

## N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	40
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.00084
$I_D$ (A)	409
Configuration	Single
Qg (nC)	250

### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  and UIS Tested

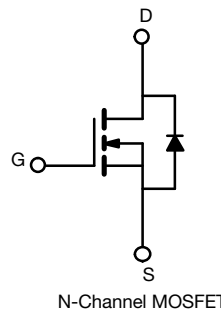
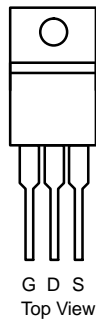
### APPLICATIONS

- Synchronous Rectification
- Power Supplies



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

TO-220AB



ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		$V_{DS}$	40	V
Gate-source voltage		$V_{GS}$	$\pm 20$	
Continuous drain current <sup>a</sup>	$T_C = 25$ °C	$I_D$	409	A
	$T_C = 125$ °C		320	
Continuous source current (diode conduction) <sup>a</sup>		$I_S$	409	
Pulsed drain current <sup>b</sup>		$I_{DM}$	600	
Single pulse avalanche current	L = 0.1 mH	$I_{AS}$	100	
Single pulse avalanche energy		$E_{AS}$	500	mJ
Maximum power dissipation <sup>b</sup>	$T_C = 25$ °C	$P_D$	375	W
	$T_C = 125$ °C		125	
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>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-case (drain)		$R_{thJC}$	0.4	

### Notes

- Based on  $T_C = 25$  °C.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %
- When mounted on 1" square PCB (FR4 material)

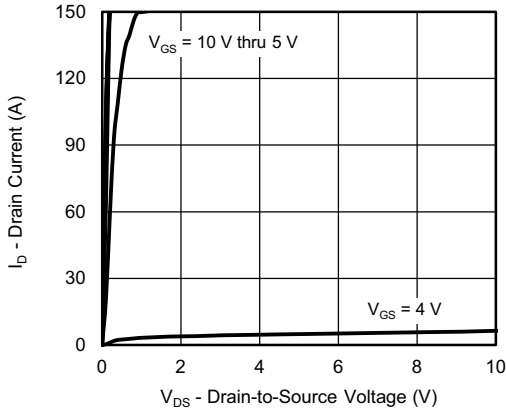
SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		40	-	-	V
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		2.5	3.0	3.5	
Gate-source leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 40 V	-	-	1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 40 V, T <sub>J</sub> = 125 °C	-	-	50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 40 V, T <sub>J</sub> = 175 °C	-	-	300	μA
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	100	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 35 A	-	0.00084	-	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 35 A, T <sub>J</sub> = 125 °C	-	0.00140	-	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 35 A, T <sub>J</sub> = 175 °C	-	0.00164	-	
Forward transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A		-	196	-	S
<b>Dynamic<sup>b</sup></b>							
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	11 938	15 525	pF
Output capacitance	C <sub>oss</sub>			-	11 163	14 520	
Reverse transfer capacitance	C <sub>rss</sub>			-	282	370	
Total gate charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 100 A	-	158	250	nC
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>			-	44	-	
Gate-drain charge <sup>c</sup>	Q <sub>gd</sub>			-	22	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz		2.70	5.44	8.20	Ω
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 20 V, R <sub>L</sub> = 0.2 Ω I <sub>D</sub> ≅ 100 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		-	16	25	ns
Rise time <sup>c</sup>	t <sub>r</sub>			-	10	17	
Turn-off delay time <sup>c</sup>	t <sub>d(off)</sub>			-	103	160	
Fall time <sup>c</sup>	t <sub>f</sub>			-	61	95	
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>							
Pulsed current <sup>a</sup>	I <sub>SM</sub>			-	-	260	A
Forward voltage	V <sub>SD</sub>	I <sub>F</sub> = 60 A, V <sub>GS</sub> = 0 V		-	0.81	1.5	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 30 A, di/dt = 100 A/μs		-	165	350	ns
Body diode reverse recovery charge	Q <sub>rr</sub>			-	530	1100	nC
Reverse recovery fall time	t <sub>a</sub>			-	66	-	ns
Reverse recovery rise time	t <sub>b</sub>			-	99	-	
Body diode peak reverse recovery current	I <sub>RM(REC)</sub>			-	-6.2	-	A

**Notes**

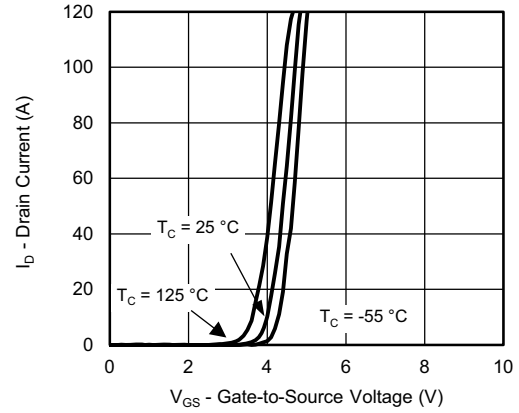
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

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.

