VBsemi

D603A-VB Datasheet

N-and P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

|	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
N-Channel	60	0.030 at V_{GS} = 10 V	35	6 nC
		0.033 at V_{GS} = 4.5 V	30	
P-Channel	- 60	0.050 at V_{GS} = - 10 V	- 19	8 nC
		0.060 at V_{GS} = - 4.5 V	- 15	

FEATURES
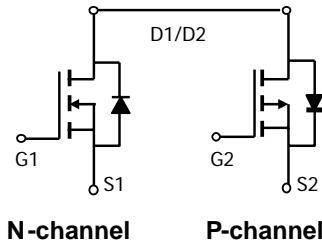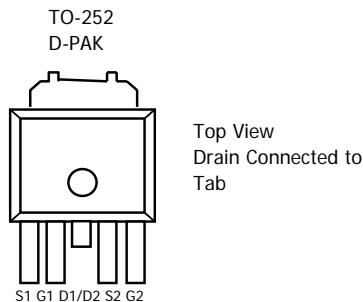
- **Halogen-free According to IEC 61249-2-21 Available**
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- CCFL Inverter

Pb-free

RoHS COMPLIANT

HALOGEN FREE Available

TO-252
D-PAK

Top View
Drain Connected to Tab

S1 G1 D1/D2 S2 G2

D1/D2

G1   S1   G2   S2

N-channel   **P-channel**

ABSOLUTE MAXIMUM RATINGS (TA = 25°C UNLESS OTHERWISE NOTED)					
Parameter		Symbol	Nch Limit	Pch Limit	Units
Drain-Source Voltage		V_{DS}	60	-60	V
Gate-Source Voltage		V_{GS}	±20	±20	
