

N-Channel 60 V (D-S) MOSFET

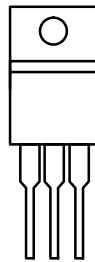
PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.003
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.009
I _D (A)	210
Configuration	Single

FEATURES

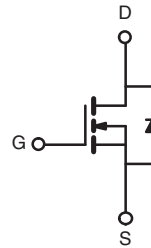
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_G and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



TO-220AB



G D S
Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V _{DS}	60	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current	I _D	T _C = 25 °C	210	A
		T _C = 125 °C	120 ^a	
Continuous Source Current (Diode Conduction) ^a	I _S	120 ^a		
Pulsed Drain Current ^b	I _{DM}	480		
Single Pulse Avalanche Current	I _{AS}	75	mJ	
Single Pulse Avalanche Energy	E _{AS}	281		
Maximum Power Dissipation ^b	P _D	T _C = 25 °C	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	R _{thJA}	40	°C/W
Junction-to-Case (Drain)	R _{thJC}	0.4	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

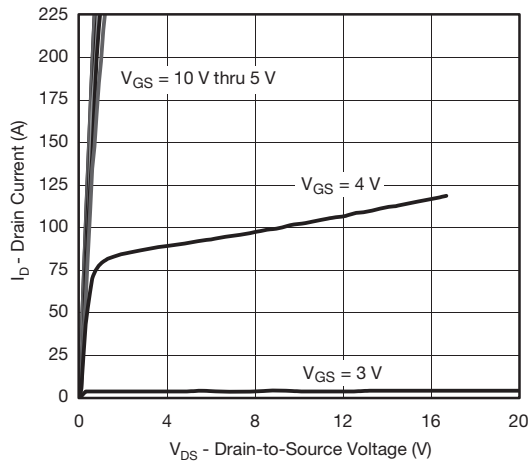
SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.0	-	3.5	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$	-	-	1.0	μA
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	350	
On-State Drain Current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	120	-	-	A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	-	0.003	-	Ω
		$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	0.006	-	
		$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	0.008	-	
		$V_{GS} = 4.5\text{ V}$	$I_D = 20\text{ A}$	-	0.009	-	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		-	109	-	S
Dynamic^b							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	9300	-	pF
Output Capacitance	C_{oss}			-	1000	-	
Reverse Transfer Capacitance	C_{rss}			-	750	-	
Total Gate Charge ^c	Q_g	$V_{GS} = 10\text{ V}$	$V_{DS} = 30\text{ V}, I_D = 110\text{ A}$	-	180	-	nC
Gate-Source Charge ^c	Q_{gs}			-	24.7	-	
Gate-Drain Charge ^c	Q_{gd}			-	50.4	-	
Gate Resistance	R_g	$f = 1\text{ MHz}$		0.5	1.1	1.6	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \cong 110\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$	-	19	29	ns	
Rise Time ^c	t_r		-	23	35		
Turn-Off Delay Time ^c	$t_{d(off)}$		-	83	125		
Fall Time ^c	t_f		-	35	53		
Source-Drain Diode Ratings and Characteristics^b							
Pulsed Current ^a	I_{SM}			-	-	480	A
Forward Voltage	V_{SD}	$I_F = 100\text{ A}, V_{GS} = 0$		-	0.9	1.5	V

Notes

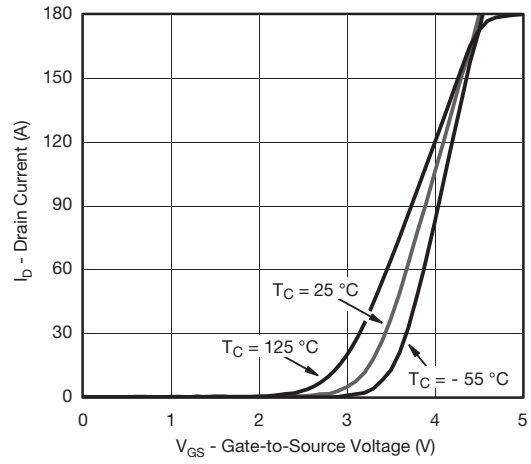
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

