

N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
60	0.027 at $V_{GS} = 10$ V	55	27.5 nC
	0.029 at $V_{GS} = 6$ V	55	
	0.030 at $V_{GS} = 4.5$ V	50	

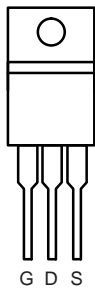
FEATURES

- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested
- Low Q_g for High Efficiency

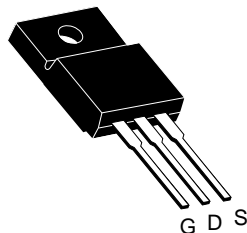

RoHS
 COMPLIANT

APPLICATIONS

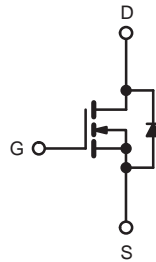
- Primary Side Switch
- POL
- Synchronous Rectifier
- DC/DC Converter
- Amusement System
- Industrial
- LED Backlighting

TO-220AB


Top View

TO-220 FULLPAK


Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed Drain Current (60 μ s Pulse Width)	I_{DM}	350	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	
Single Pulse Avalanche Current	I_{AS}	40	mJ
Single Pulse Avalanche Energy	E_{AS}	80	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)		260	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient	R_{thJA}	15	20	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	0.9	1.2	

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

 c. $t = 10$ s.

SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60			V
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA		- 6		mV/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1		3	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		0.027	0.030	Ω
		V _{GS} = 6 V, I _D = 20 A		0.029	0.032	
		V _{GS} = 4.5 V, I _D = 20 A		0.030	0.034	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 20 A		82		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 30 V, V _{GS} = 0 V, f = 1 MHz		1475		pF
Output Capacitance	C _{oss}			305		
Reverse Transfer Capacitance	C _{rss}			77		
Total Gate Charge	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 20 A		63.5	96	nC
Gate-Source Charge	Q _{gs}	V _{DS} = 30 V, V _{GS} = 4.5 V, I _D = 20 A		27.5	42	
Gate-Drain Charge	Q _{gd}			12		
				5.9		
Gate Resistance	R _g	f = 1 MHz	0.4	1.2	2.4	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 30 V, R _L = 3 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω		14	28	ns
Rise Time	t _r			11	22	
Turn-Off Delay Time	t _{d(off)}			33	60	
Fall Time	t _f			11	22	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 30 V, R _L = 3 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω		47	90	
Rise Time	t _r			97	180	
Turn-Off Delay Time	t _{d(off)}			32	60	
Fall Time	t _f			13	26	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			60	A
Pulse Diode Forward Current ^a	I _{SM}				100	
Body Diode Voltage	V _{SD}	I _S = 5 A		0.73	1.1	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C		79	120	ns
Body Diode Reverse Recovery Charge	Q _{rr}			88	135	nC
Reverse Recovery Fall Time	t _a			32		ns
Reverse Recovery Rise Time	t _b			47		

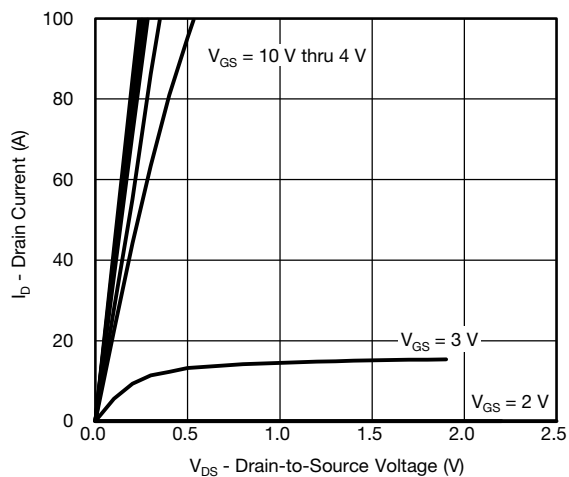
Notes:

 a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

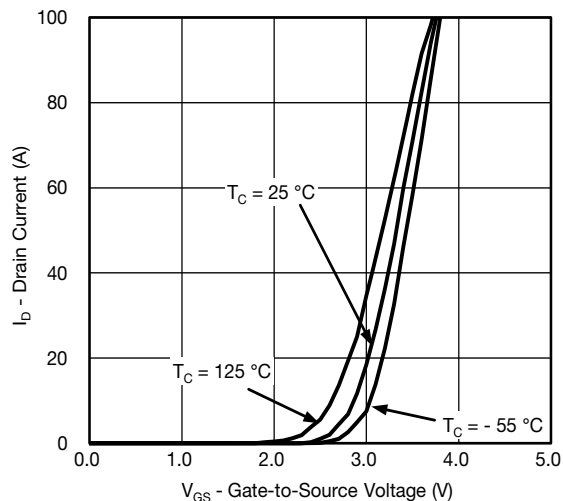
b. Guaranteed by design, not subject to production testing.

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.

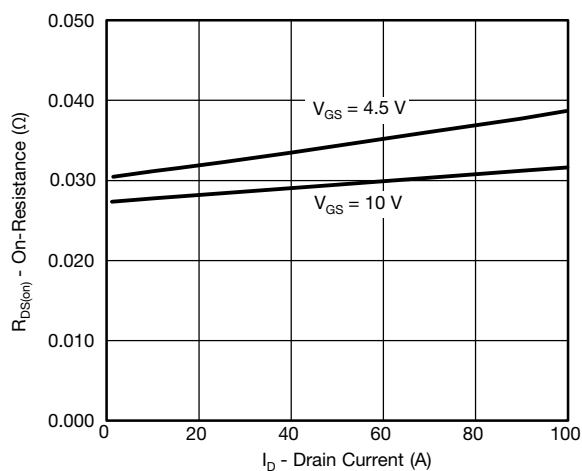
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



