



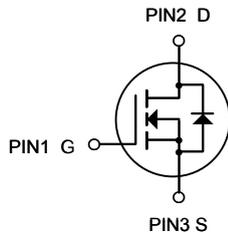
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### FEATURE

- Low gate charge
- Low  $C_{iss}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



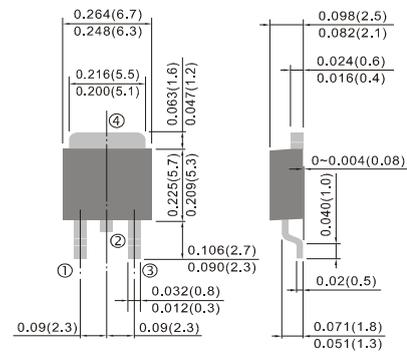
### VOLTAGE RANGE

30Volts

### CURRENT

60Amperes

### TO-252



Dimensions in inches and (millimeters)

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175\text{ }^\circ\text{C}$ )	$I_D$	$T_C = 25\text{ }^\circ\text{C}$	A
		$T_C = 70\text{ }^\circ\text{C}$	
		$T_A = 25\text{ }^\circ\text{C}$	
		$T_A = 70\text{ }^\circ\text{C}$	
Pulsed Drain Current	$I_{DM}$	250	
Avalanche Current Pulse	$I_{AS}$	39	
Single Pulse Avalanche Energy	$E_{AS}$	94.8	mJ
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	A
		$T_A = 25\text{ }^\circ\text{C}$	
Maximum Power Dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	W
		$T_C = 70\text{ }^\circ\text{C}$	
		$T_A = 25\text{ }^\circ\text{C}$	
		$T_A = 70\text{ }^\circ\text{C}$	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	$^\circ\text{C}$

# 60N03

## THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 sec	R <sub>thJA</sub>	32	40	°C/W
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.5	0.6	

Notes:

a. Based on T<sub>C</sub> = 25 °C.

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

c. t = 10 sec.

d. Maximum under steady state conditions is 90 °C/W.

e. Calculated based on maximum junction temperature. Package limitation current is 90 A.

## SPECIFICATIONS (T<sub>J</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	30			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		35		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			- 7.5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1.0		2.5	V
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>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	90			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 38.8 A		0.005		Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 37 A		0.006		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 38.8 A		160		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		2201		pF
Output Capacitance	C <sub>oss</sub>			525		
Reverse Transfer Capacitance	C <sub>rss</sub>			270		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 38.8 A		61	107	nC
		V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 28.8 A		31.5	50	
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 28.8 A		10		
Gate-Drain Charge	Q <sub>gd</sub>			6		
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 0.625 Ω I <sub>D</sub> ≅ 24 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		18	27	ns
Rise Time	t <sub>r</sub>			11	17	
Turn-Off Delay Time	t <sub>d(off)</sub>			70	105	
Fall Time	t <sub>f</sub>			10	15	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 0.67 Ω I <sub>D</sub> ≅ 22.5 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω		55	83	
Rise Time	t <sub>r</sub>			180	270	
Turn-Off Delay Time	t <sub>d(off)</sub>			55	83	
Fall Time	t <sub>f</sub>			12	18	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			120	A
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				120	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C		52	78	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			70.2	105	nC
Reverse Recovery Fall Time	t <sub>a</sub>			27		ns
Reverse Recovery Rise Time	t <sub>b</sub>			25		

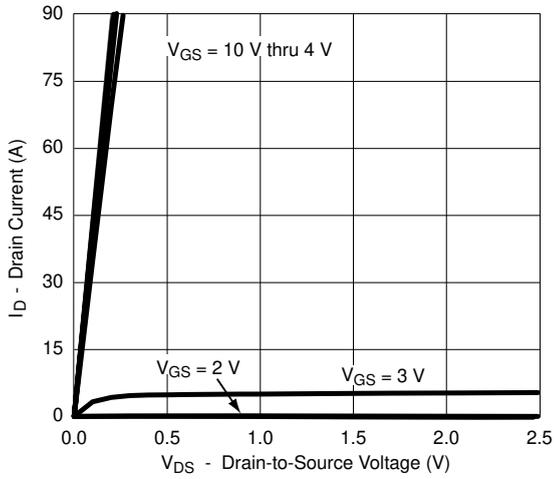
Notes:

a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.