Continuous Drain Current [a]	T_C=25°C	I_D	35	-20	A
Pulsed Drain Current [b]		I_{DM}	140	-80	
Continuous Source Current (Diode Conduction) [a]	T_C=25°C	I_S	35	-20	A
Power Dissipation [a]	T_C=25°C	P_D	50	50	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	T_J, T_{stg}	-55 to 175	°C
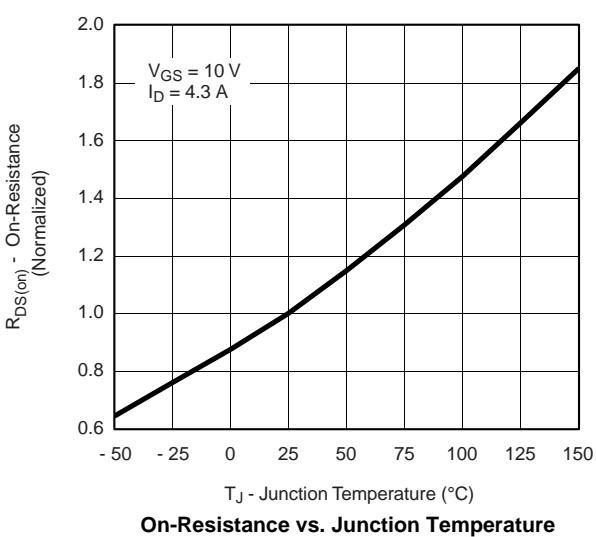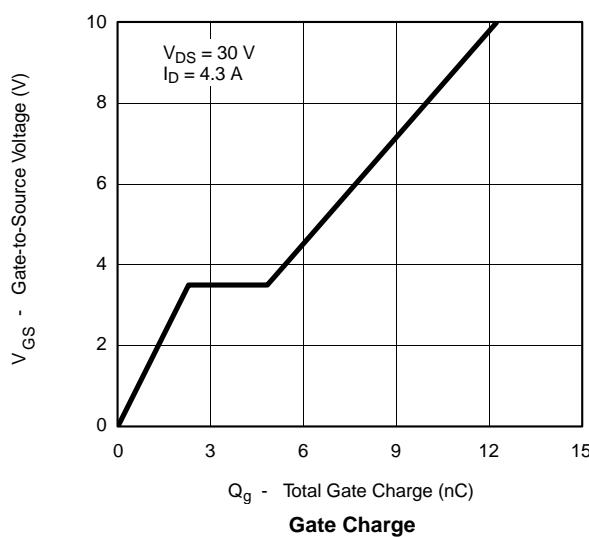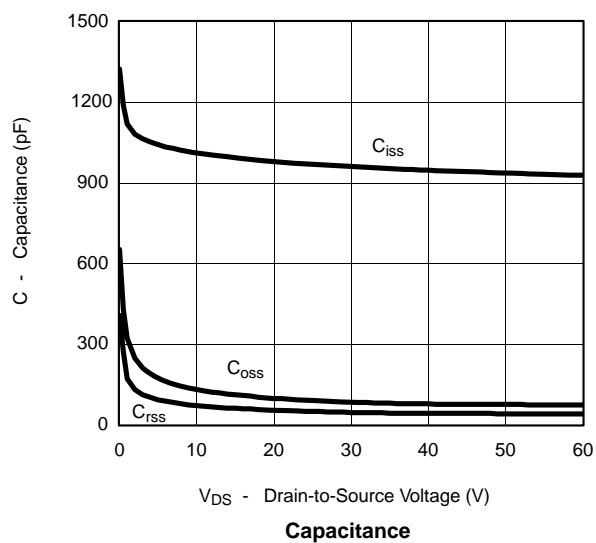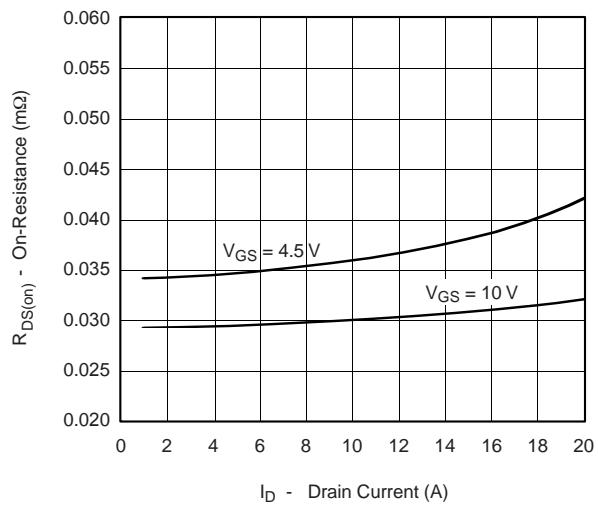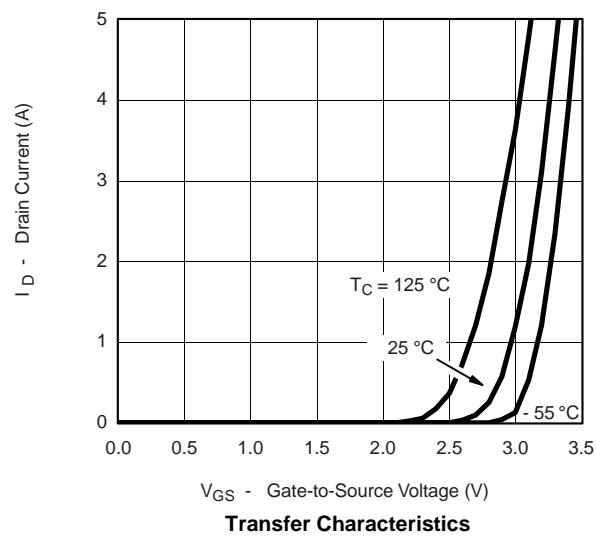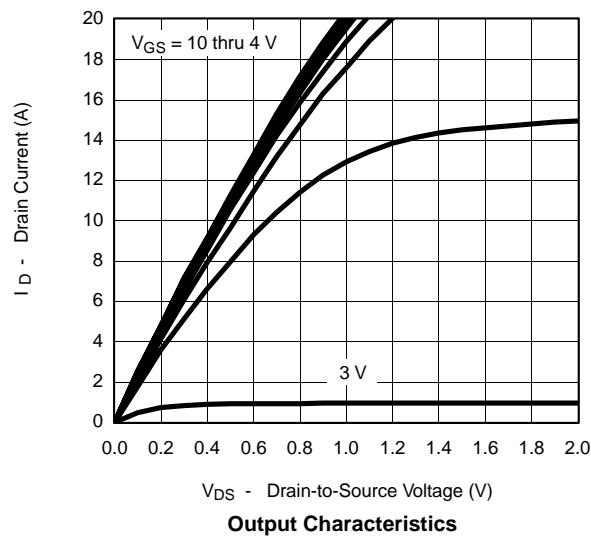
| THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient [c]	$R_{\theta JA}$	50	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	3	
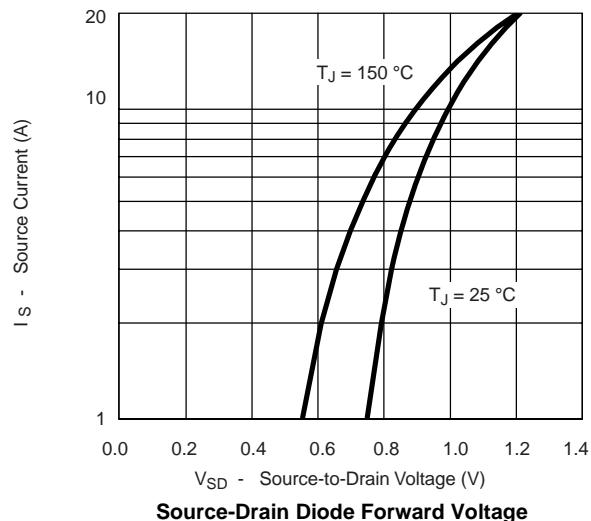
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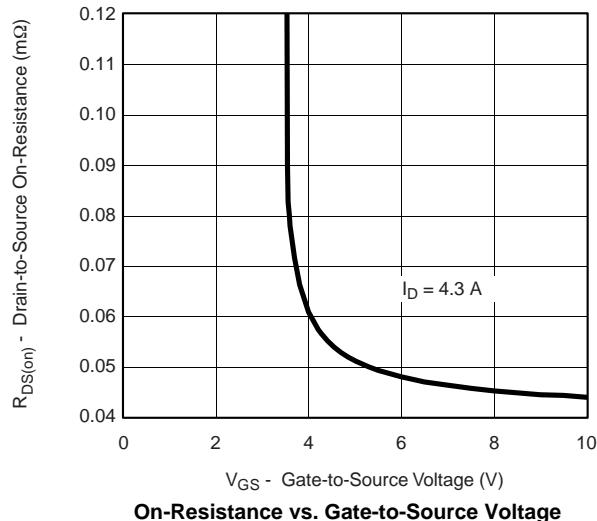
a. Package Limited
b. Pulse width limited by maximum junction temperature
c. Surface Mounted on 1" x 1" FR4 Board.

| Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 uA	1		3	V
		$V_{DS} = V_{GS}$, I_D = -250 uA	-1		-3	V
Gate-Body 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	uA
		V_{DS} = -48 V, V_{GS} = 0 V			-1	
On-State Drain Current [a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	45			A
		V_{DS} = -5 V, V_{GS} = -10 V	-25			A
Drain-Source On-Resistance [a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		30		mΩ
		V_{GS} = 4.5 V, I_D = 16 A		33		
		V_{GS} = -10 V, I_D = -10 A		50		mΩ
		V_{GS} = -4.5 V, I_D = -8 A		60		
Forward Transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		15		S
		V_{DS} = -15 V, I_D = -10 A		11		S
Diode Forward Voltage [a]	V_{SD}	I_S = 17 A, V_{GS} = 0 V		0.89		V
		I_S = -10 A, V_{GS} = 0 V		-0.98		V
Dynamic [b]						
Total Gate Charge	Q_g	N - Channel V_{DS} = 30 V, V_{GS} = 4.5 V, I_D = 20 A		9		nC
Gate-Source Charge	Q_{gs}			3		
Gate-Drain Charge	Q_{gd}			4		
Turn-On Delay Time	$t_{d(on)}$	N - Channel V_{DS} = 30 V, R_L = 1.5 Ω, I_D = 20 A, V_{GEN} = 10 V, R_{GEN} = 6 Ω		5		ns
Rise Time	t_r			5		
Turn-Off Delay Time	$t_{d(off)}$			27		
Fall Time	t_f			8		
Input Capacitance	C_{iss}	N - Channel V_{DS} = 15 V, V_{GS} = 0 V, f = 1 Mhz		1500		pF
Output Capacitance	C_{oss}			84		
Reverse Transfer Capacitance	C_{rss}			79		
Total Gate Charge	Q_g	P - Channel V_{DS} = -30 V, V_{GS} = 4.5 V, I_D = -10 A		10		nC
Gate-Source Charge	Q_{gs}			5		
Gate-Drain Charge	Q_{gd}			4		
Turn-On Delay Time	$t_{d(on)}$	P - Channel V_{DS} = -30 V, R_L = 3 Ω, I_D = -10 A, V_{GEN} = -10 V, R_{GEN} = 6 Ω		5		ns
Rise Time	t_r			4		
Turn-Off Delay Time	$t_{d(off)}$			30		
Fall Time	t_f			11		
Input Capacitance	C_{iss}	P - Channel V_{DS} = -15 V, V_{GS} = 0 V, f = 1 Mhz		1180		pF
Output Capacitance	C_{oss}			84		
Reverse Transfer Capacitance	C_{rss}			60		
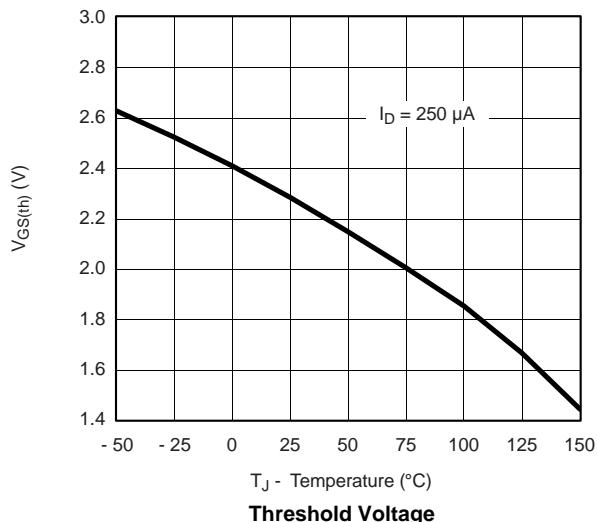
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

V_{GS} = 10 thru 4 V

3 V

I_D - Drain Current (A)

V_{DS} - Drain-to-Source Voltage (V)

Transfer Characteristics

T_C = 125 °C

25 °C

- 55 °C

I_D - Drain Current (A)

V_{GS} - Gate-to-Source Voltage (V)

On-Resistance vs. Drain Current and Gate Voltage

V_{GS} = 4.5 V

V_{GS} = 10 V

$R_{DS(on)}$ - On-Resistance (mΩ)

I_D - Drain Current (A)

Capacitance

C_{iss}

C_{oss}

C_{rss}

C - Capacitance (pF)

V_{DS} - Drain-to-Source Voltage (V)

Gate Charge

V_{DS} = 30 V
I_D = 4.3 A

V_{GS} - Gate-to-Source Voltage (V)

Q_g - Total Gate Charge (nC)

On-Resistance vs. Junction Temperature

V_{GS} = 10 V
I_D = 4.3 A

$R_{DS(on)}$ - On-Resistance (Normalized)