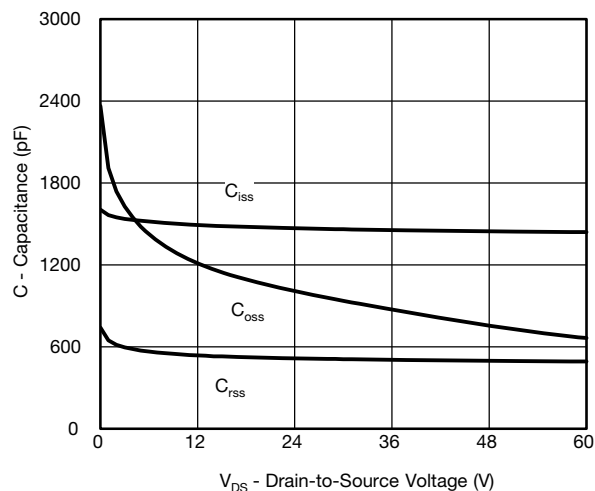
Output Characteristics



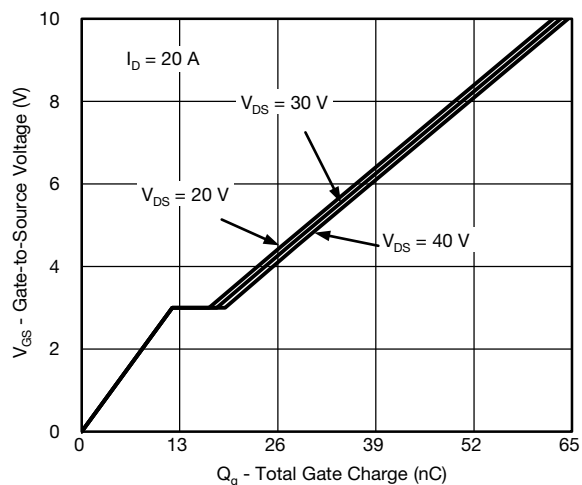
Transfer Characteristics



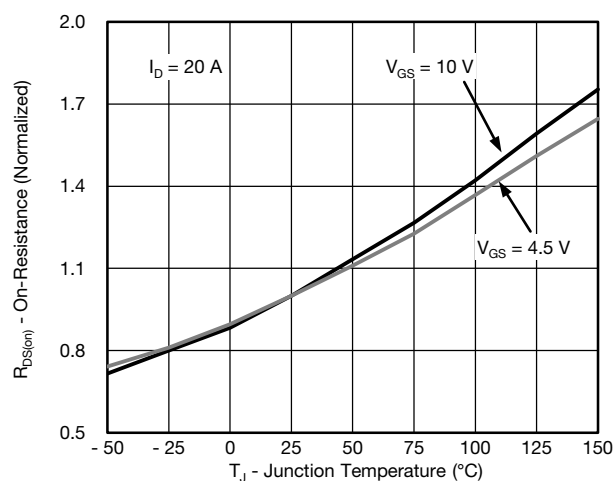
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

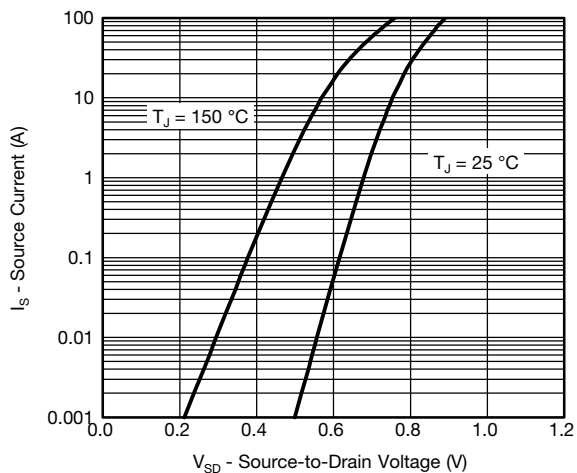


Gate Charge

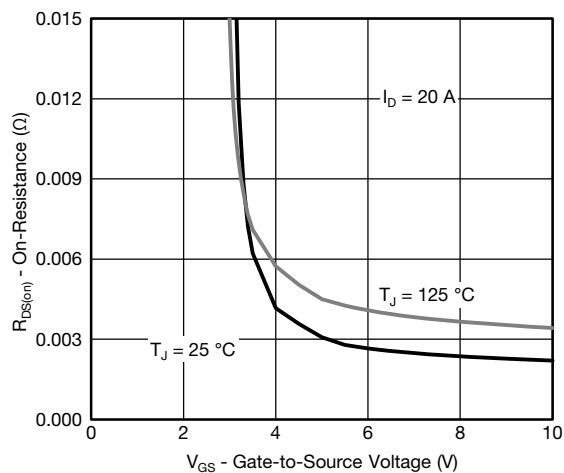


On-Resistance vs. Junction Temperature

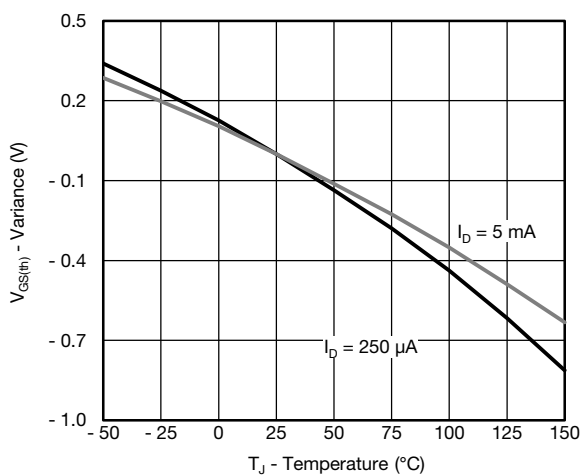
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