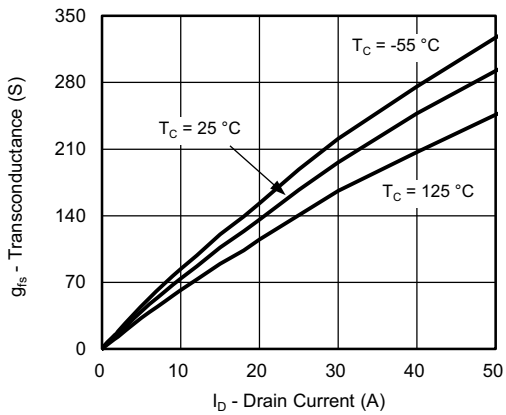
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



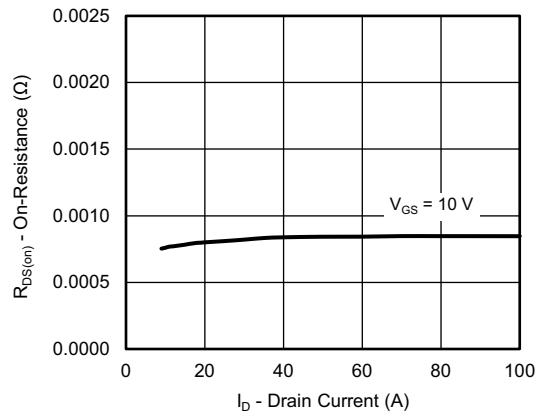
**Output Characteristics**



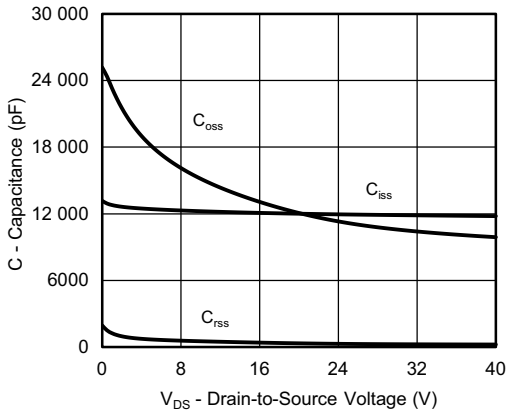
**Transfer Characteristics**



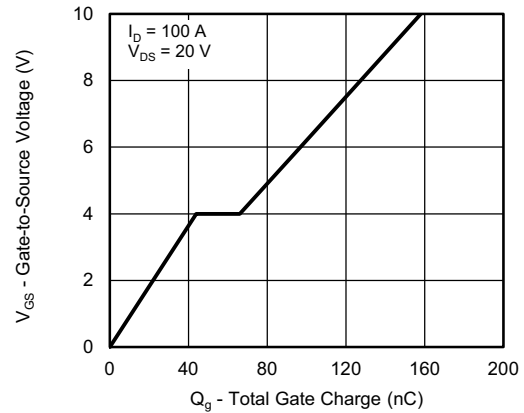
**Transconductance**



**On-Resistance vs. Drain Current**

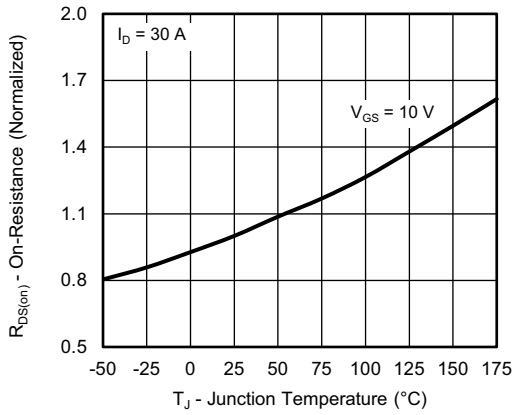


**Capacitance**

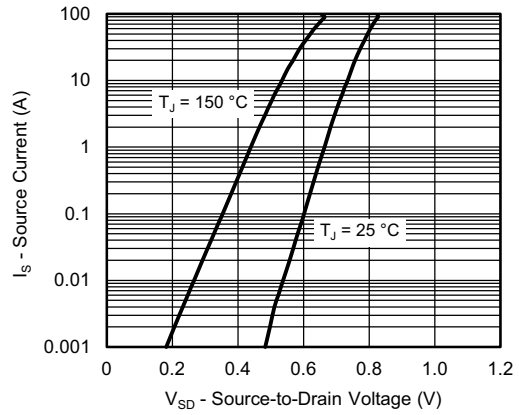