T_J - Junction Temperature (°C)

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3

## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted
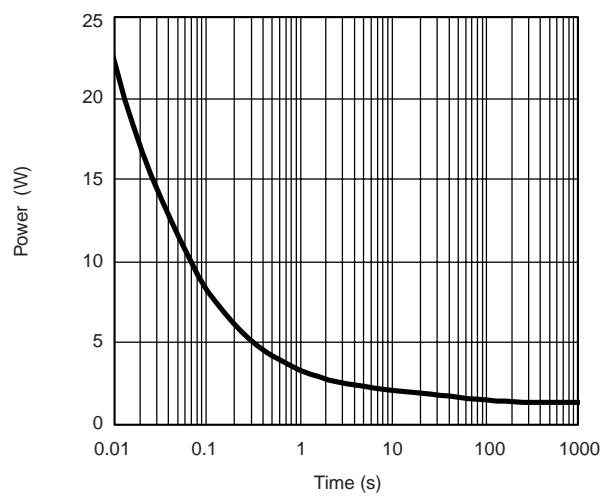
Source-Drain Diode Forward Voltage
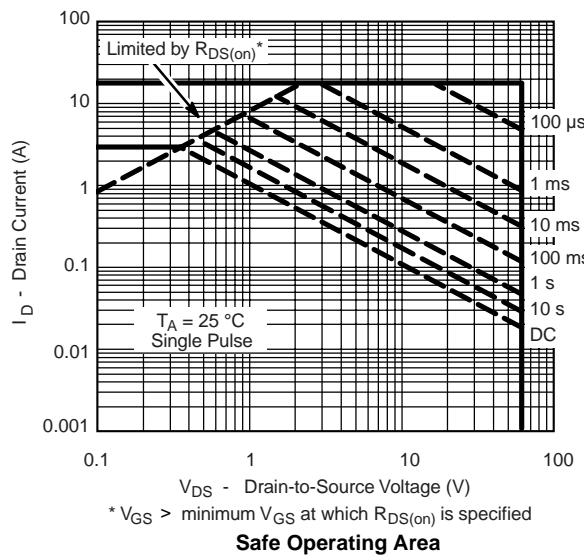
