

## N- and P-Channel 30 V (D-S) MOSFET

<b>PRODUCT SUMMARY</b>				
	V <sub>DS</sub> (V)	R <sub>DS(on)</sub> ( $\Omega$ )	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)
N-Channel	30	0.013 at V <sub>GS</sub> = 10 V	8 <sup>e</sup>	6.2
		0.014 at V <sub>GS</sub> = 8 V	8 <sup>e</sup>	
		0.015 at V <sub>GS</sub> = 4.5 V	8	
P-Channel	- 30	0.032 at V <sub>GS</sub> = - 10 V	- 8 <sup>e</sup>	18.5
		0.034 at V <sub>GS</sub> = - 8 V	- 8 <sup>e</sup>	
		0.040 at V <sub>GS</sub> = - 4.5 V	- 7.5	

### FEATURES

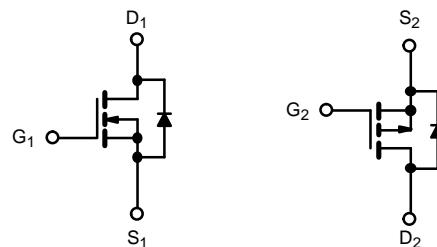
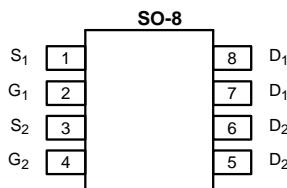
- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- Motor Drive
- Mobile Power Bank



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V <sub>DS</sub>	30	- 30	V
Gate-Source Voltage	V <sub>GS</sub>	± 12	± 12	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	8 <sup>e</sup>	- 8 <sup>e</sup>	A
	T <sub>C</sub> = 70 °C	6.8	- 6.8	
	T <sub>A</sub> = 25 °C	6.8 <sup>b, c</sup>	- 6.6 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C	5.4 <sup>b, c</sup>	- 5.3 <sup>b, c</sup>	
Pulsed Drain Current (10 µs Pulse Width)	I <sub>DM</sub>	40	- 40	
Source-Drain Current Diode Current	T <sub>C</sub> = 25 °C	2.6	- 2.6	
	T <sub>A</sub> = 25 °C	1.6 <sup>b, c</sup>	- 1.6 <sup>b, c</sup>	
Pulsed Source-Drain Current	I <sub>SM</sub>	40	- 40	
Single Pulse Avalanche Current	I <sub>AS</sub>	10	- 20	
Single Pulse Avalanche Energy	E <sub>AS</sub>	5	20	mJ
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	3.1	3.2	W
	T <sub>C</sub> = 70 °C	2	2.1	
	T <sub>A</sub> = 25 °C	2 <sup>b, c</sup>	2 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C	1.28 <sup>b, c</sup>	1.28 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150		°C

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	N-Channel		P-Channel		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	50	62.5	47	62.5
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	30	40	29	38

Notes:

a. Based on T<sub>C</sub> = 25 °C.

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

c. t = 10 s.

d. Maximum under steady state conditions is 120 °C/W (n-channel) and 110 °C/W (p-channel).

e. Package limited.

**SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	N-Ch	30		V	
		$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	P-Ch	-30			
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$	N-Ch	40		mV/ $^\circ\text{C}$	
		$I_D = -250 \mu\text{A}$	P-Ch	-34			
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$	$I_D = 250 \mu\text{A}$	N-Ch	-4.1			
		$I_D = -250 \mu\text{A}$	P-Ch	5			
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	N-Ch	0.5	1.0	V	
		$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	P-Ch	-0.5	-1.0		
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 12 \text{ V}$	N-Ch		$\pm 100$	nA	
		$V_{DS} = 0 \text{ V}, V_{GS} = \pm 12 \text{ V}$	P-Ch		$\pm 100$		
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	N-Ch		1	$\mu\text{A}$	
		$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$	P-Ch		-1		
		$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$	N-Ch		10		
		$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$	P-Ch		-10		
On-State Drain Current <sup>b</sup>	$I_{D(\text{on})}$	$V_{DS} = 5 \text{ V}, V_{GS} = 10 \text{ V}$	N-Ch	20		A	
		$V_{DS} = -5 \text{ V}, V_{GS} = -10 \text{ V}$	P-Ch	-20			
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}, I_D = 6.8 \text{ A}$	N-Ch	0.012	0.013	$\Omega$	
		$V_{GS} = -10 \text{ V}, I_D = -8 \text{ A}$	P-Ch	0.031	0.032		
		$V_{GS} = 8 \text{ V}, I_D = 6.7 \text{ A}$	N-Ch	0.013	0.014		
		$V_{GS} = -8 \text{ V}, I_D = -6.5 \text{ A}$	P-Ch	0.032	0.034		
		$V_{GS} = 4.5 \text{ V}, I_D = 6.6 \text{ A}$	N-Ch	0.014	0.015		
		$V_{GS} = -4.5 \text{ V}, I_D = -5 \text{ A}$	P-Ch	0.037	0.040		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}, I_D = 6.8 \text{ A}$	N-Ch	27		S	
		$V_{DS} = -15 \text{ V}, I_D = -6.7 \text{ A}$	P-Ch	25			
<b>Dynamic<sup>a</sup></b>							
Input Capacitance	$C_{iss}$	N-Channel $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ P-Channel $V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	N-Ch	510		$\text{pF}$	
			P-Ch	620			
Output Capacitance	$C_{oss}$		N-Ch	95			
			P-Ch	115			
Reverse Transfer Capacitance	$C_{rss}$		N-Ch	33			
			P-Ch	57			
Total Gate Charge	$Q_g$	$V_{DS} = 20 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$	N-Ch	6	10	$\text{nC}$	
		$V_{DS} = -20 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -10 \text{ A}$	P-Ch	41.5	63		
Gate-Source Charge	$Q_{gs}$	N-Channel $V_{DS} = 20 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$ P-Channel $V_{DS} = -20 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -10 \text{ A}$	N-Ch	5.8	7	$\text{nC}$	
			P-Ch	16	22		
			N-Ch	1.6			
			P-Ch	4.3			
Gate-Drain Charge	$Q_{gd}$	$f = 1 \text{ MHz}$	N-Ch	1.4			
			P-Ch	7			
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	N-Ch	0.3	1.1	$\Omega$	
			P-Ch	1.2	5.7		
					2.3		
					9.6		

