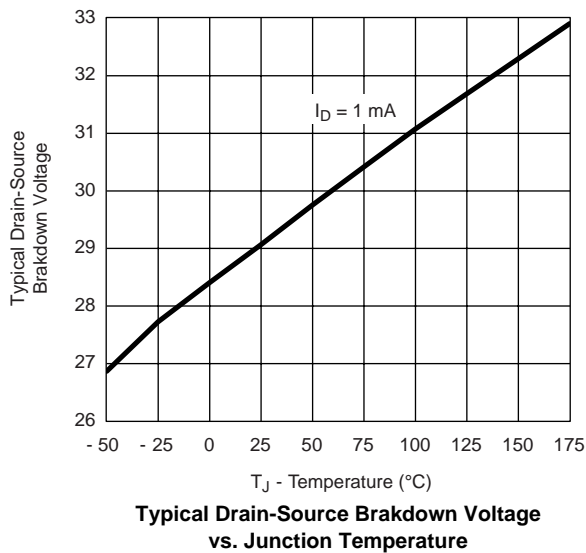
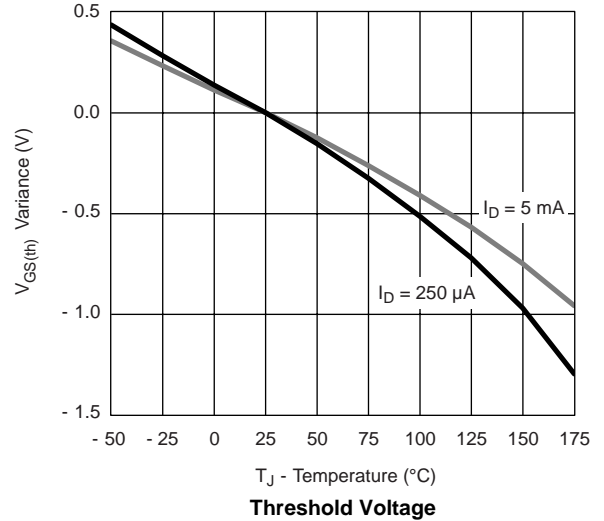
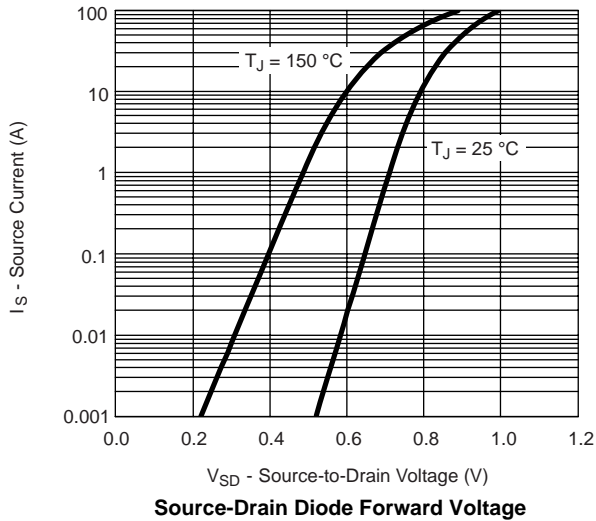
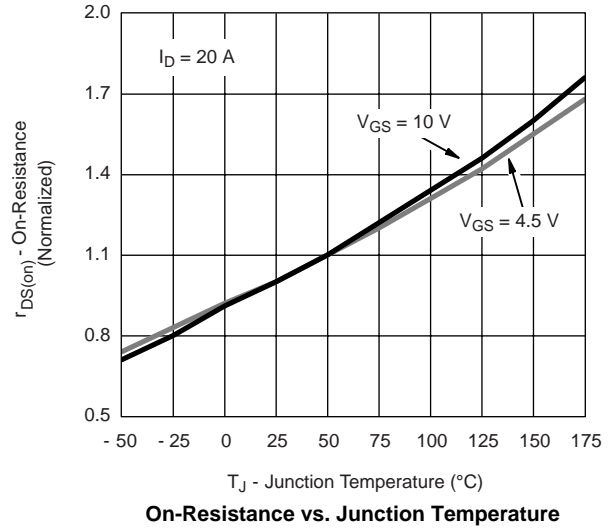
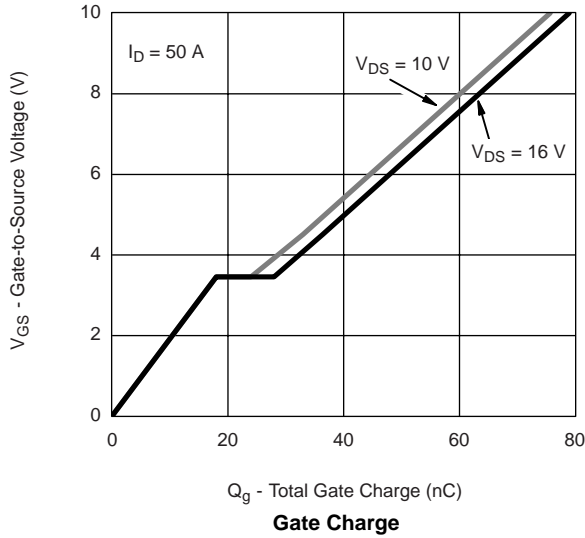


