



**THE DATASHEET OF  
AON3613**



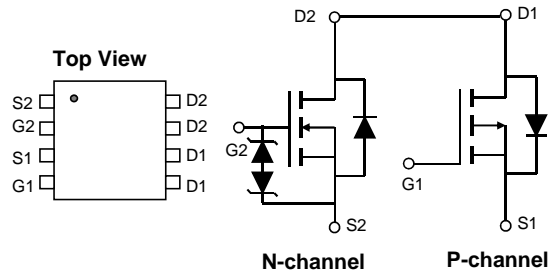
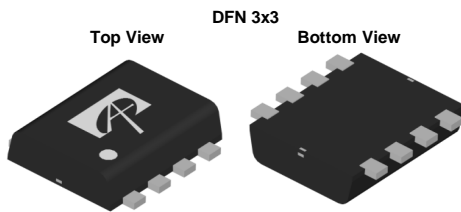
### General Description

The AON3613 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used in inverter and other applications.

### Product Summary

N-channel	P-channel	
$V_{DS} (V) = 30V$	$V_{DS} (V) = -30V$	
$I_D = 4.5A$	$I_D = -4.5A$	$(V_{GS} = \pm 10V)$
$R_{DS(ON)} < 52m\Omega$	$R_{DS(ON)} < 68m\Omega$	$(V_{GS} = \pm 10V)$
$R_{DS(ON)} < 60m\Omega$	$R_{DS(ON)} < 100m\Omega$	$(V_{GS} = \pm 4.5V)$

**ESD protection**  
**HBM Class 3A**



### Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Max N-channel	Max P-channel	Units	
Drain-Source Voltage	$V_{DS}$	30	-30	V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$	$\pm 20$	V	
Continuous Drain Current	$I_D$	$T_A=25^\circ C$	4.5	-4.5	A
		$T_A=70^\circ C$	3.5	-3.5	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	20	-20		
Power Dissipation <sup>B</sup>	$P_D$	$T_A=25^\circ C$	2.1	2.1	W
		$T_A=70^\circ C$	1.3	1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$	

### Thermal Characteristics: N-channel

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	50	60	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A D</sup> Steady-State		80	100	$^\circ C/W$
Maximum Junction-to-Lead Steady-State	$R_{\theta JL}$	30	40	$^\circ C/W$

### Thermal Characteristics: P-channel

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	50	60	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A D</sup> Steady-State		80	100	$^\circ C/W$
Maximum Junction-to-Lead Steady-State	$R_{\theta JL}$	30	40	$^\circ C/W$

**N-channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.7	1.05	1.5	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	20			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A T <sub>J</sub> =125°C		42 66	52 82	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A		47	60	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =4.5A		15		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.75	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		245		pF
C <sub>oss</sub>	Output Capacitance			35		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			20		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		5.3		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =4.5A		5.7	10	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge			2.6	5	nC
Q <sub>gs</sub>	Gate Source Charge			0.5		nC
Q <sub>gd</sub>	Gate Drain Charge			1		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =3.3Ω, R <sub>GEN</sub> =3Ω		2		ns
t <sub>r</sub>	Turn-On Rise Time			3.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			22		ns
t <sub>f</sub>	Turn-Off Fall Time			3.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =4.5A, di/dt=500A/μs		6.5		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =4.5A, di/dt=500A/μs		7.5		nC

A. The value of R<sub>qJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

D. The R<sub>qJA</sub> is the sum of the thermal impedance from junction to lead R<sub>qJL</sub> and lead to ambient.

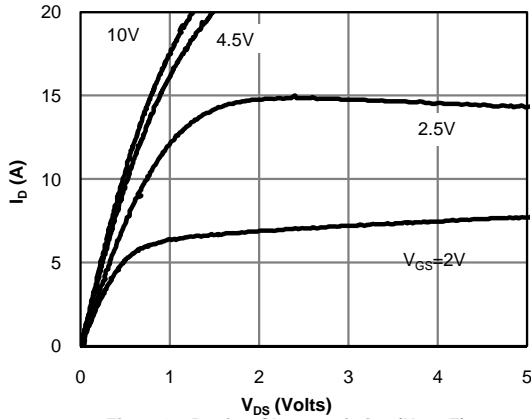
E. The static characteristics in Figures 1 to 6 are obtained using <300ms pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