**Gate Charge**

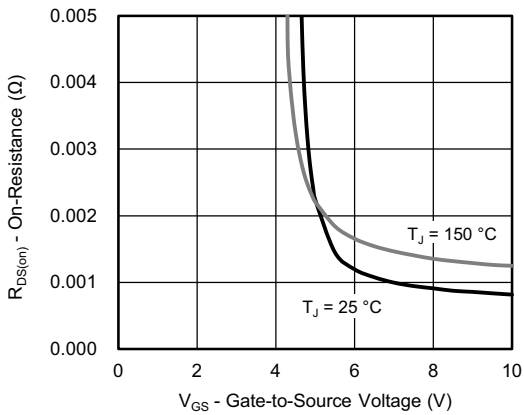
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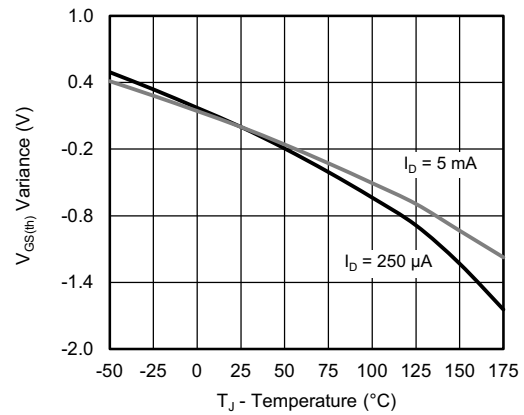
**On-Resistance vs. Junction Temperature**



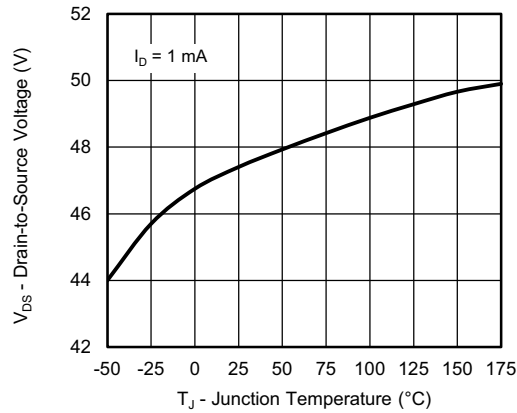
**Source Drain Diode Forward Voltage**



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

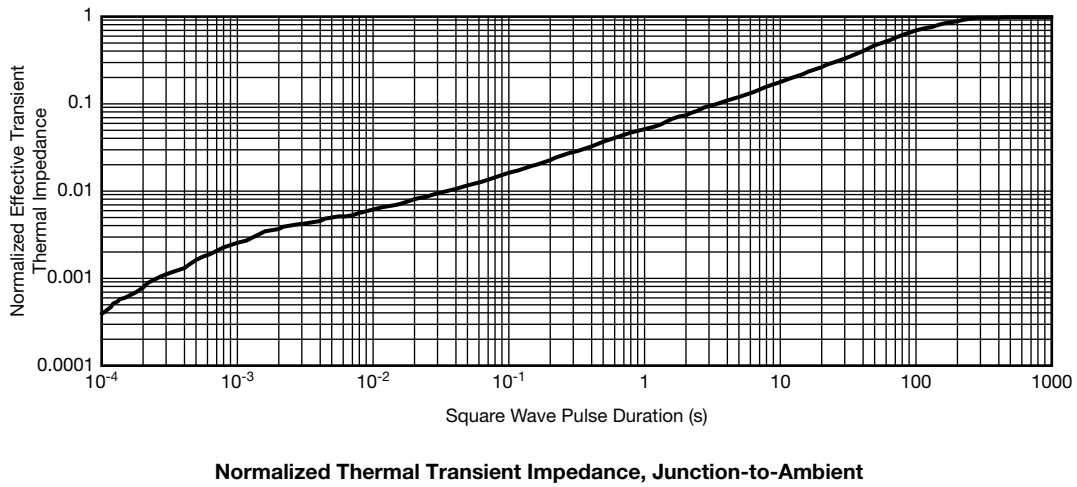
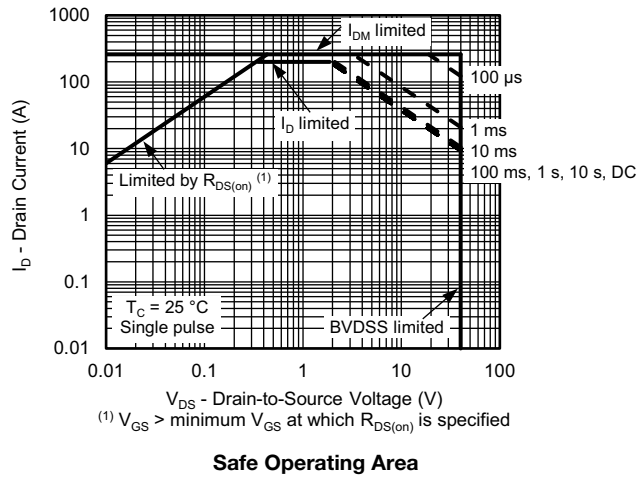


