

## N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>d</sup>	Q <sub>g</sub> (Typ.)
60	0.0047 at V <sub>GS</sub> = 10 V	100	79
	0.0054 at V <sub>GS</sub> = 4.5 V	80	

### FEATURES

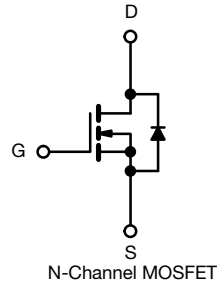
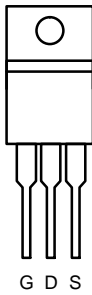
- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



### APPLICATIONS

- Power Supply
  - Secondary Synchronous Rectification
- DC/DC Converter

TO-220AB



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	100 <sup>d</sup>
		T <sub>C</sub> = 70 °C	80 <sup>d</sup>
Pulsed Drain Current	I <sub>DM</sub>	350	A
Avalanche Current	I <sub>AS</sub>	50	
Single Avalanche Energy <sup>a</sup>	E <sub>AS</sub>	170	
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C	125 <sup>b</sup>
		T <sub>A</sub> = 25 °C <sup>c</sup>	3.0
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) <sup>c</sup>	R <sub>thJA</sub>	40	°C/W
Junction-to-Case (Drain)	R <sub>thJC</sub>	1	

Notes:

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

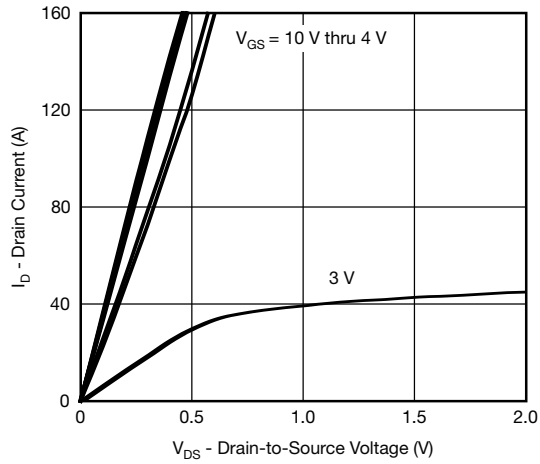
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 250$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 22\text{ A}$		0.0047	0.0056	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0054	0.0065	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		159		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, f = 1\text{ MHz}$		13580		$\mu\text{F}$
Output Capacitance	$C_{oss}$			1805		
Reverse Transfer Capacitance	$C_{rss}$			298		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		87	131	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			15.3		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			12.2		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.5	2.7	5.4	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		11	20	ns
Rise Time <sup>c</sup>	$t_r$			7	14	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			45	68	
Fall Time <sup>c</sup>	$t_f$			7	14	
<b>Drain-Source Body Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				100	A
Pulsed Current	$I_{SM}$				350	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 10\text{ A}, V_{GS} = 0\text{ V}$		0.72	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		42	63	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2.5	3.8	A
Reverse Recovery Charge	$Q_{rr}$				52	78

**Notes:**

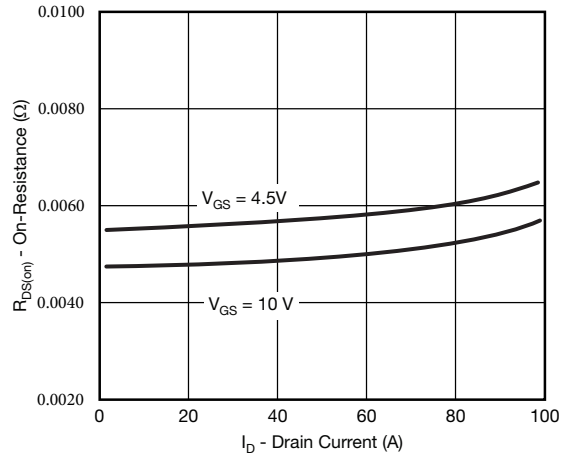
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