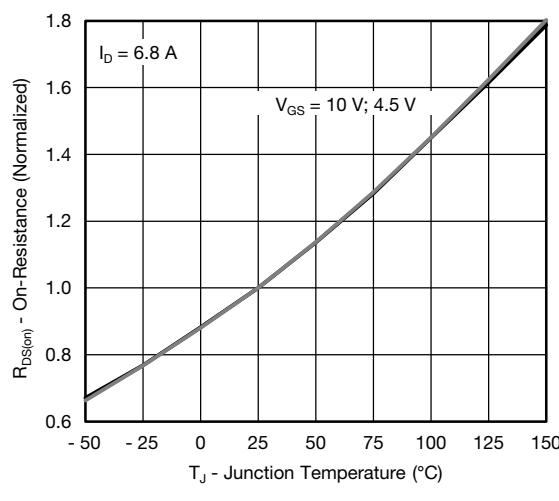
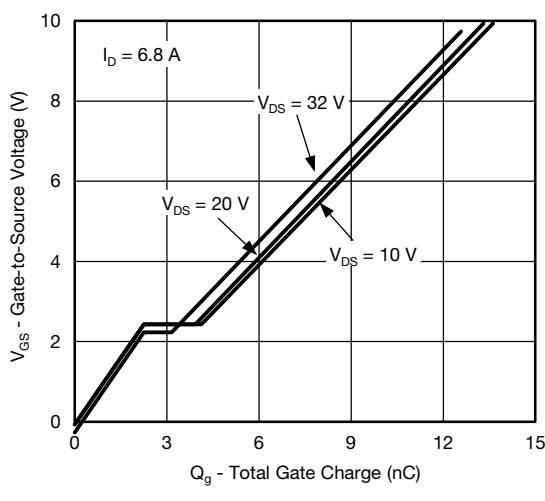
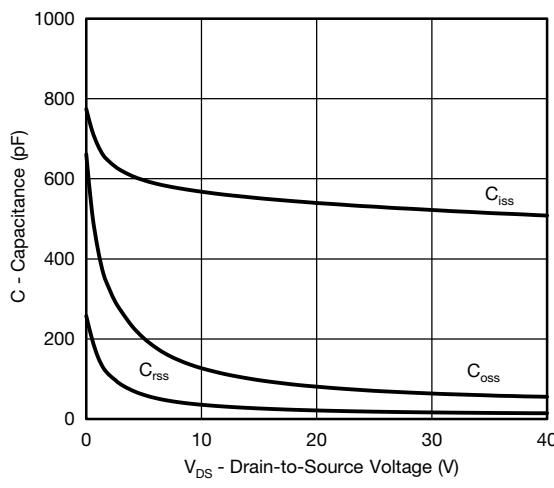
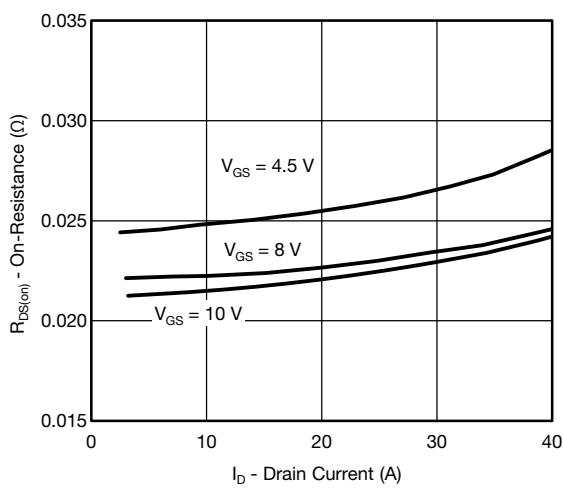
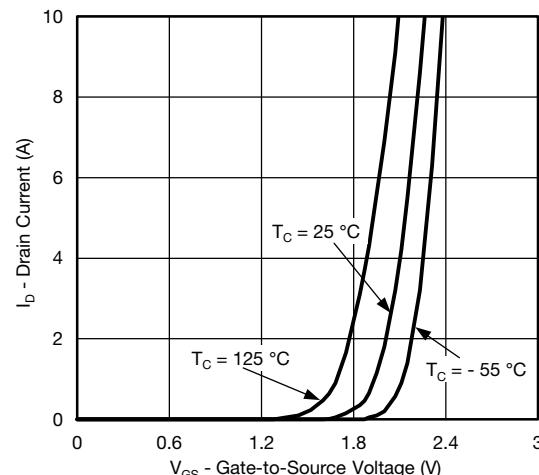
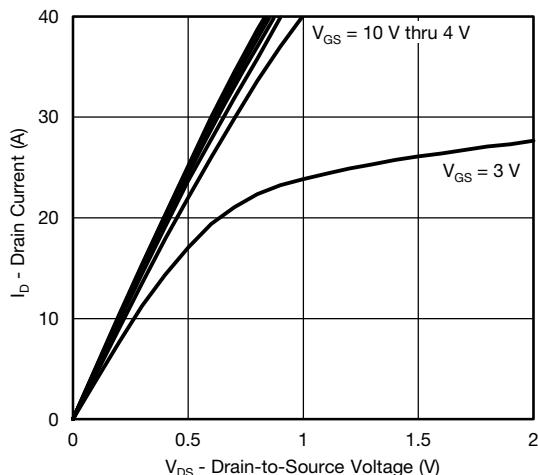
<b>SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)								
Parameter	Symbol	Test Conditions			Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Dynamic<sup>a</sup></b>								
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 20 \text{ V}$ , $R_L = 3.7 \Omega$ $I_D \approx 5.4 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	N-Ch		4	8		ns
Rise Time	$t_r$		P-Ch		10	16		
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		10	17		
Fall Time	$t_f$		P-Ch		9	15		
Turn-On Delay Time	$t_{d(on)}$		N-Ch		16	22		
Rise Time	$t_r$		P-Ch		23	26		
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		5	9		
Fall Time	$t_f$		P-Ch		10	16		
<b>Drain-Source Body Diode Characteristics</b>								
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	N-Ch			2.6		A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$		P-Ch			- 2.6		
Body Diode Voltage	$V_{SD}$	$I_S = 5.4 \text{ A}$	N-Ch			40		V
		$I_S = - 2 \text{ A}$	P-Ch			- 40		
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 5 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$	N-Ch		0.81	1.2		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		P-Ch		- 0.77	- 1.2		
Reverse Recovery Fall Time	$t_a$		N-Ch		12	25		
Reverse Recovery Rise Time	$t_b$		P-Ch		31	57		
			N-Ch		10	17		nC
			P-Ch		29	47		
			N-Ch		10			ns
			P-Ch		13			
			N-Ch		7			
			P-Ch		23			