**On-Resistance vs. Gate-to-Source Voltage**
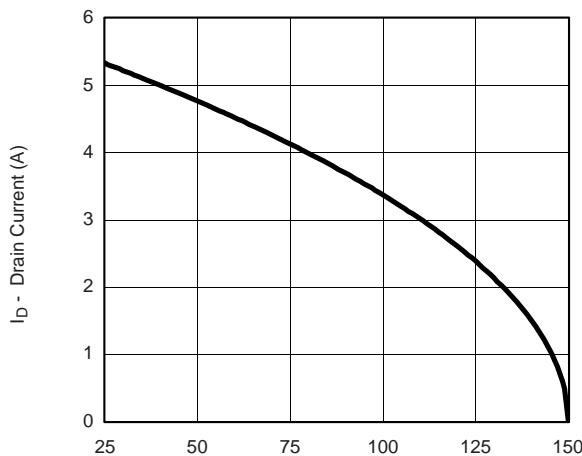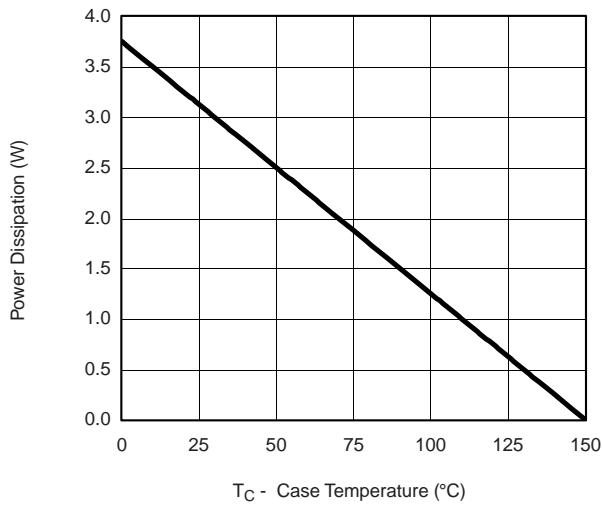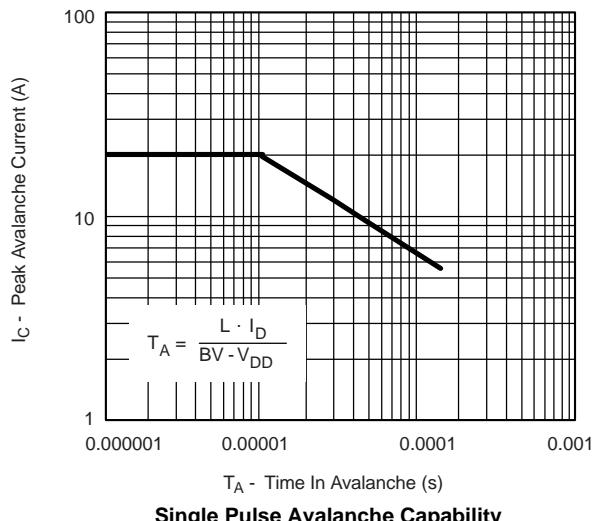
Threshold Voltage
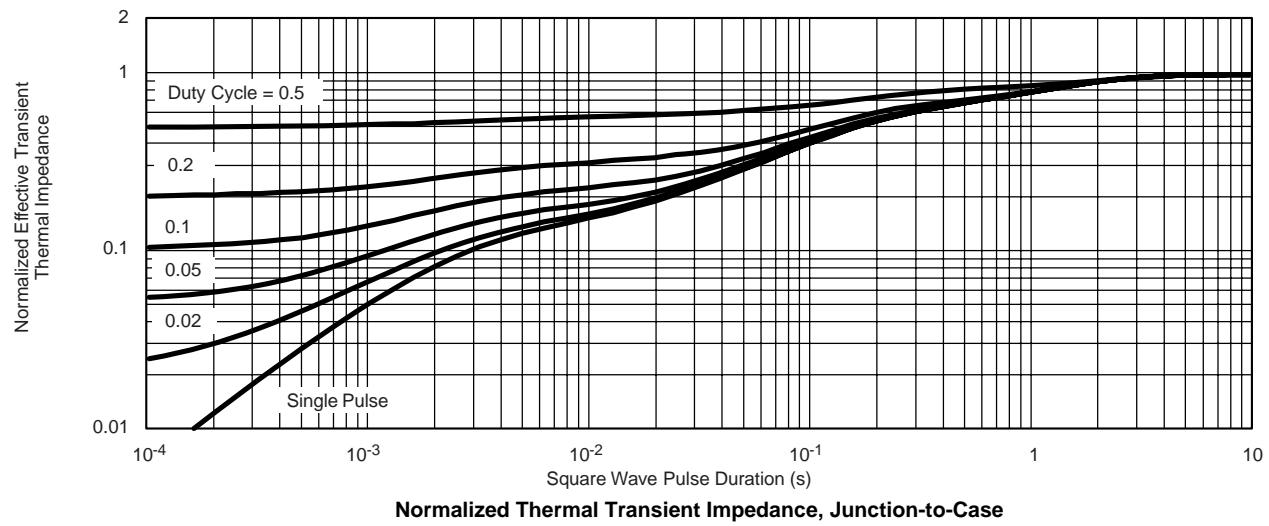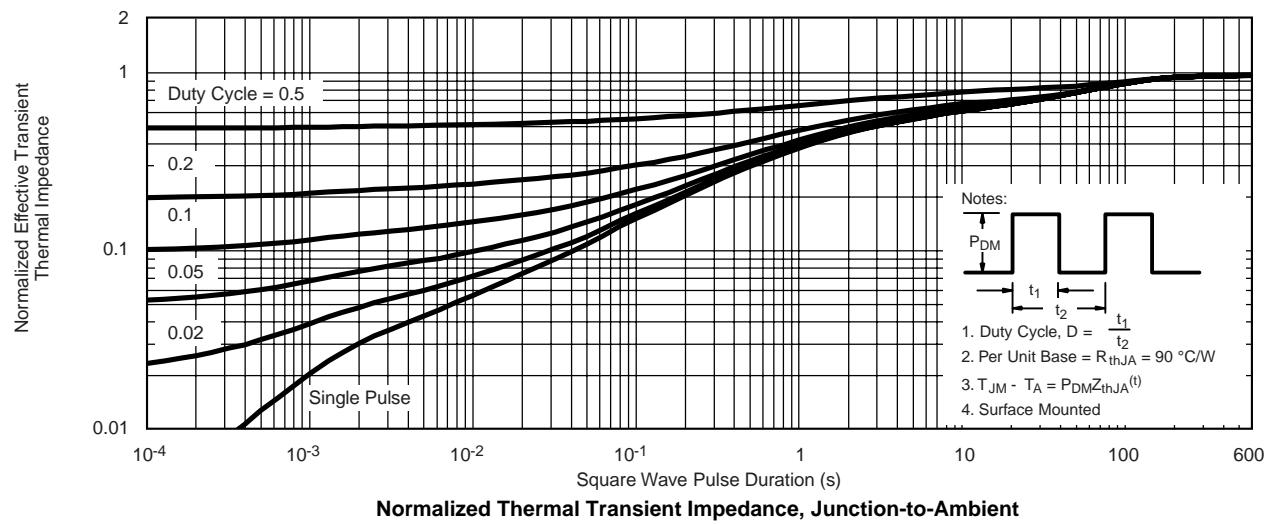
Single Pulse Power, Junction-to-Ambient