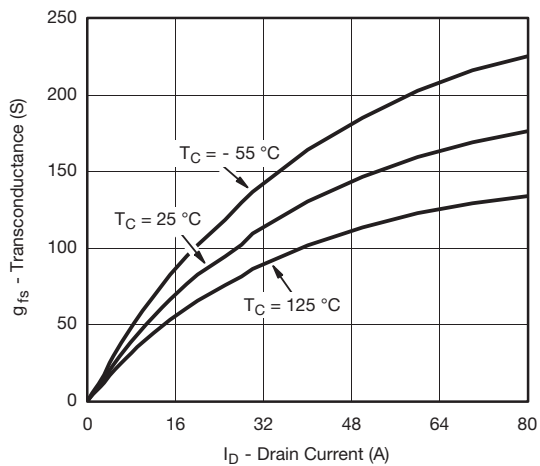
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



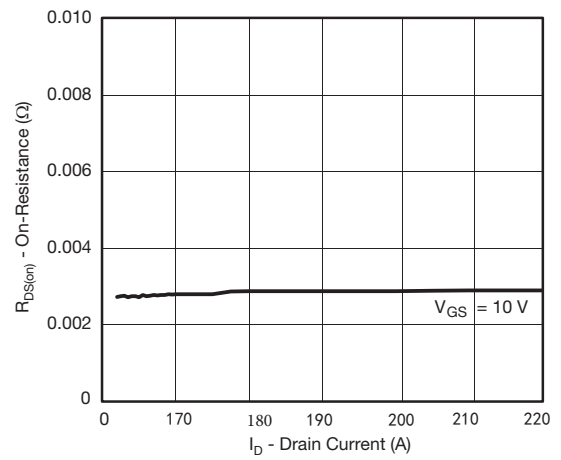
Output Characteristics



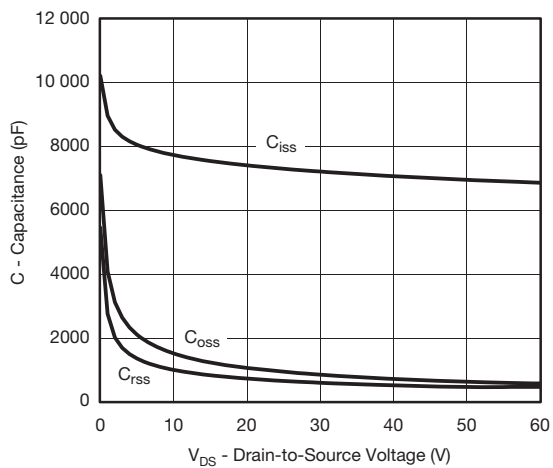
Transfer Characteristics



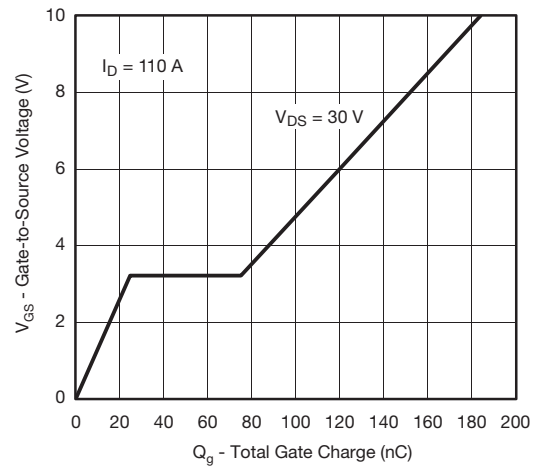
Transconductance



On-Resistance vs. Drain Current

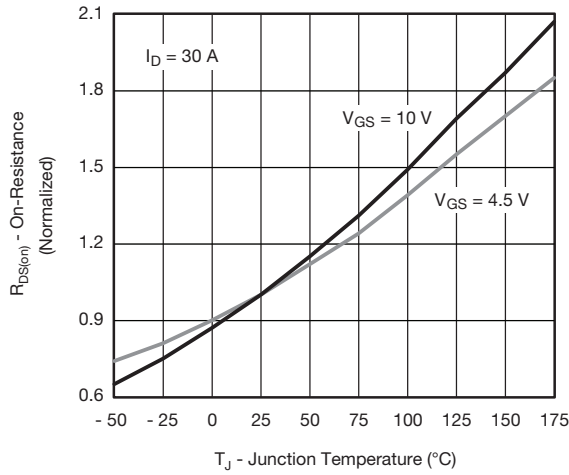