Notes:

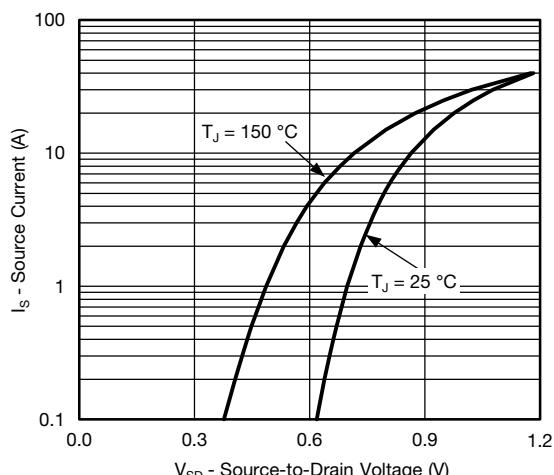
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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.

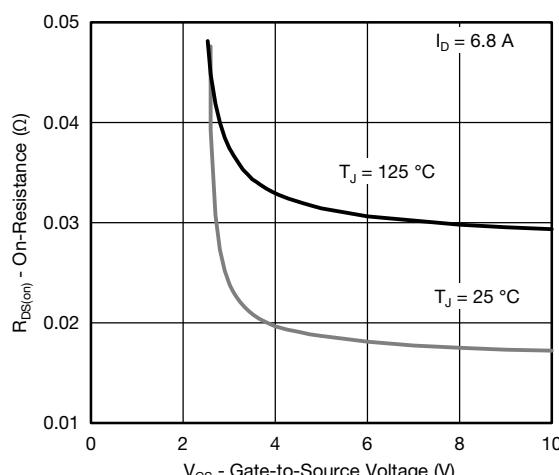
**N-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



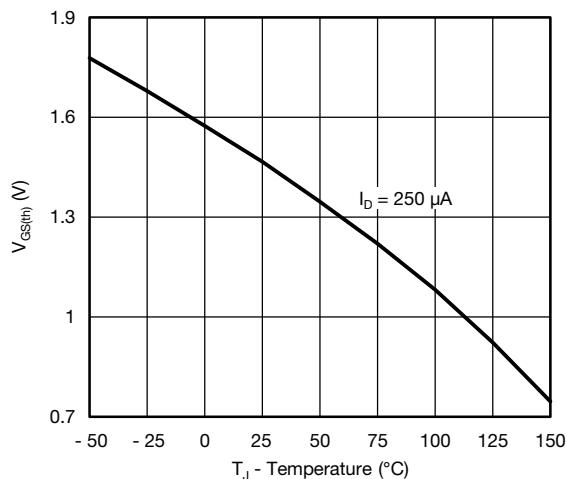
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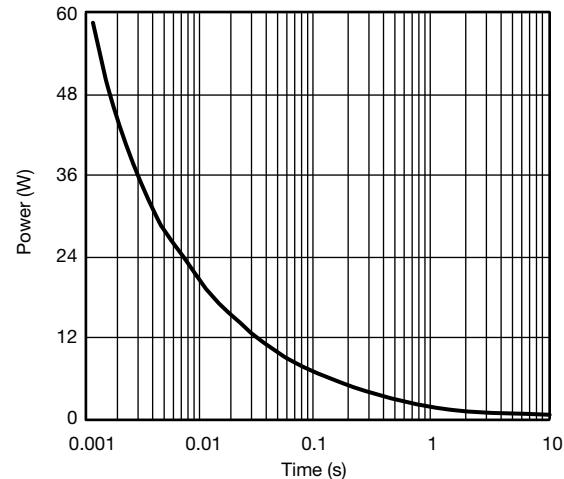
Source-Drain Diode Forward Voltage