**Threshold Voltage**

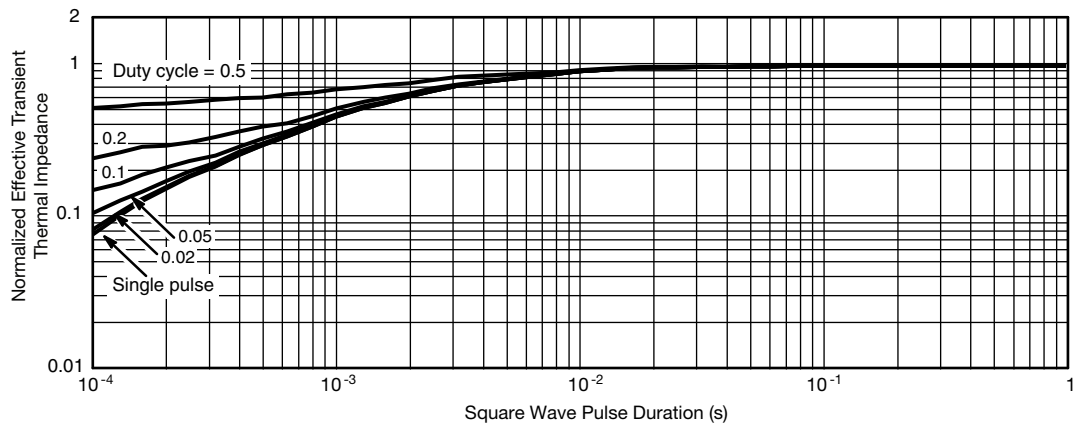


**Drain Source Breakdown vs. Junction Temperature**

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



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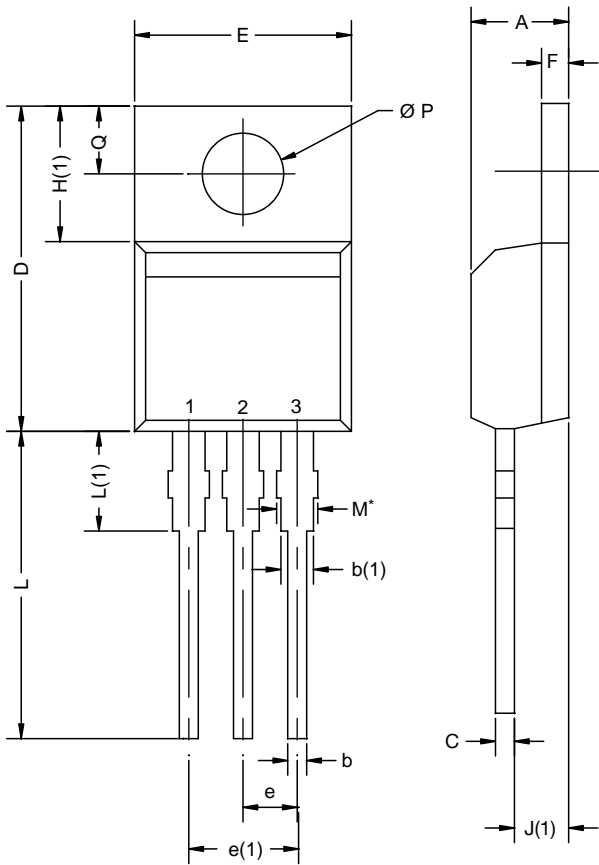


**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °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

### TO-220AB



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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