Capacitance

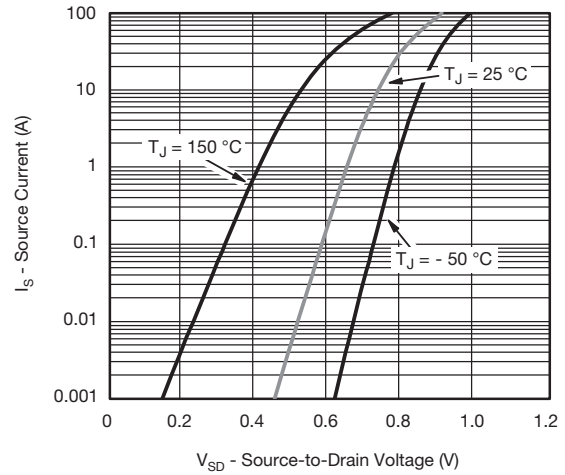


Gate Charge

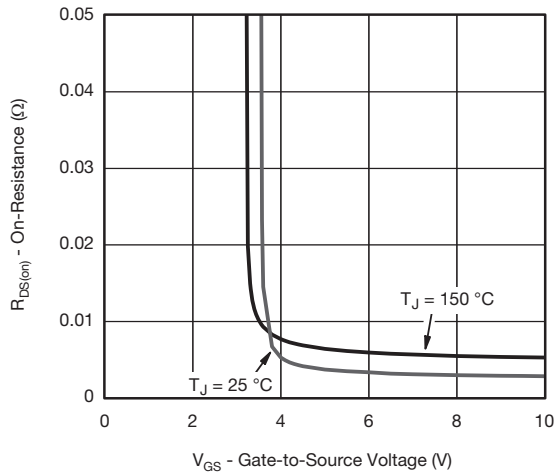
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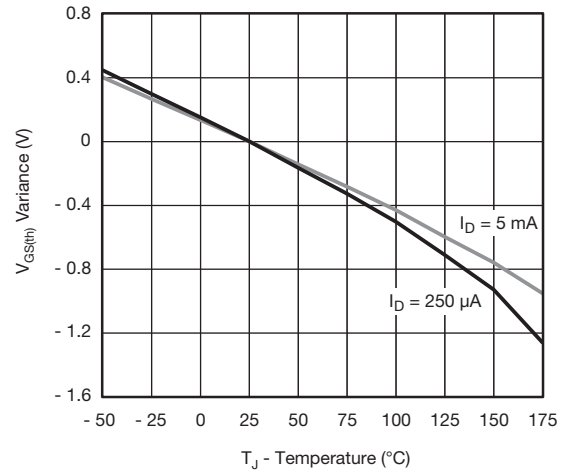
On-Resistance vs. Junction Temperature



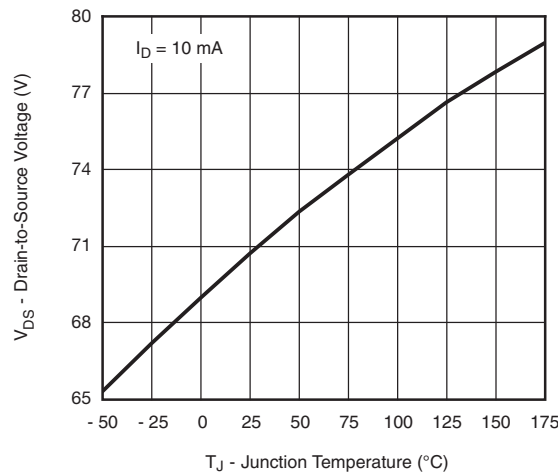
Source Drain Diode Forward Voltage



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)