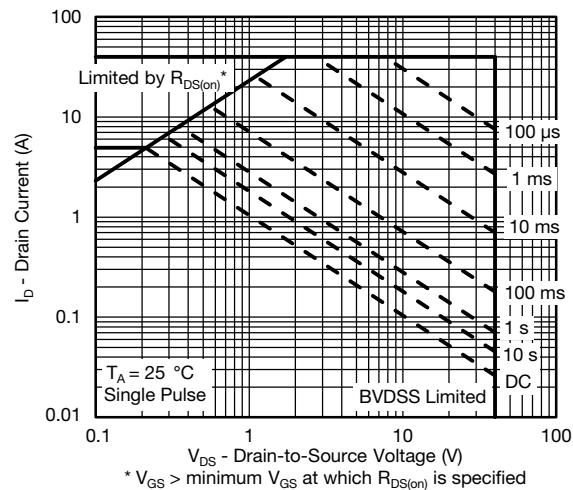
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

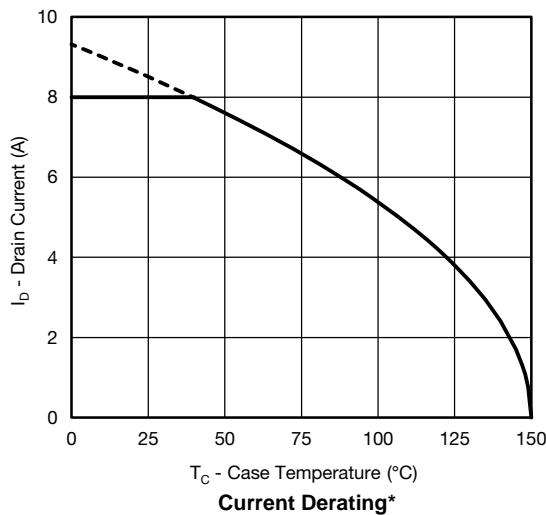


Single Pulse Power, Junction-to-Ambient

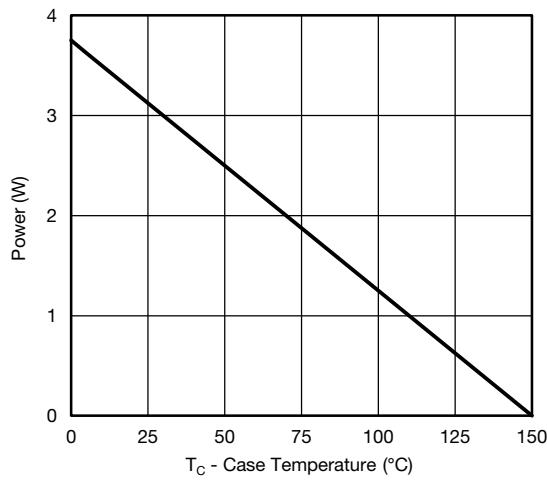


Safe Operating Area, Junction-to-Ambient

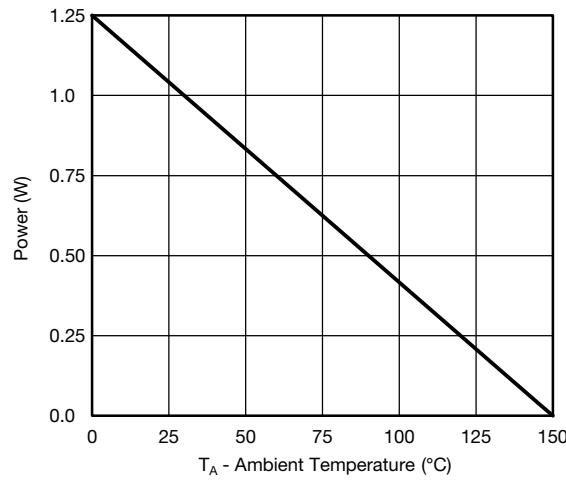
**N-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating\***



