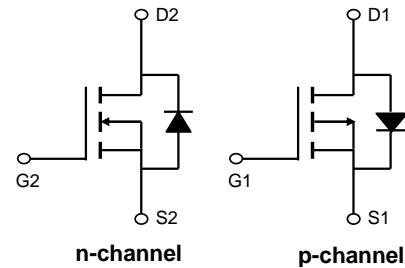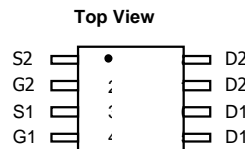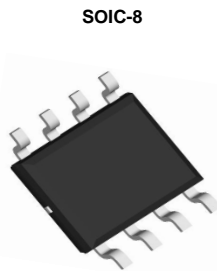# AO4614B
40V Dual P + N-Channel MOSFET

General Description

The AO4614B uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications.

Features

N-Channel

V_{DS} (V) = 40V,

I_D = 6A (V_{GS}=10V)

$R_{DS(ON)}$

< 30mΩ   (V_{GS}=10V)

< 38mΩ   (V_{GS}=4.5V)

P-Channel

-40V

-5A (VGS=-10V)

< 45mΩ   (VGS= -10V)

< 63mΩ   (VGS= -4.5V)

Green Product

SOIC-8

Top View

```
S2  [1 •    8] D2
G2  [2      7] D2
S1  [3      6] D1
G1  [4      5] D1
```

n-channel

p-channel

Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage		V_{DS}	40	-40	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current [A]	T_A=25℃		6	-5	A
	T_A=70℃	I_D	5	-4	
Pulsed Drain Current [B]		I_{DM}	30	-30	
Avalanche Current [B]		I_{AR}	14	-20	
Repetitive avalanche energy L=0.1mH [B]		E_{AR}	9.8	20	mJ
Power Dissipation	T_A=25℃	P_D	2	2	W
	T_A=70℃		1.28	1.28	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	℃

Thermal Characteristics: n-channel and p-channel

Parameter		Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{θJA}$	n-ch	48	62.5	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		n-ch	74	110	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{θJL}$	n-ch	35	50	℃/W
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{θJA}$	p-ch	48	62.5	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		p-ch	74	110	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{θJL}$	p-ch	35	50	℃/W

N Channel Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	I$_D$=250µA, V$_{GS}$=0V		40			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=40V, V$_{GS}$=0V				1	µA
			T$_J$=55℃			5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$= ±20V				±100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=250µA		1.7	2.5	3	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=10V, V$_{DS}$=5V		30			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=6A			24	30	mΩ
			T$_J$=125℃		36	45	
		V$_{GS}$=4.5V, I$_D$=5A			30	38	
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=6A			19		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.76	1	V
I$_S$	Maximum Body-Diode Continuous Current					2	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=20V, f=1MHz		410	516	650	pF
C$_{oss}$	Output Capacitance				82		pF
C$_{rss}$	Reverse Transfer Capacitance				43		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz			4.6		Ω
SWITCHING PARAMETERS							
Q$_g$ (10V)	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=20V, I$_D$=6A			8.9	10.8	nC
Q$_g$ (4.5V)	Total Gate Charge				4.3	5.6	nC
Q$_{gs}$	Gate Source Charge				2.4		nC
Q$_{gd}$	Gate Drain Charge				1.4		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=20V, R$_L$=3.3Ω, R$_{GEN}$=3Ω			6.4		ns
t$_r$	Turn-On Rise Time				3.6		ns
t$_{D(off)}$	Turn-Off DelayTime				16.2		ns
t$_f$	Turn-Off Fall Time				6.6		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=6A, dI/dt=100A/µs			18	24	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=6A, dI/dt=100A/µs			10		nC