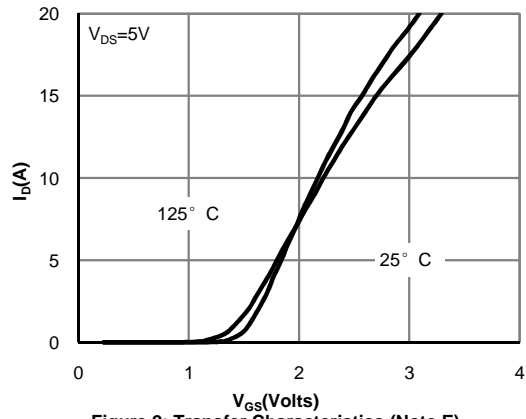
G. The maximum current rating is package limited.

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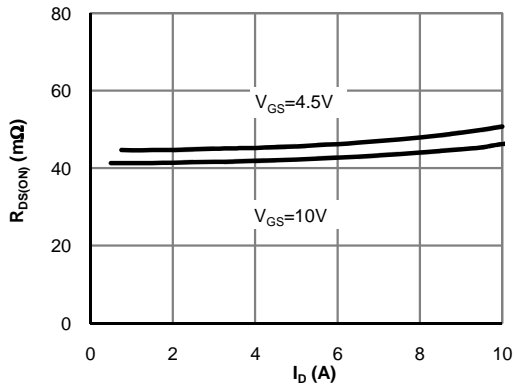
**N-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



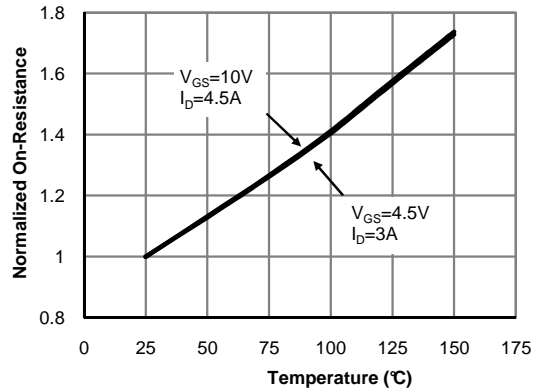
**Figure 1: On-Region Characteristics (Note E)**



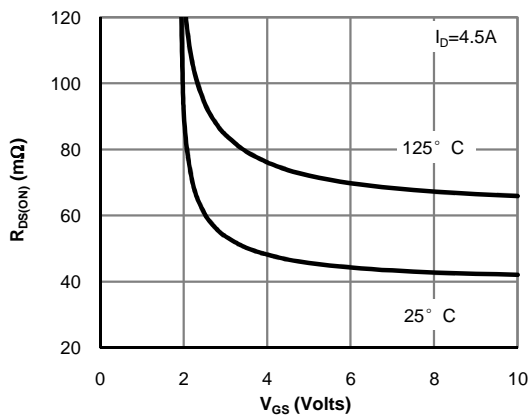
**Figure 2: Transfer Characteristics (Note E)**



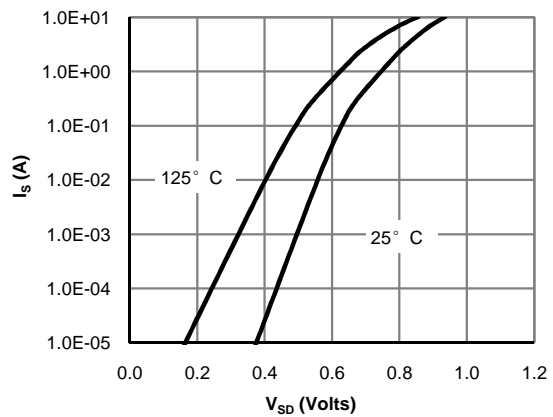
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