**On-Resistance vs. Gate-to-Source Voltage**

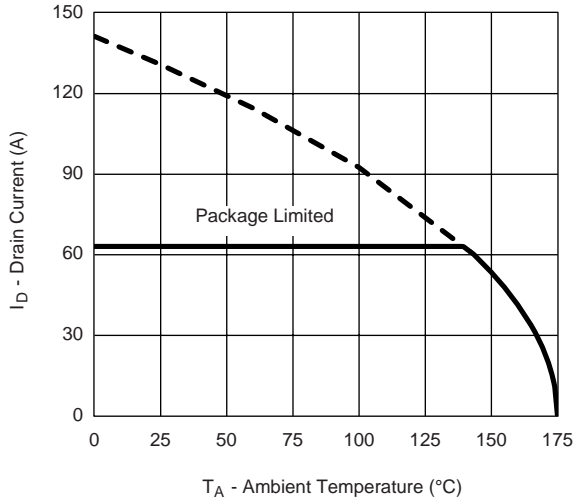


**Capacitance**

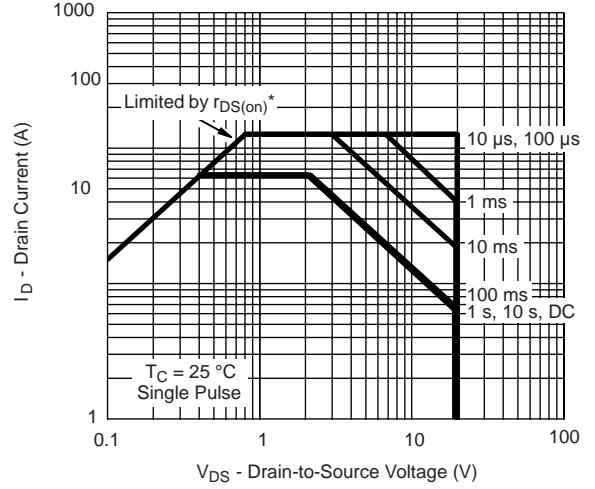
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



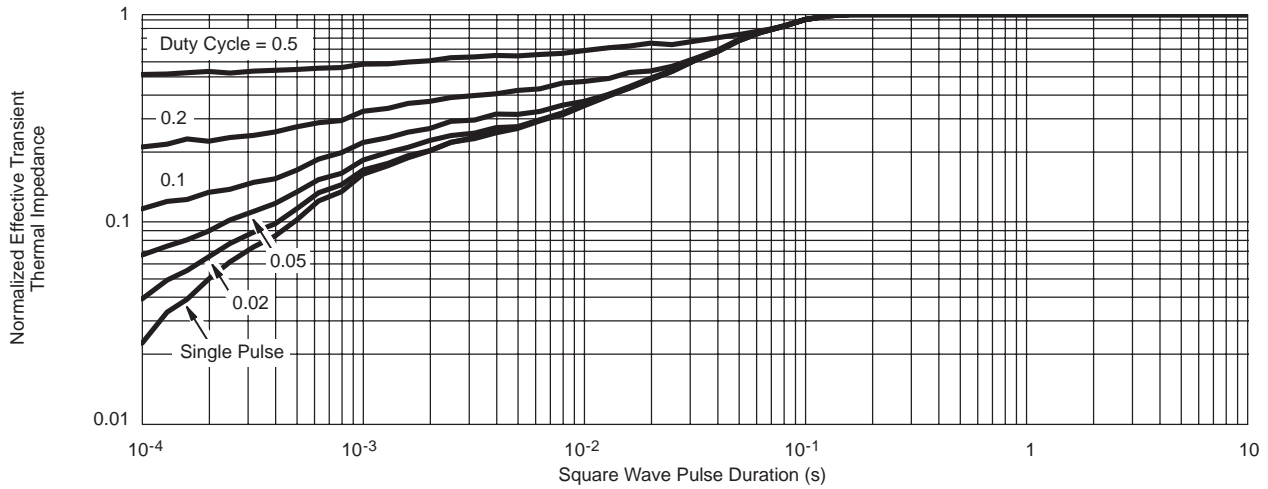
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Drain Current vs. Ambient Temperature**



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



**Normalized Thermal Transient Impedance, Junction-to-Case**

## TO-252AA CASE OUTLINE



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.14	1.52	0.045	0.060
ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347				

**Note**

- Dimension L3 is for reference only.

**RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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