A: The value of R$_{θJA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T$_A$=25℃. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The R$_{θJA}$ is the sum of the thermal impedance from junction to lead R$_{θJL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.
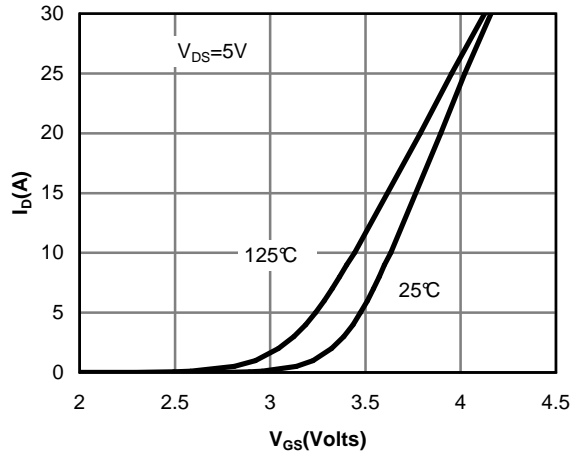
E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T$_A$=25℃. The SOA curve provides a single pulse rating.
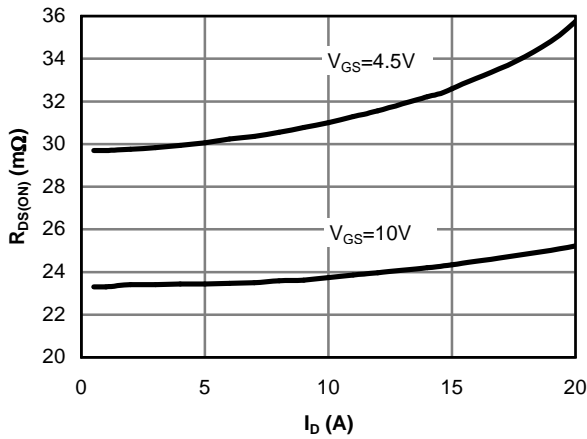
Rev2 : Nov. 2010

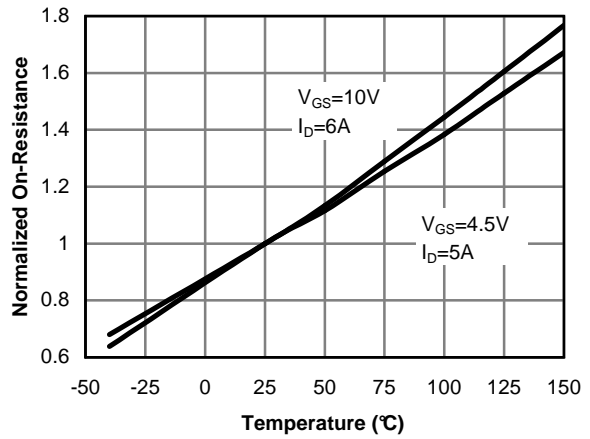**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL**
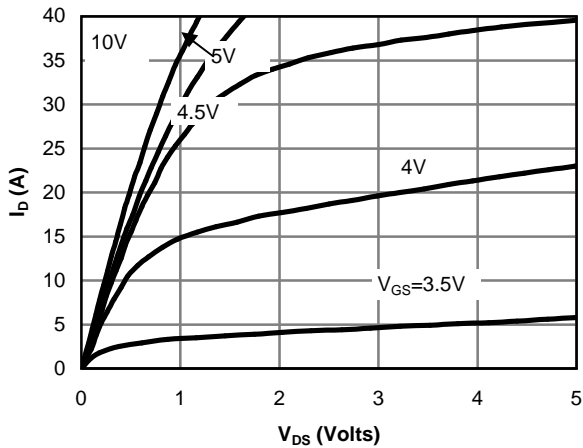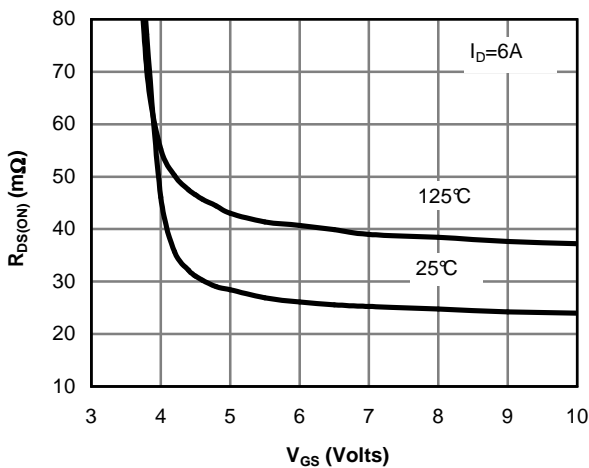
Fig 1: On-Region Characteristics
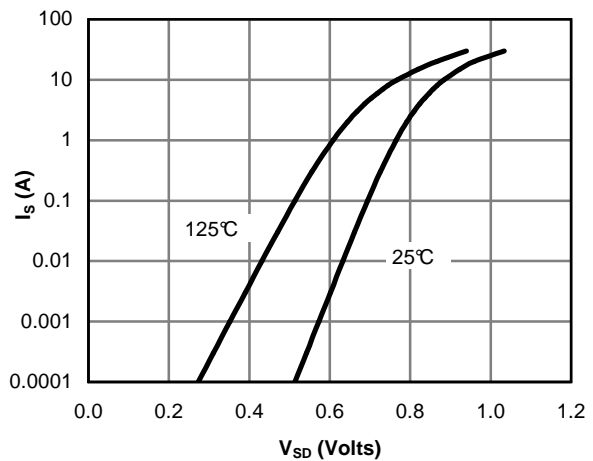
Figure 2: Transfer Characteristics