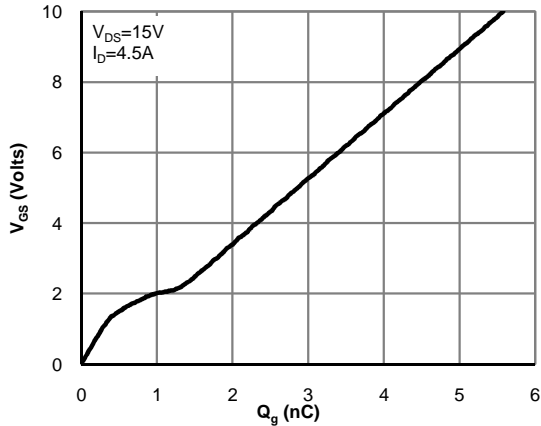


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

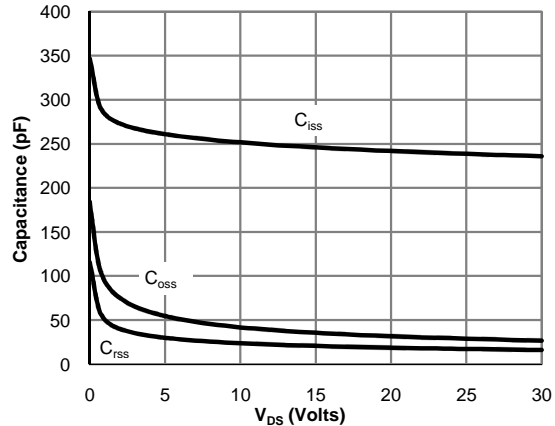


**Figure 6: Body-Diode Characteristics (Note E)**

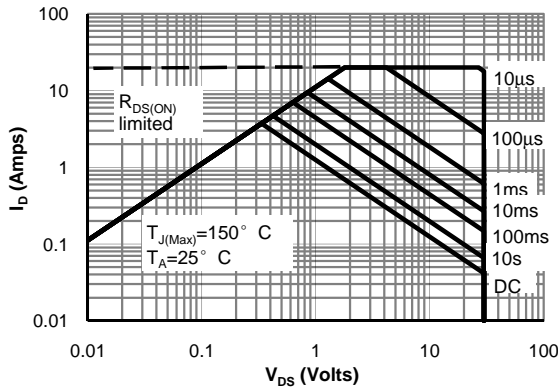
**N-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



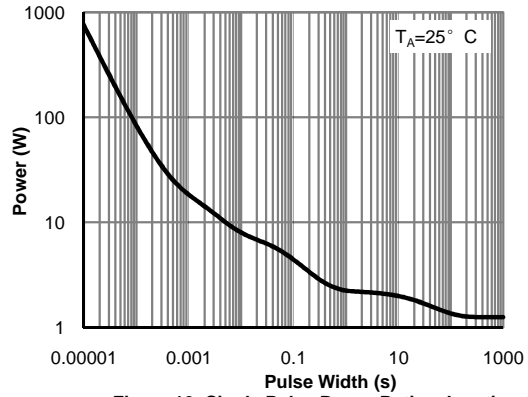
**Figure 7: Gate-Charge Characteristics**