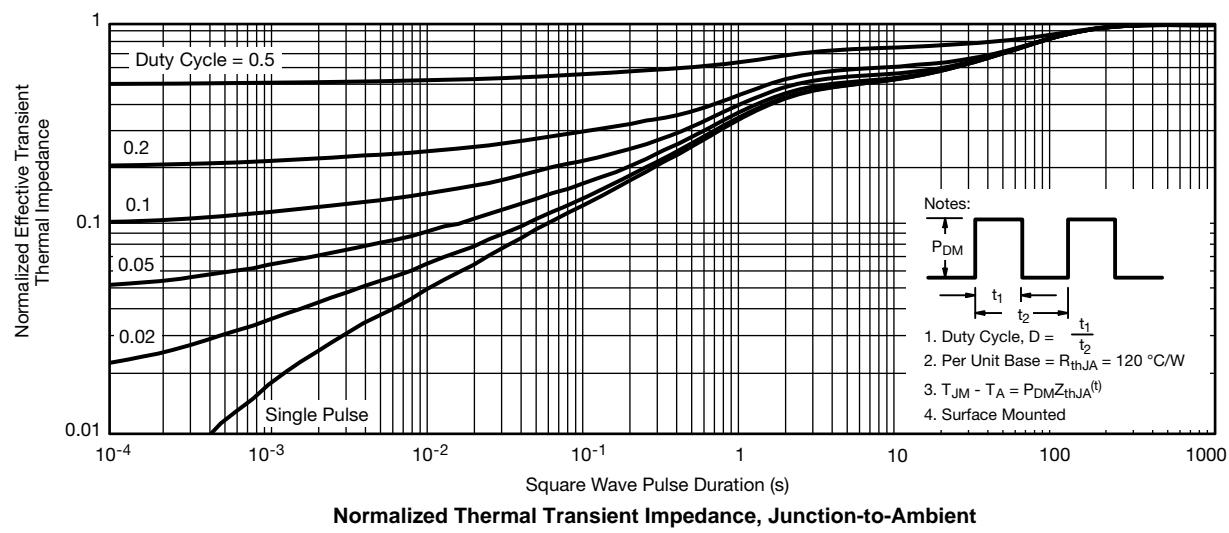
**Power Derating, Junction-to-Foot**



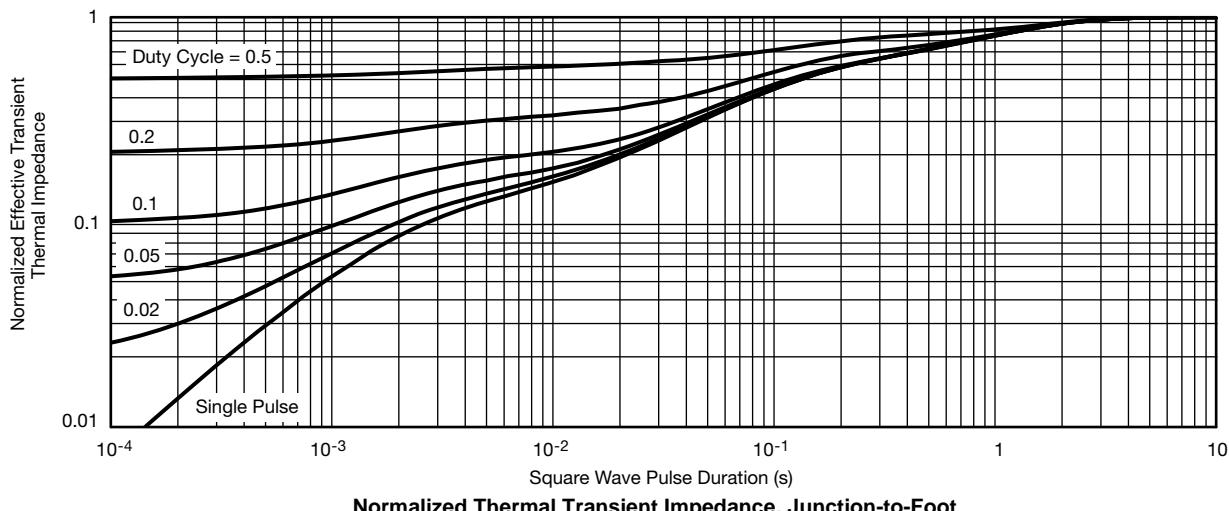
**Power Derating, Junction-to-Ambient**

\* 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.