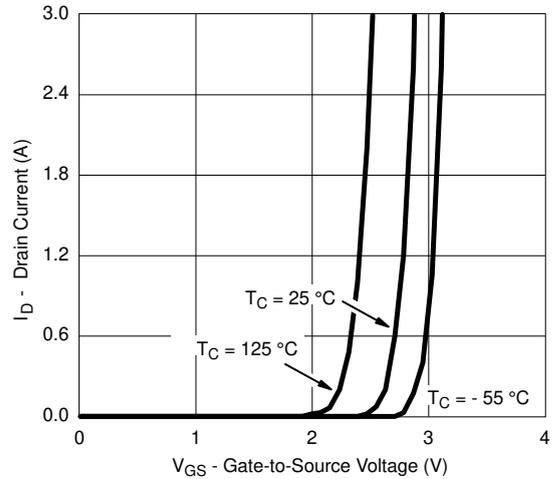
b. Guaranteed by design, not subject to production testing.

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.

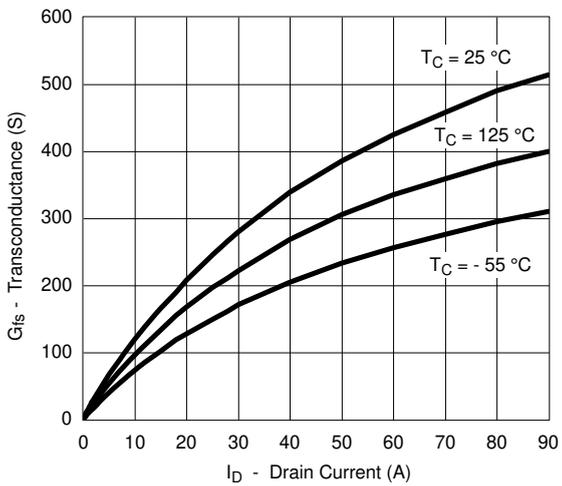
## RATING AND CHARACTERISTIC CURVES (60N03)