Safe Operating Area

$^*V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
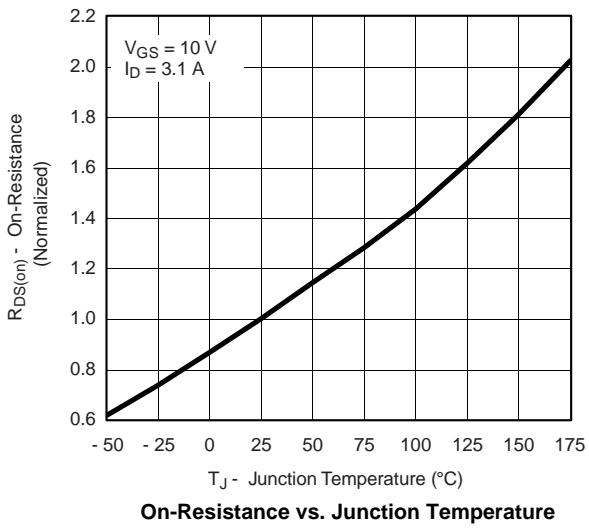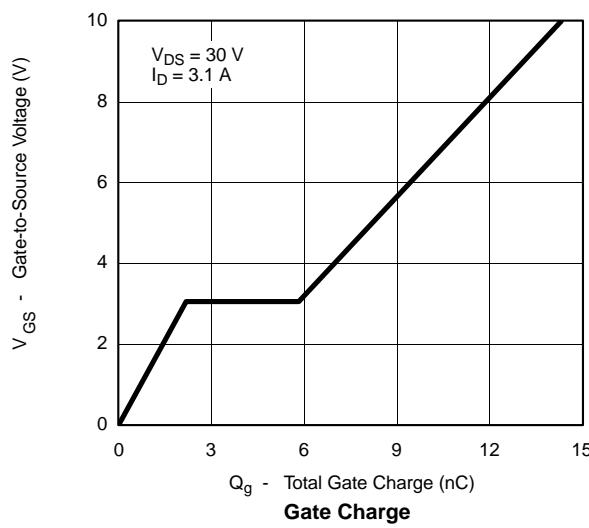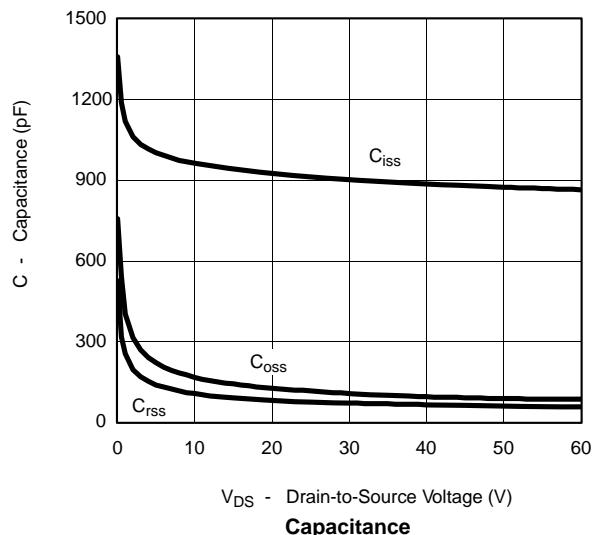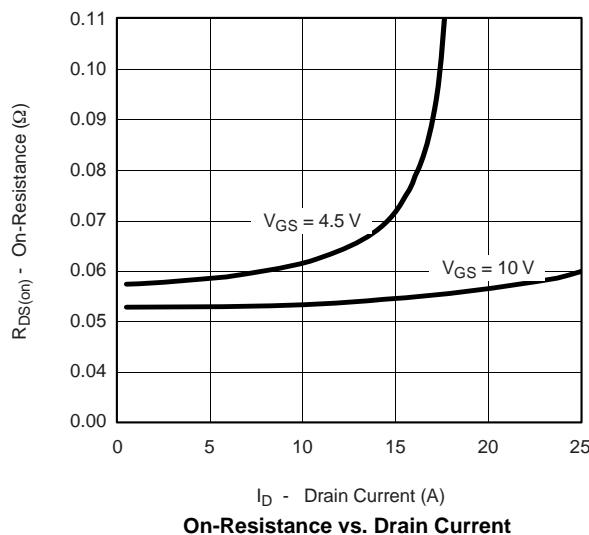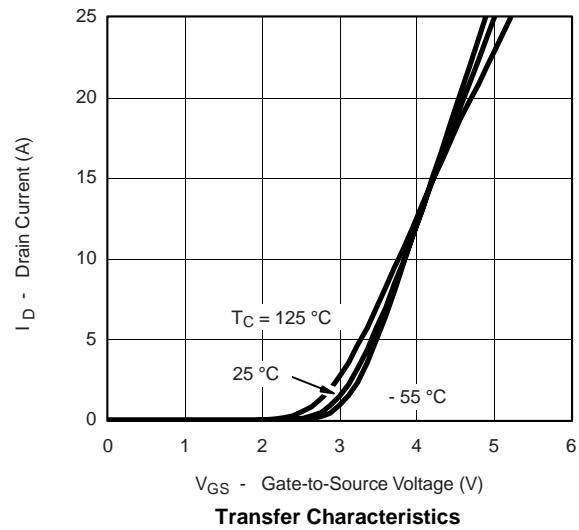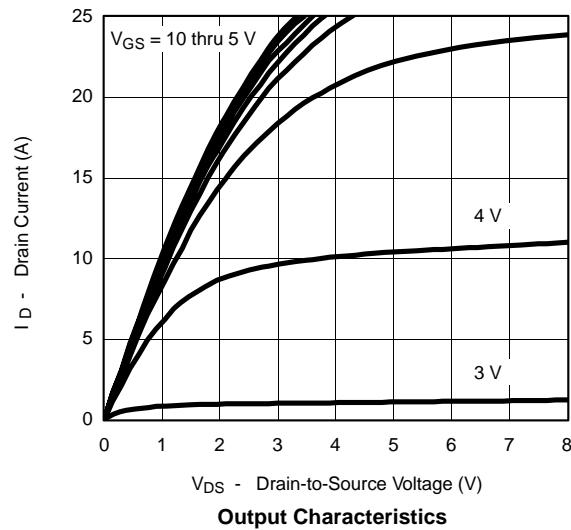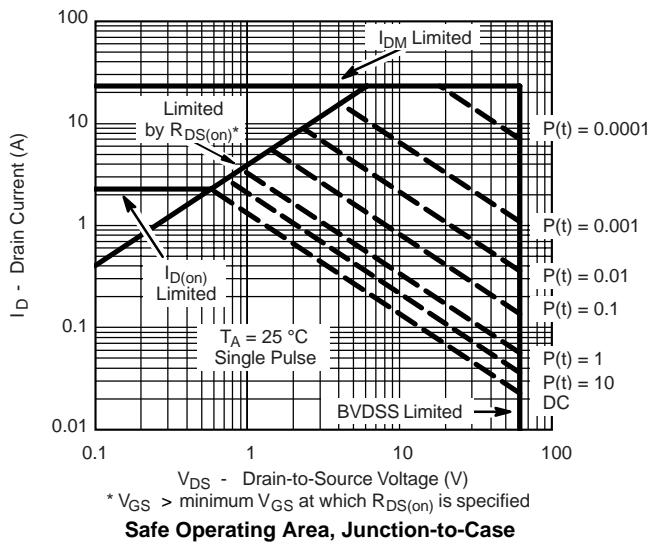