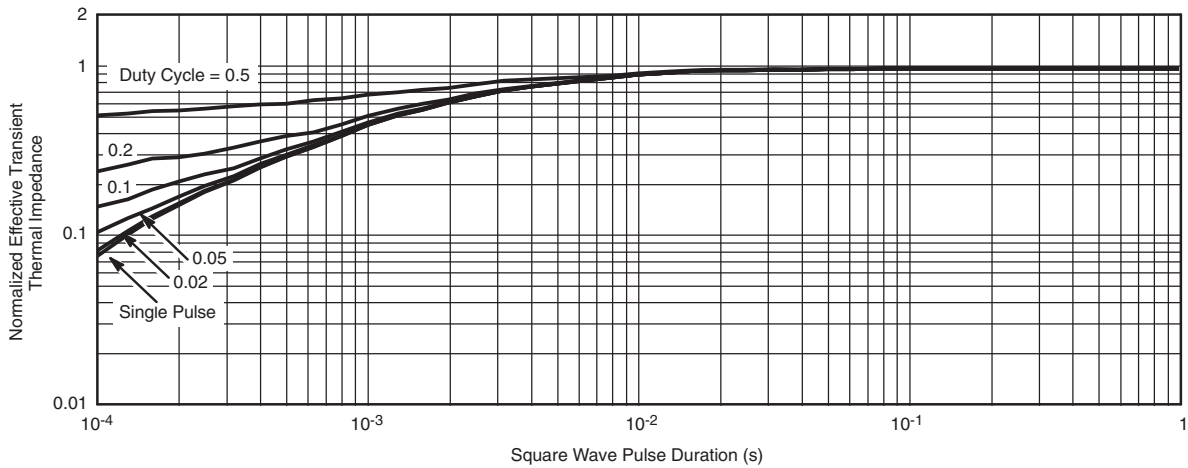


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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

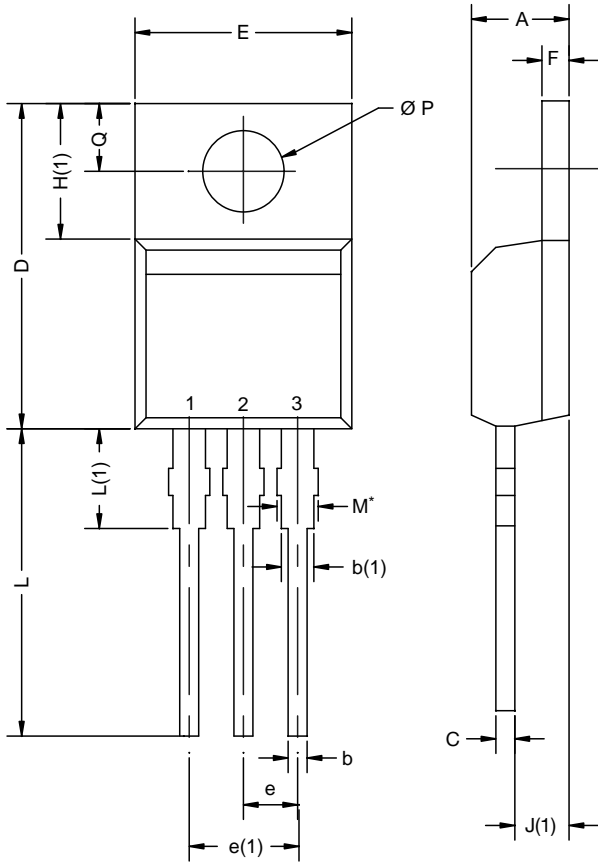


Normalized Thermal Transient Impedance, Junction-to-Case

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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