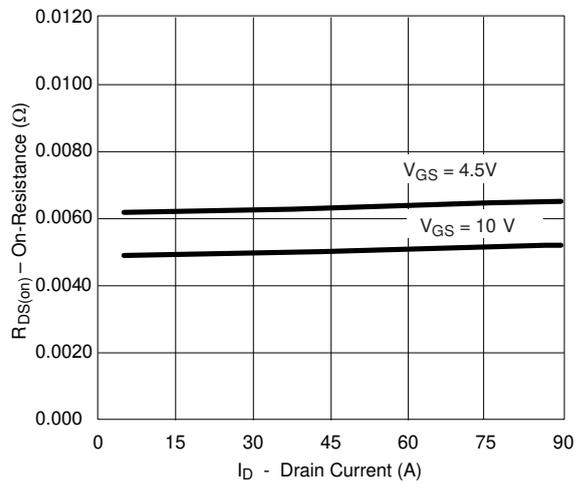
**Output Characteristics**



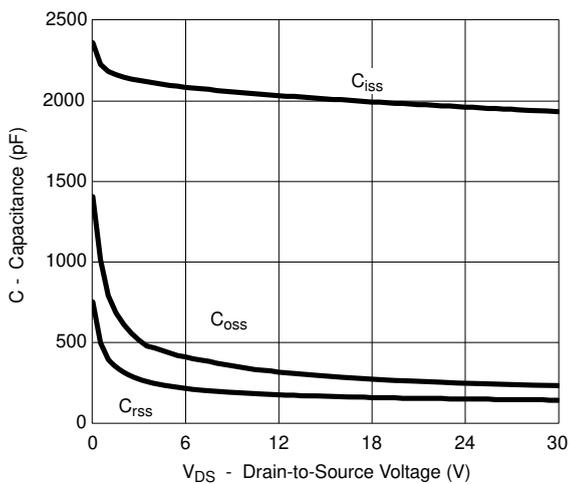
**Transfer Characteristics**



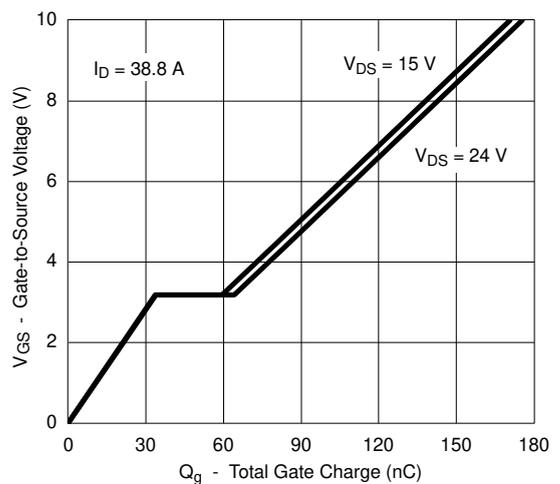
**Transconductance**



**$R_{DS(on)}$  vs. Drain Current**

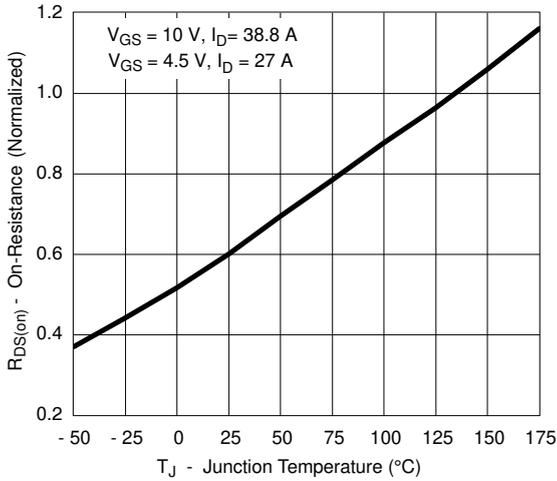


**Capacitance**

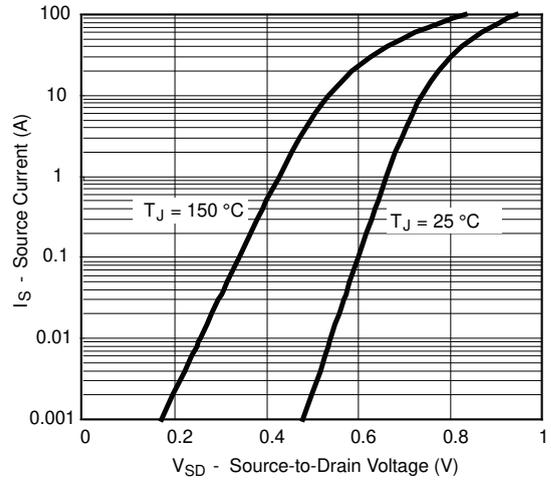


**Gate Charge**

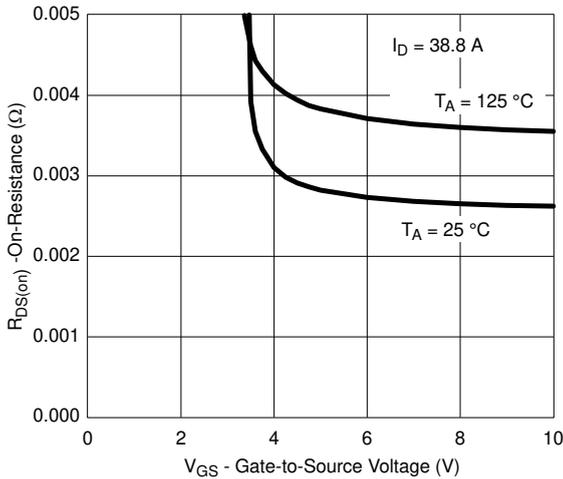
## RATING AND CHARACTERISTIC CURVES (60N03)