**N-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

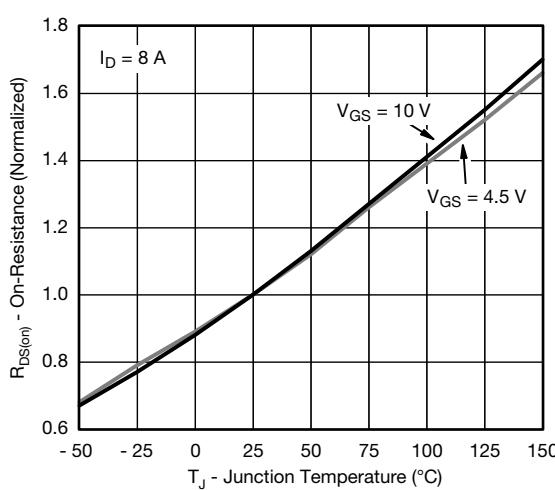
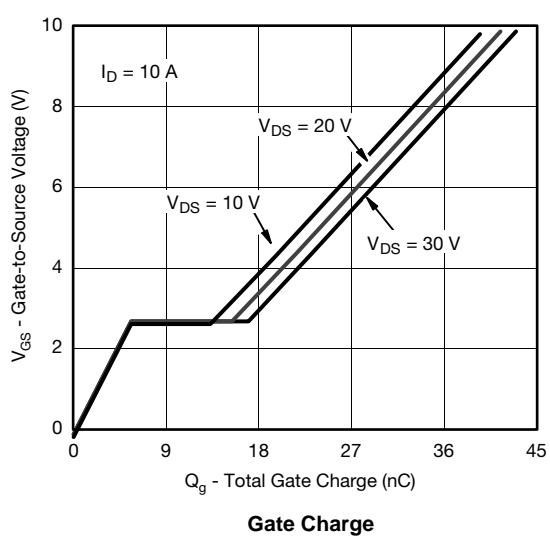
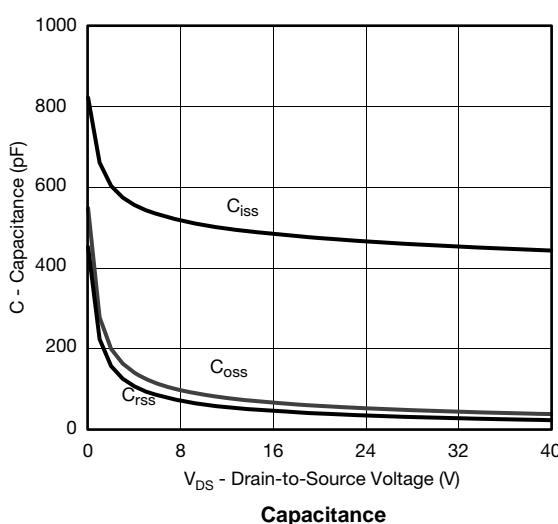
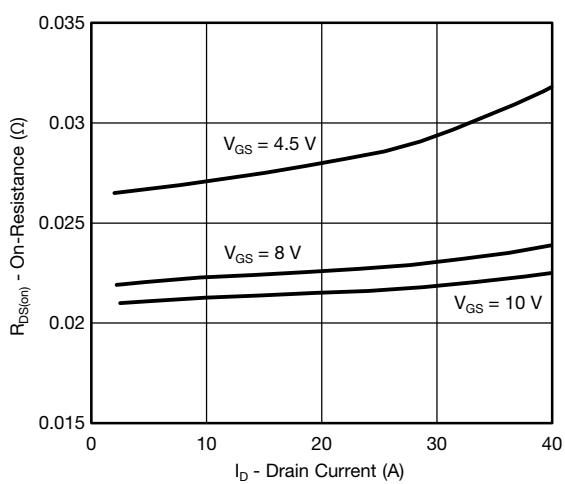
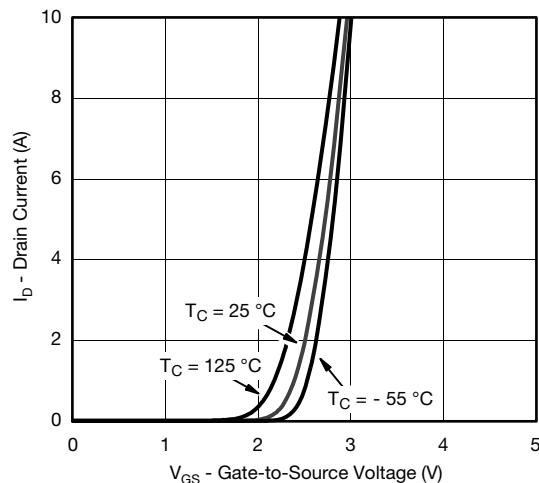
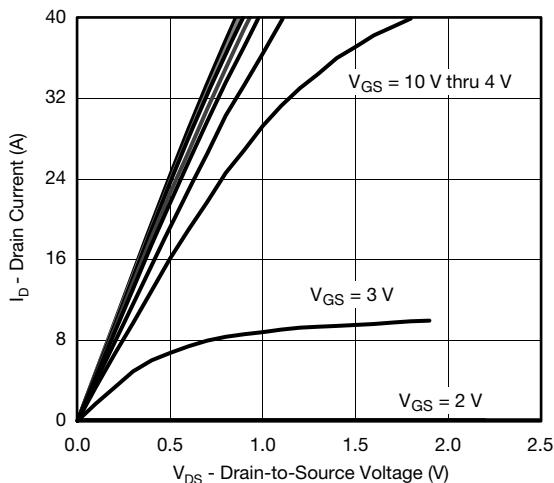