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

Figure 4: On-Resistance vs. Junction Temperature

Figure 5: On-Resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics

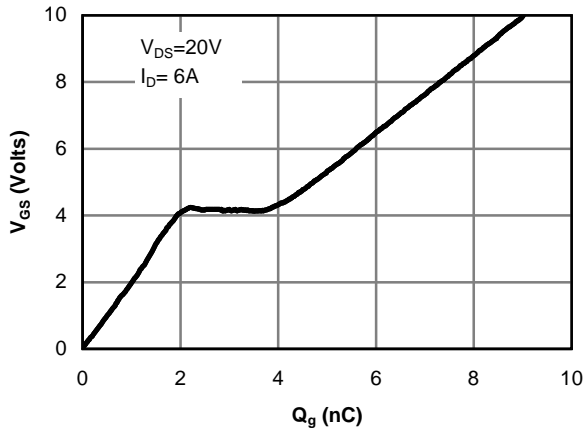## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL
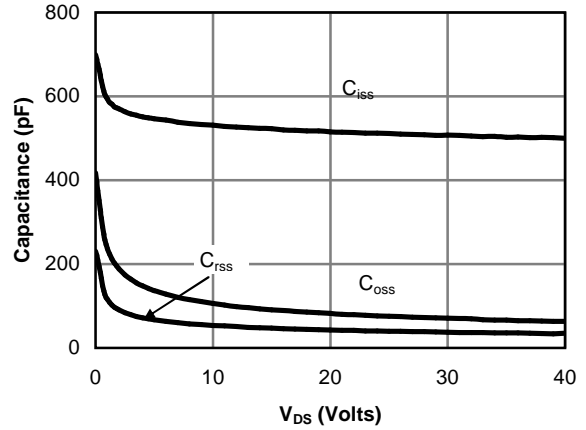

Figure 7: Gate-Charge Characteristics

$V_{DS}=20V$
$I_D= 6A$

Figure 8: Capacitance Characteristics

C_{iss}
C_{rss}
C_{oss}
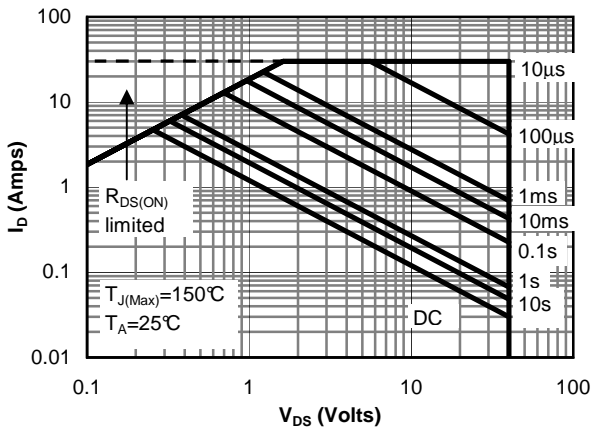
Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