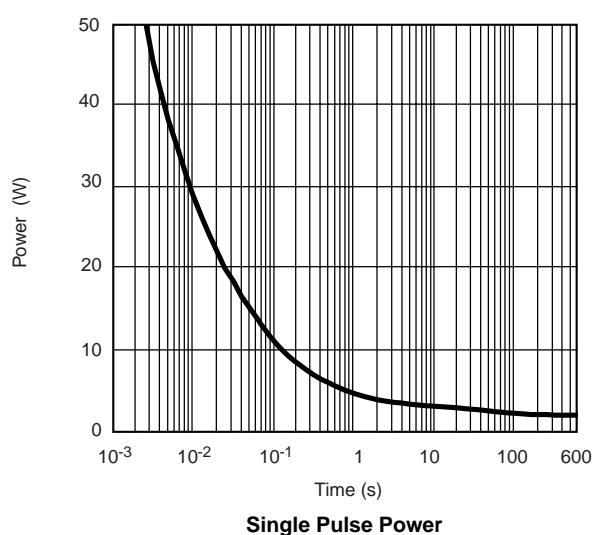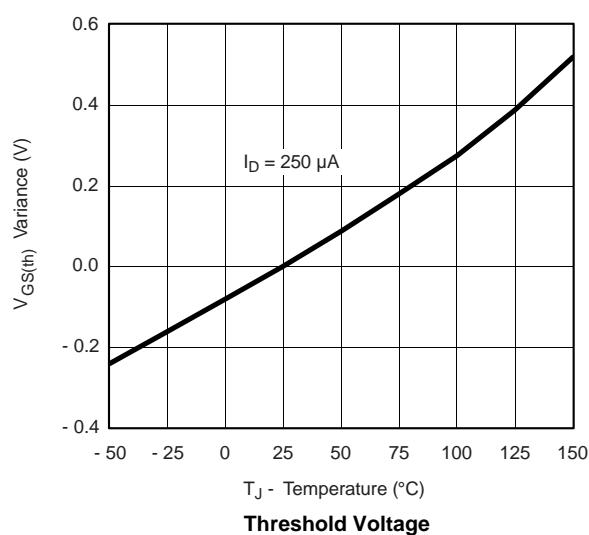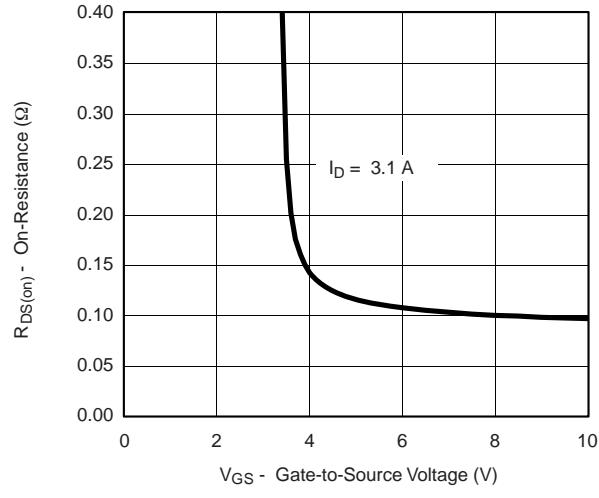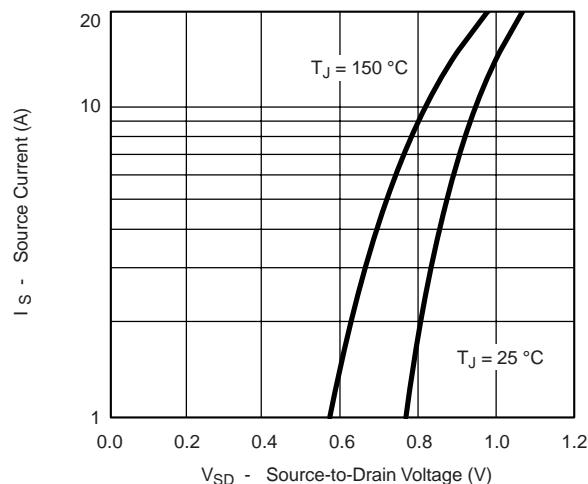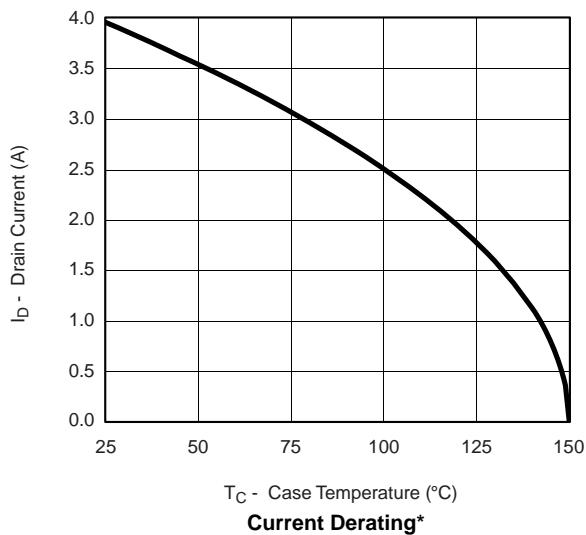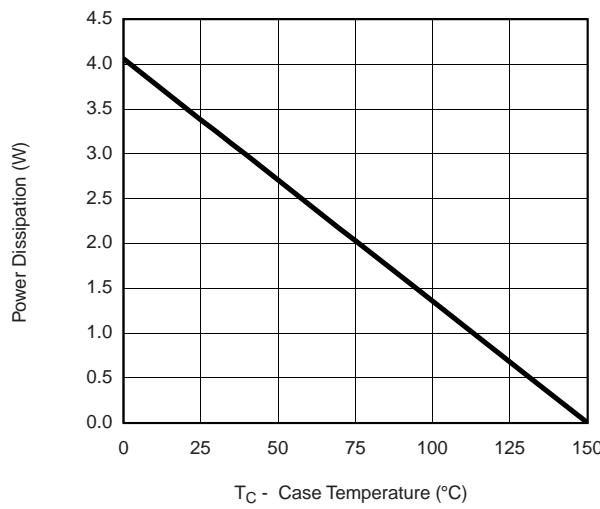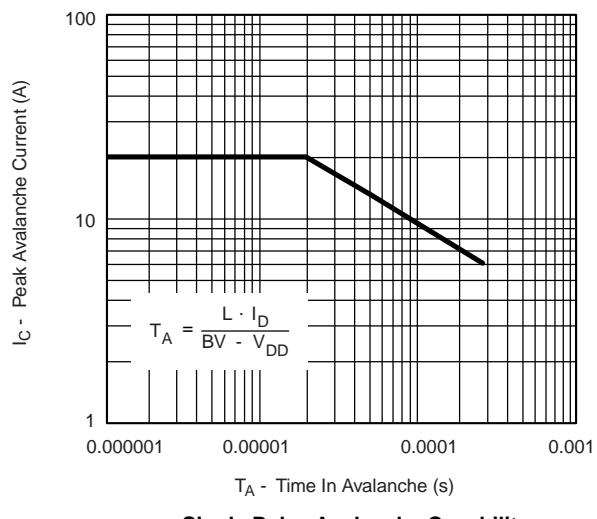
## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