Normalized Thermal Transient Impedance, Junction-to-Ambient

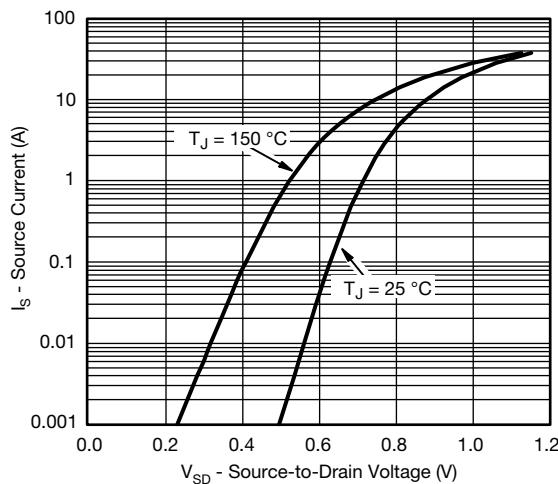


Normalized Thermal Transient Impedance, Junction-to-Foot

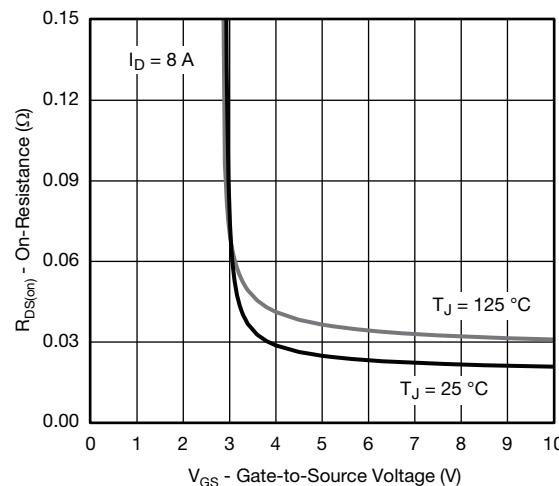
**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



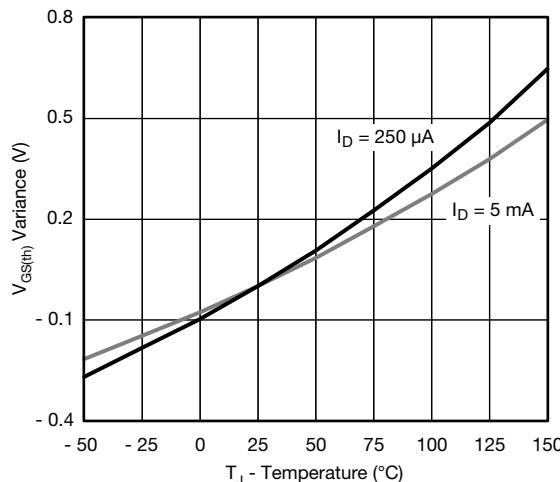
**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



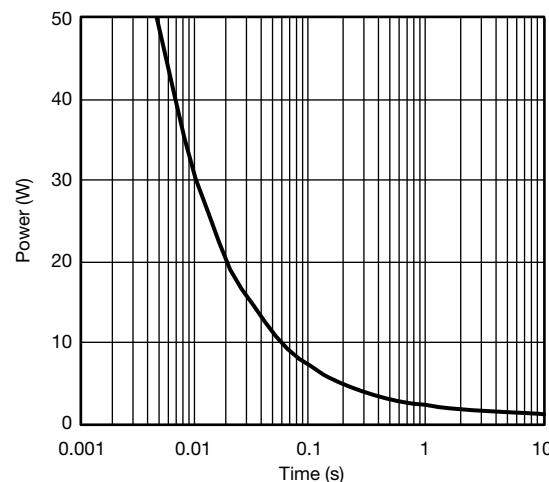
Source-Drain Diode Forward Voltage



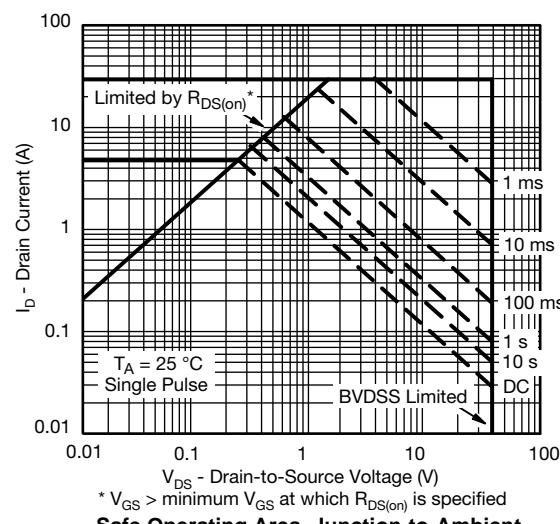
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