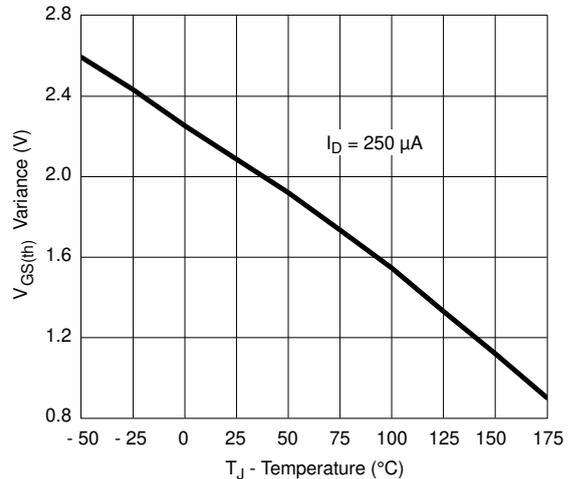
**On-Resistance vs. Junction Temperature**



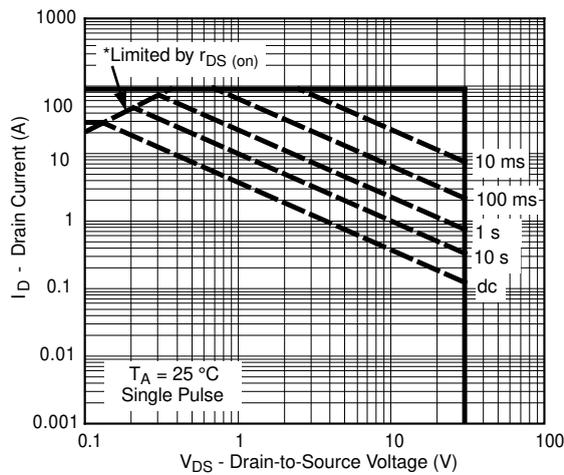
**Forward Diode Voltage vs. Temperature**



**$R_{DS(on)}$  vs.  $V_{GS}$  vs. Temperature**

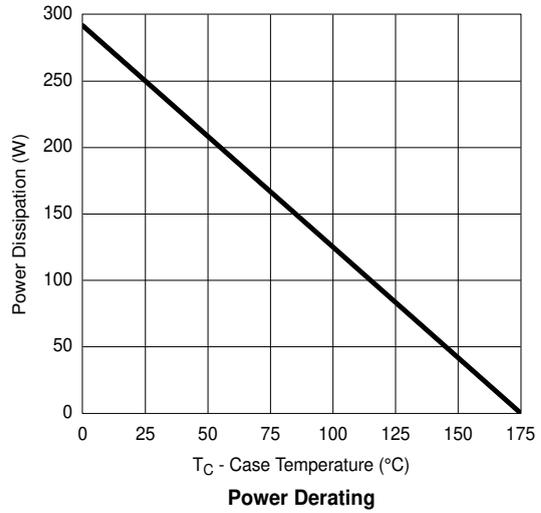
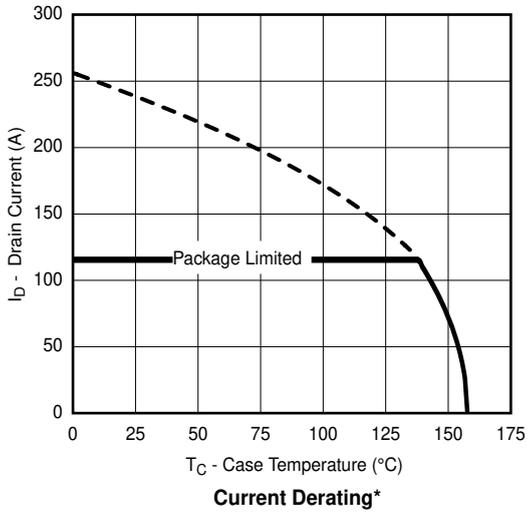


**Threshold Voltage**



**Safe Operating Area, Junction-to-Ambient**

## RATING AND CHARACTERISTIC CURVES (60N03)



\*The power dissipation  $P_D$  is based on  $T_{J(max)} = 175\text{ }^\circ\text{C}$ , 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.