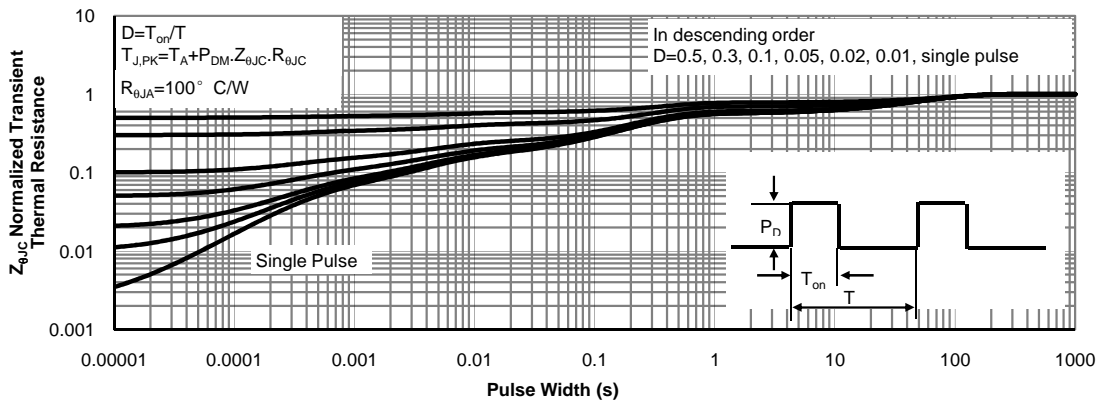
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**

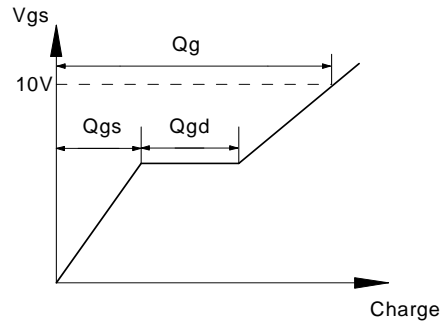
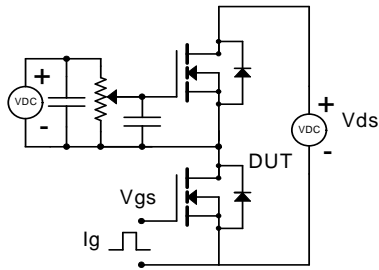


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)**

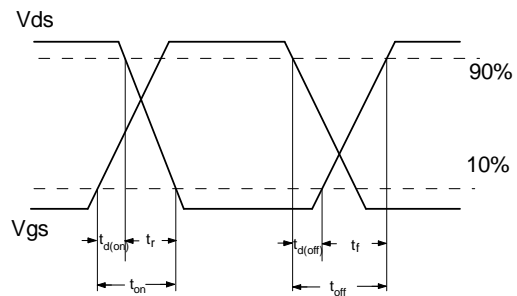
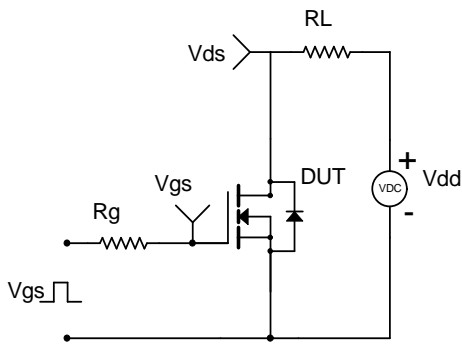


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

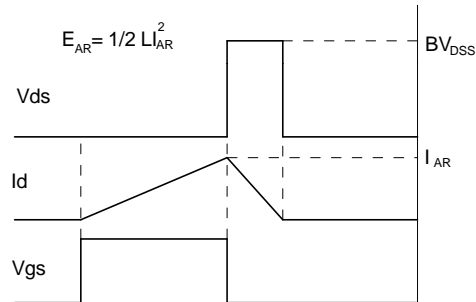
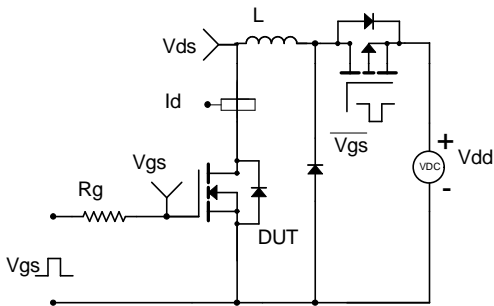
**Gate Charge Test Circuit & Waveform**