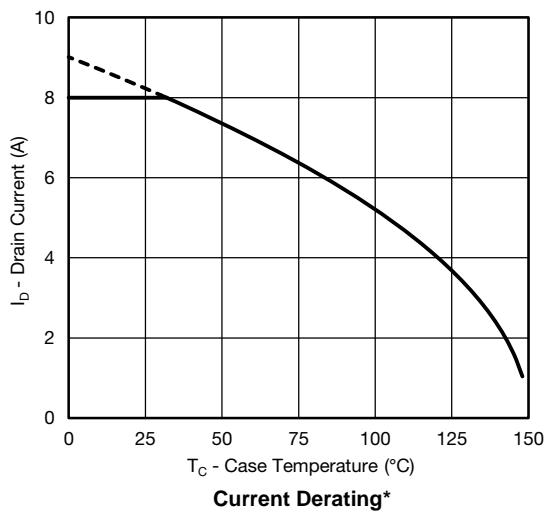


Single Pulse Power, Junction-to-Ambient

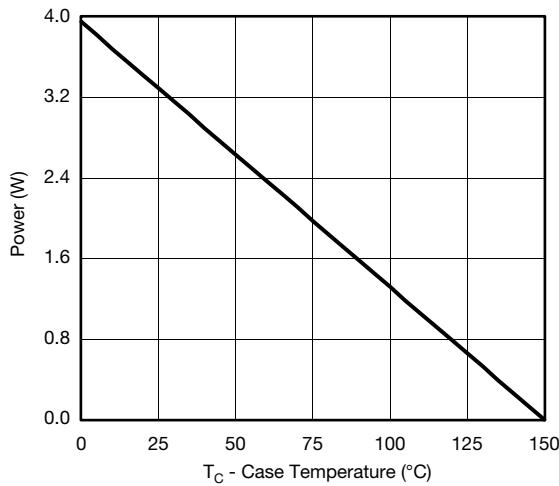


Safe Operating Area, Junction-to-Ambient

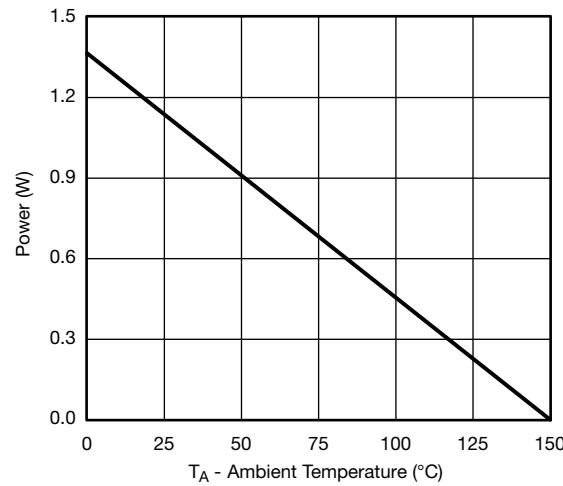
**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating\***



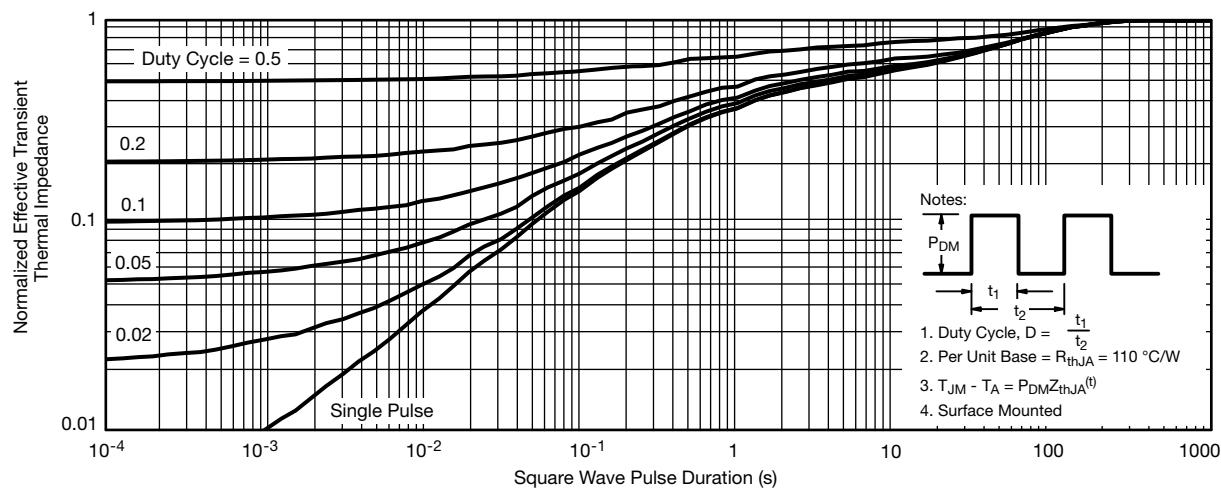
**Power Derating, Junction-to-Foot**



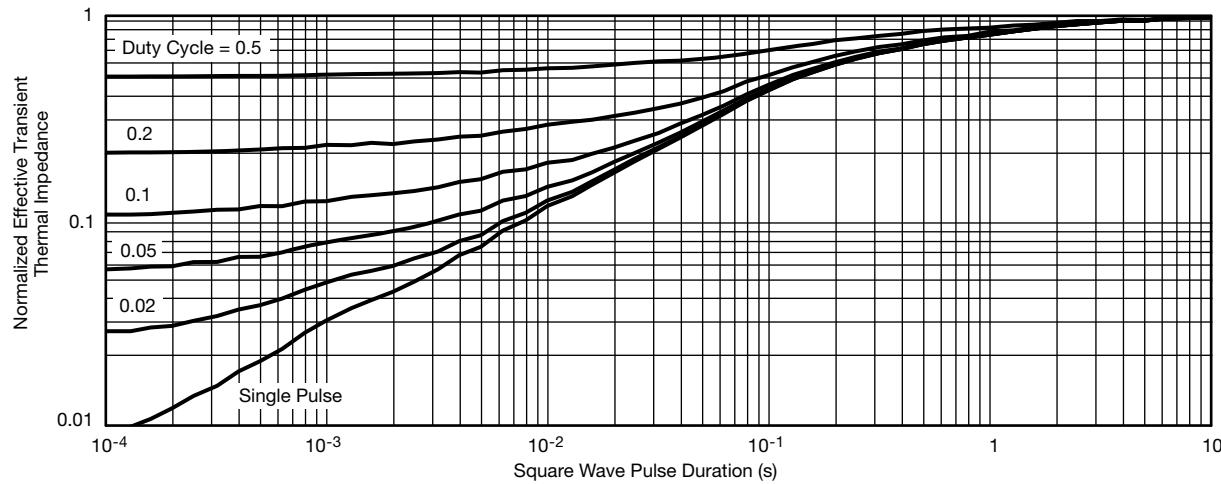
**Power Derating, Junction-to-Ambient**

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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