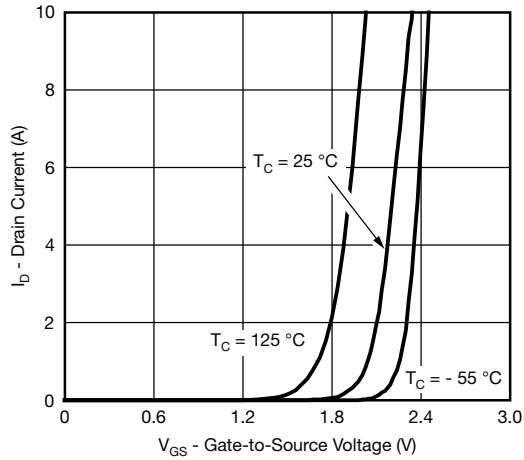
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



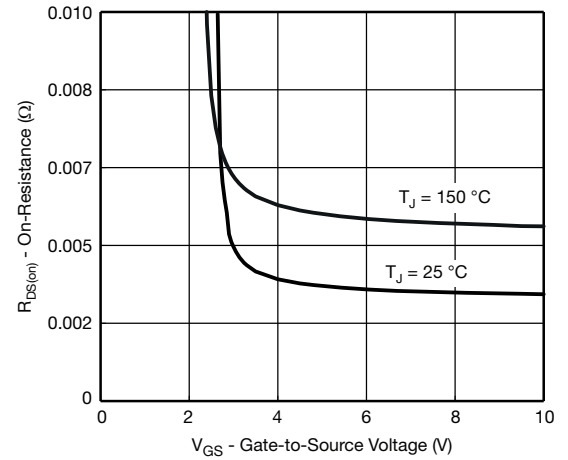
**Output Characteristics**



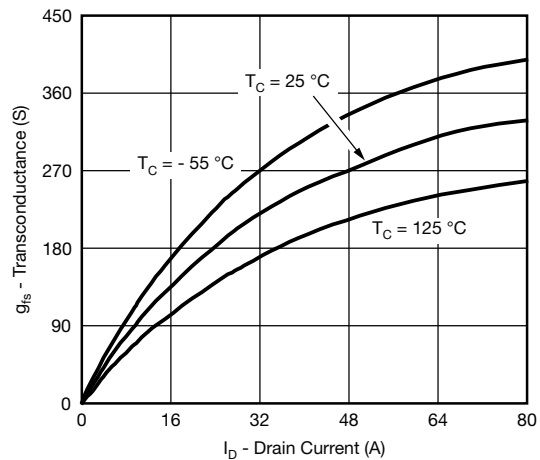
**On-Resistance vs. Drain Current**



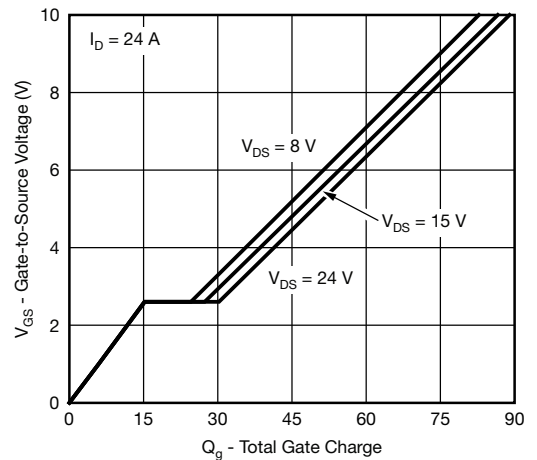
**Transfer Characteristics**



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

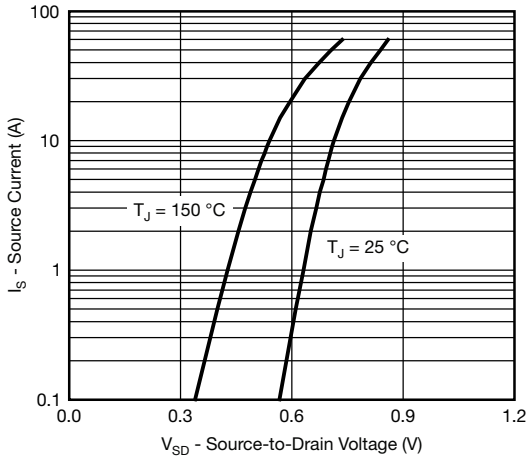


**Transconductance**

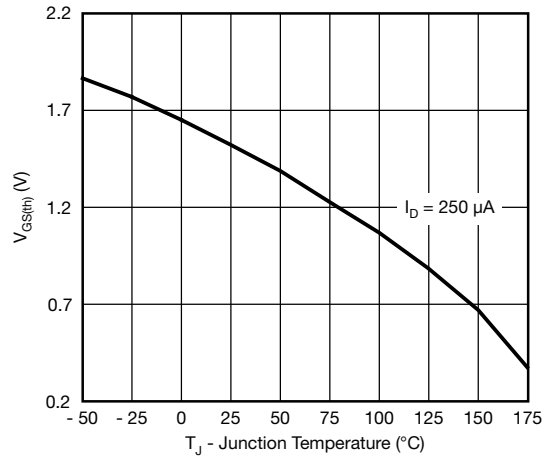


**Gate Charge**

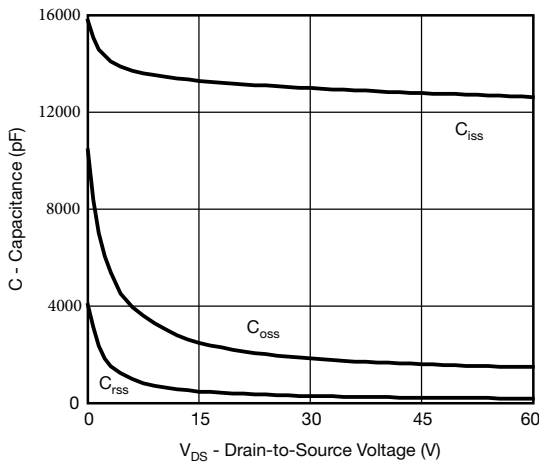
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