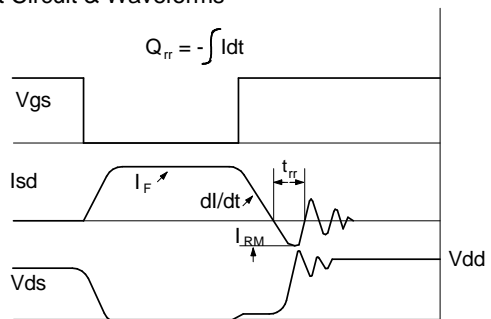
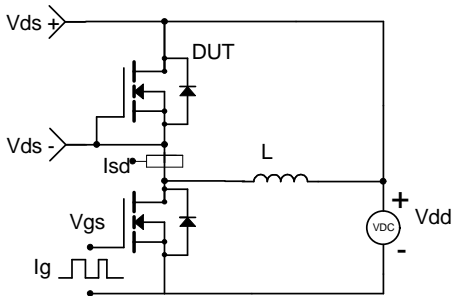
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**



**Diode Recovery Test Circuit & Waveforms**



**P-channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V	-30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			-1 -5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.3	-1.8	-2.3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	-20			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.5A T <sub>J</sub> =125°C		56 79	68 96	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A		80	100	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4.5A		8		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.78	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-2.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz		290		pF
C <sub>oss</sub>	Output Capacitance			60		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			40		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		16		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-4.5A		5.8	10	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge			2.8	6	nC
Q <sub>gs</sub>	Gate Source Charge			1.1		nC
Q <sub>gd</sub>	Gate Drain Charge			1.3		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =3.3Ω, R <sub>GEN</sub> =3Ω		6		ns
t <sub>r</sub>	Turn-On Rise Time			5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			21		ns
t <sub>f</sub>	Turn-Off Fall Time			9		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-4.5A, di/dt=500A/μs		10		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-4.5A, di/dt=500A/μs		20		nC

A. The value of R<sub>qJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

D. The R<sub>qJA</sub> is the sum of the thermal impedance from junction to lead R<sub>qJL</sub> and lead to ambient.

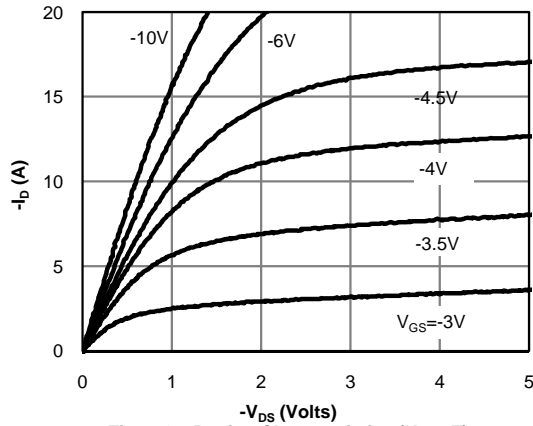
E. The static characteristics in Figures 1 to 6 are obtained using <300ms pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

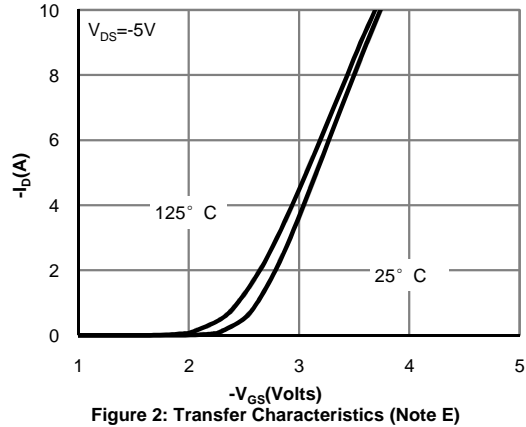
G. The maximum current rating is package limited.