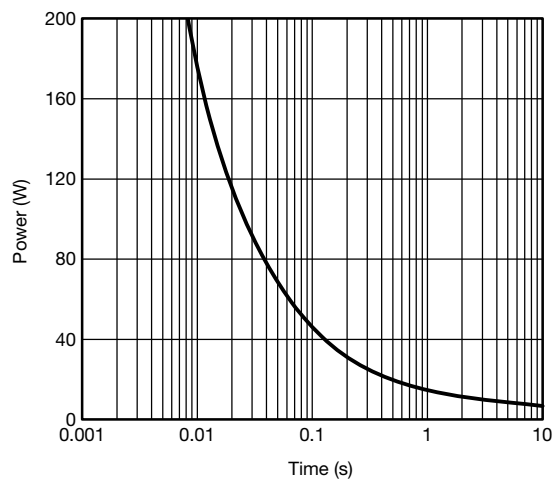
Source-Drain Diode Forward Voltage



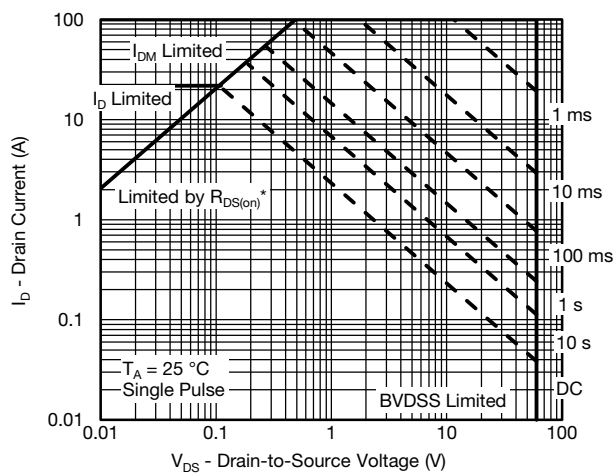
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



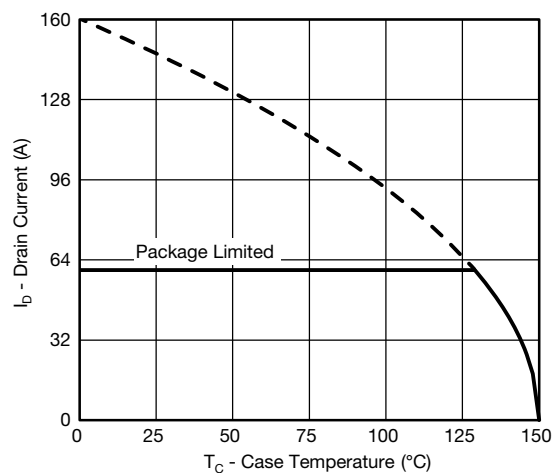
Single Pulse Power, Junction-to-Ambient



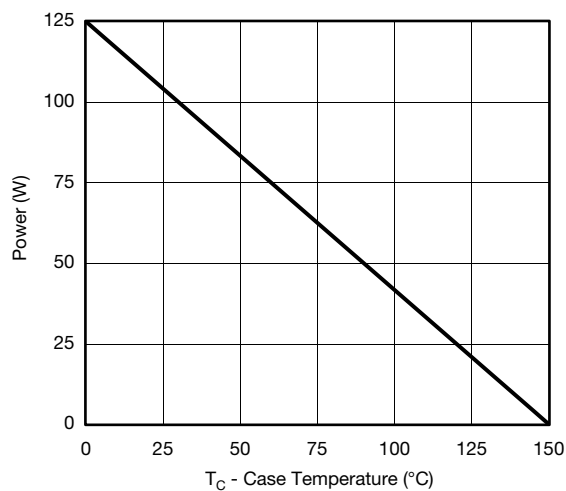
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

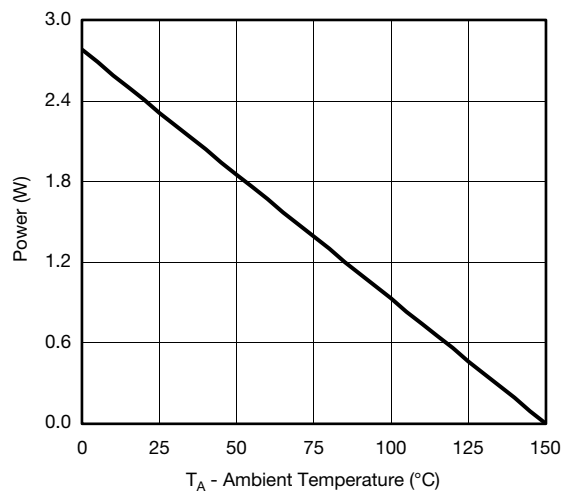
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