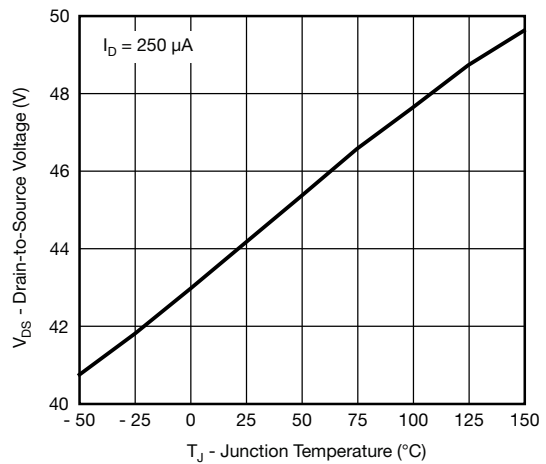
**Source-Drain Diode Forward Voltage**



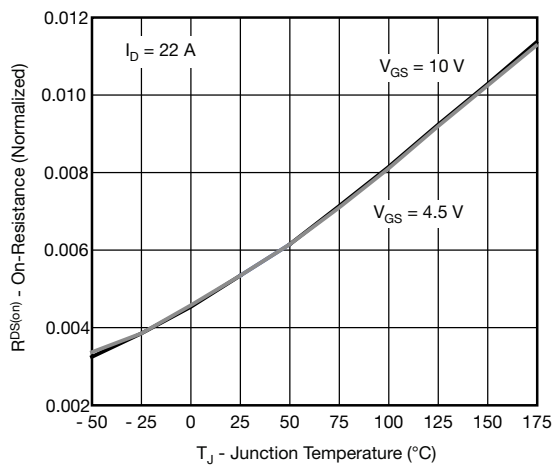
**Threshold Voltage**



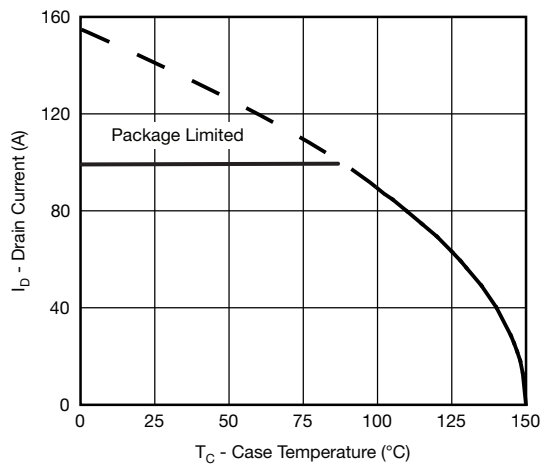
**Capacitance**



**Drain Source Breakdown vs. Junction Temperature**

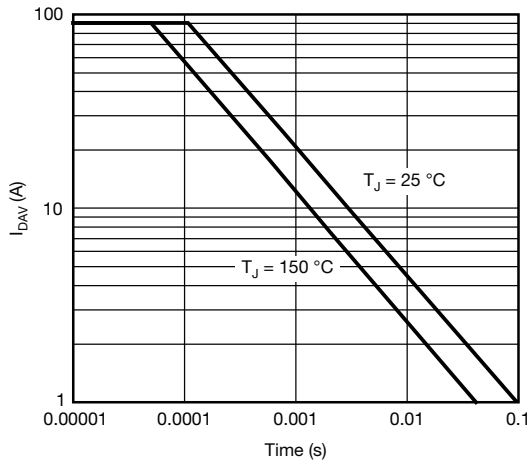


**On-Resistance vs. Junction Temperature**

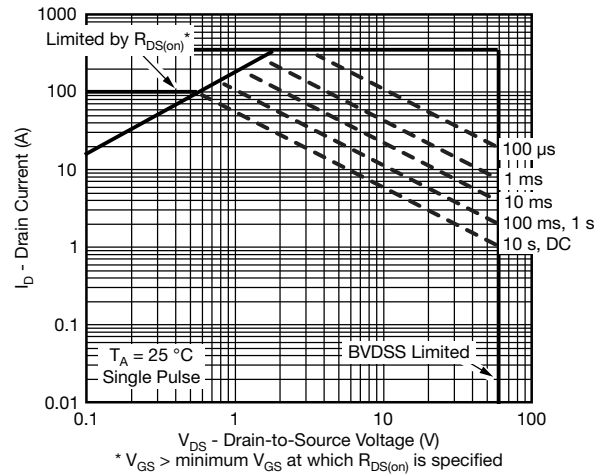


**Current Derating**

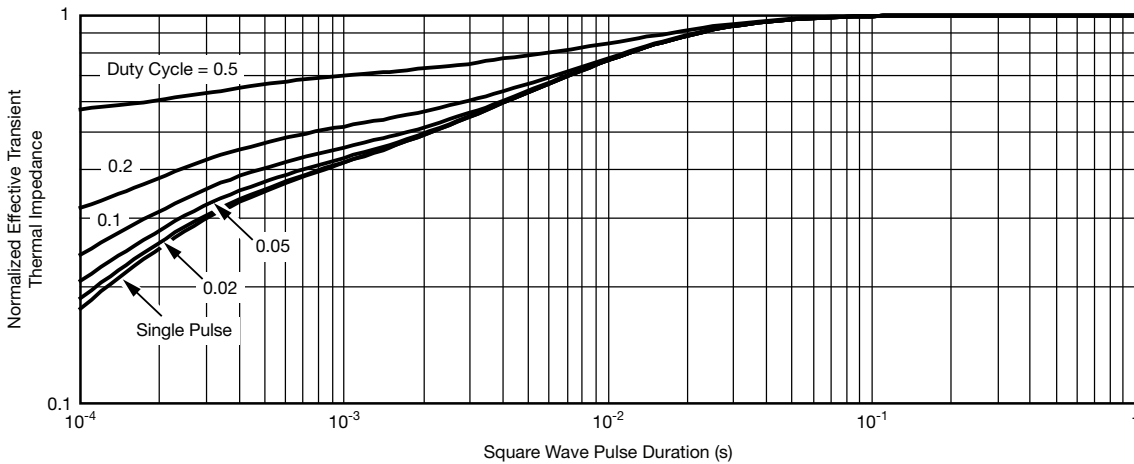
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Single Pulse Avalanche Current Capability vs. Time**



**Safe Operating Area**



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

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DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: X12-0208-Rev. N, 08-Oct-12  
DWG: 5471

**Notes**

\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM

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