T_C - Case Temperature (°C)
**Current Derating***

T_C - Case Temperature (°C)
Power Derating

$$T_A = \frac{L \cdot I_D}{BV - V_{DD}}$$

T_A - Time In Avalanche (s)
Single Pulse Avalanche Capability

* 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.

## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Normalized Effective Transient Thermal Impedance

- Duty Cycle = 0.5
- 0.2
- 0.1
- 0.05
- 0.02
- Single Pulse

Notes:
1. Duty Cycle, $D = \dfrac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 90 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Effective Transient Thermal Impedance

- Duty Cycle = 0.5
- 0.2
- 0.1
- 0.05
- 0.02
- Single Pulse

Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Case

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P-CHANNEL TYPICAL CHARACTERISTICS   25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Single Pulse Power

Safe Operating Area, Junction-to-Case

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

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

I_D - Drain Current (A) vs T_C - Case Temperature (°C)

Current Derating*

Power Dissipation (W) vs T_C - Case Temperature (°C)

Power Derating, Junction-to-Foot

I_C - Peak Avalanche Current (A) vs T_A - Time In Avalanche (s)

$$T_A = \frac{L \cdot I_D}{BV - V_{DD}}$$

Single Pulse Avalanche Capability

* 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.

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Normalized Effective Transient Thermal Impedance vs Square Wave Pulse Duration (s)

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse

Notes:
1. Duty Cycle, $D = \dfrac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 85 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}(t)$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse

Normalized Effective Transient Thermal Impedance vs Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Foot

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