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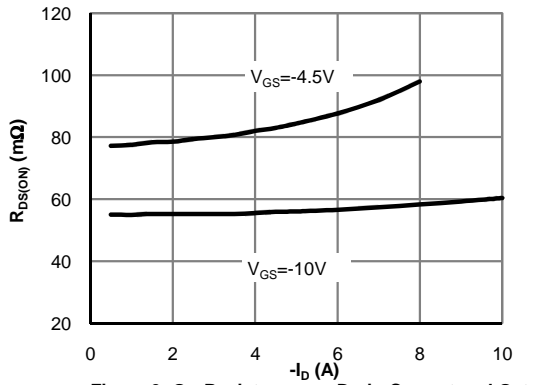
**P-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



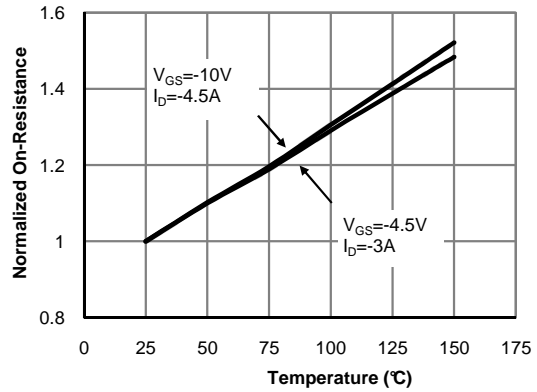
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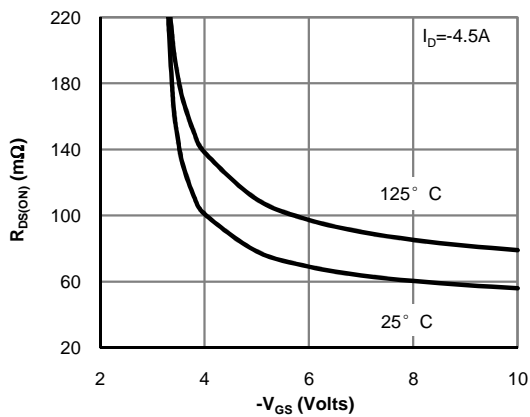
**Figure 2: Transfer Characteristics (Note E)**



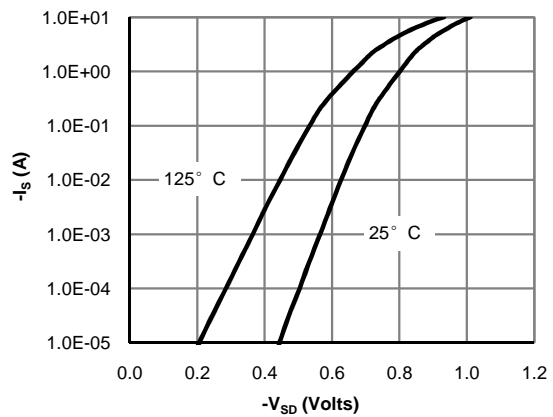
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