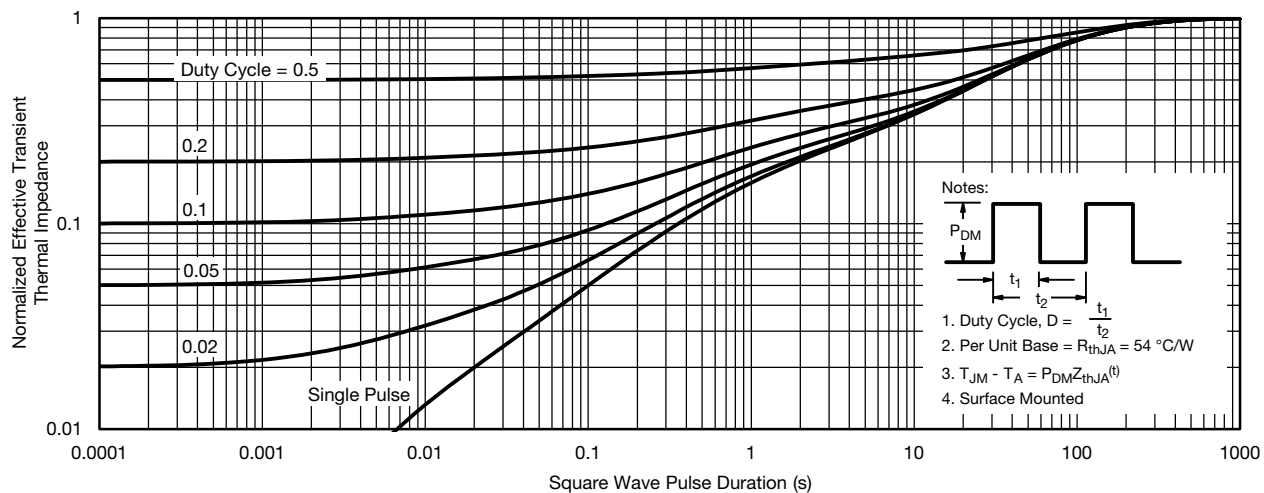
Power, Junction-to-Case



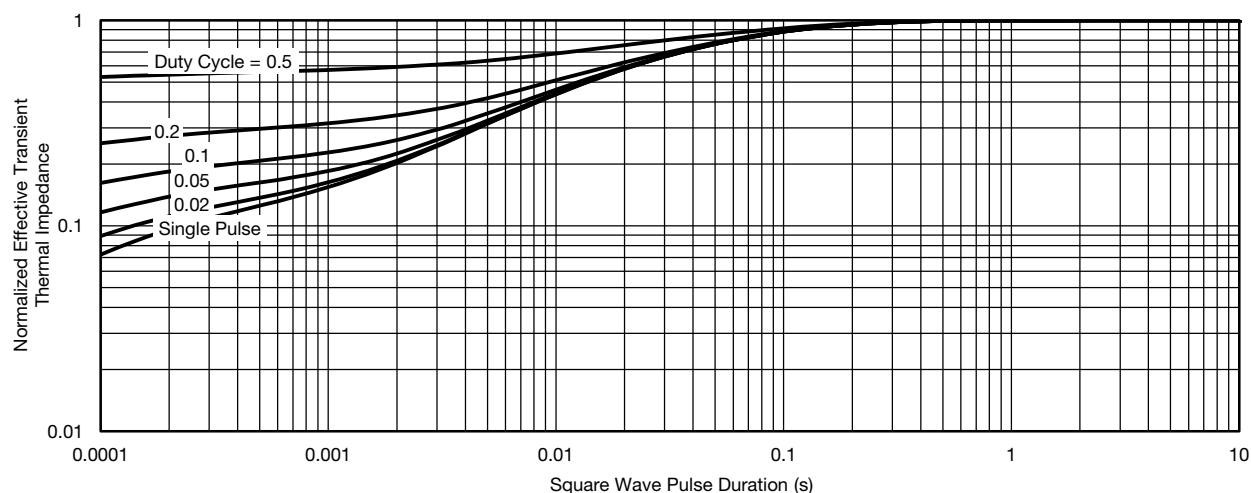
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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