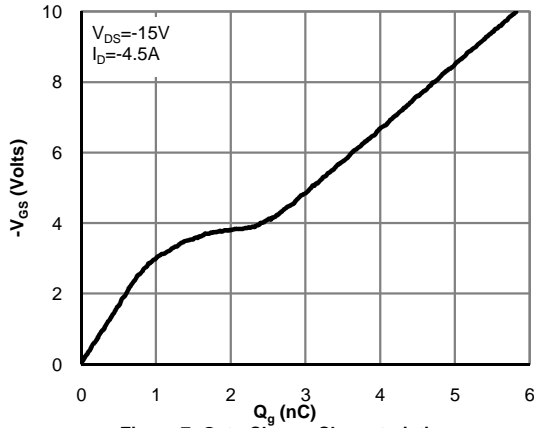


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

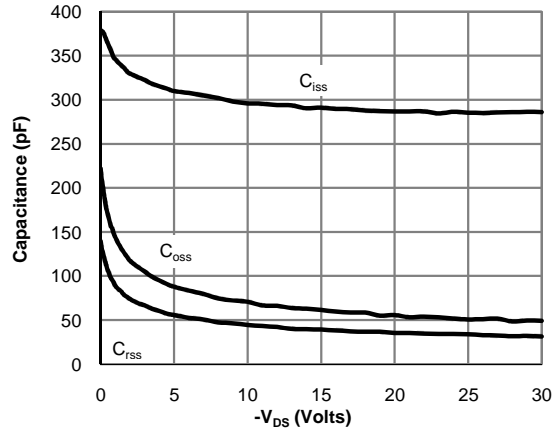


**Figure 6: Body-Diode Characteristics (Note E)**

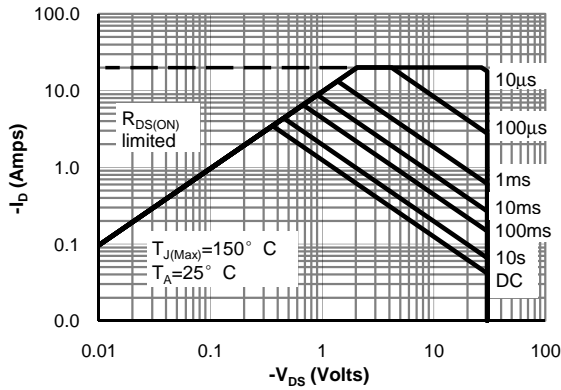
**P-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



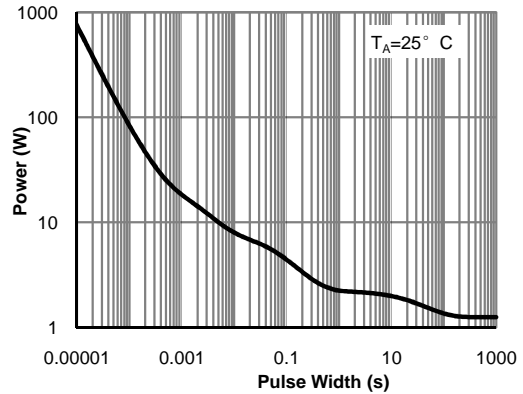
**Figure 7: Gate-Charge Characteristics**



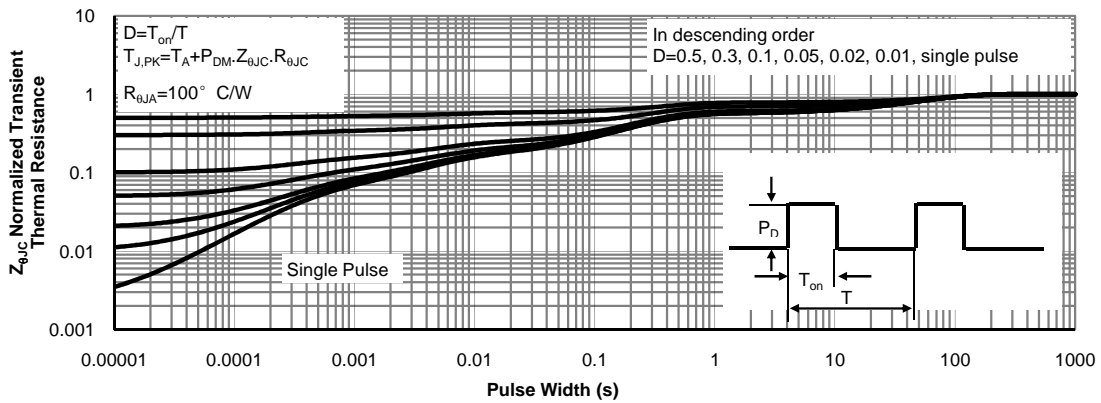
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**

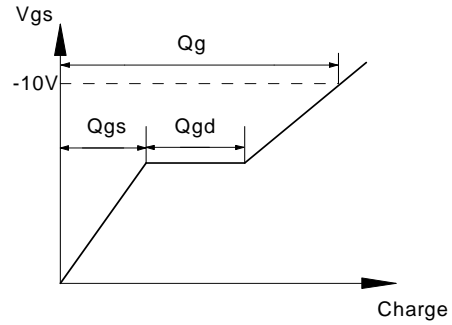
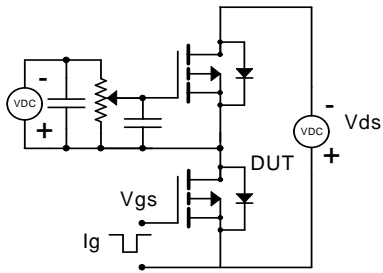


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)**

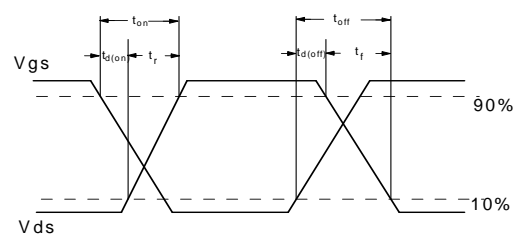
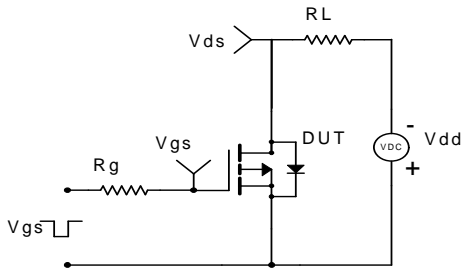


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

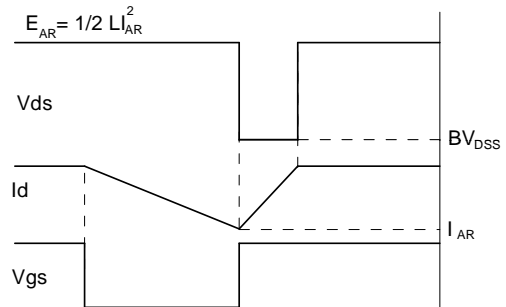
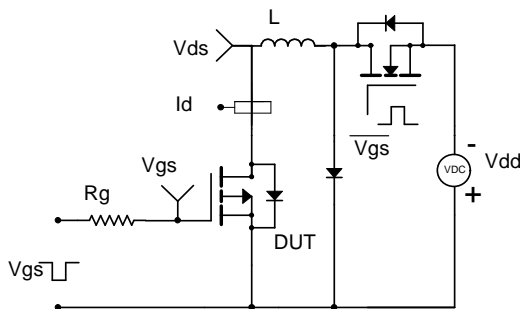
**Gate Charge Test Circuit & Waveform**



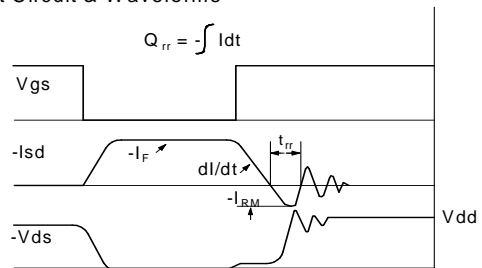
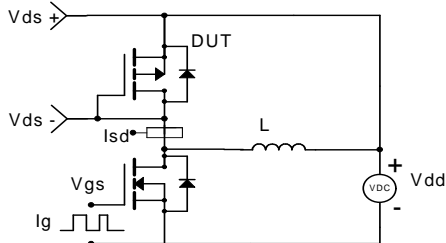
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**



**Diode Recovery Test Circuit & Waveforms**



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