$R_{DS(ON)}$ limited
$T_{J(Max)}=150℃$
$T_A=25℃$
10µs
100µs
1ms
10ms
0.1s
1s
10s
DC
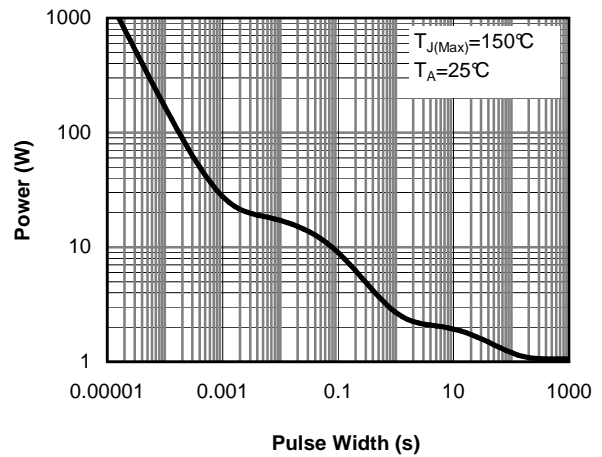
Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

$T_{J(Max)}=150℃$
$T_A=25℃$
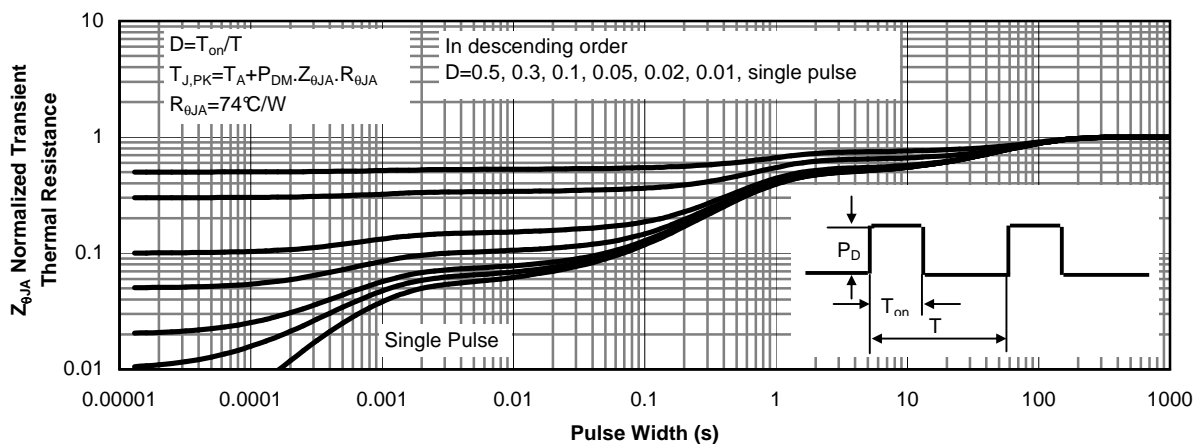
Figure 11: Normalized Maximum Transient Thermal Impedance

$D=T_{on}/T$
$T_{J,PK}=T_A+P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$
$R_{\theta JA}=74℃/W$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

P_D
T_{on}
T

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D= -250μA, V_{GS}=0V		-40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -40V, V_{GS}=0V				-1	μA
			T_J=55℃			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D= -250μA		-1.7	-2	-3	V
$I_{D(ON)}$	On state drain current	V_{GS}= -10V, V_{DS}= -5V		-30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}= -10V, I_D= -5A			36	45	mΩ
			T_J=125℃		52	65	
		V_{GS}= -4.5V, I_D= -4A			50	63	
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D= -5A			13		S
V_{SD}	Diode Forward Voltage	I_S= -1A,V_{GS}=0V			-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current					-2	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}= -20V, f=1MHz		750	940	1175	pF
C_{oss}	Output Capacitance				97		pF
C_{rss}	Reverse Transfer Capacitance				72		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			14		Ω
SWITCHING PARAMETERS							
Q_g (-10V)	Total Gate Charge	V_{GS}= -10V, V_{DS}= -20V, I_D= -5A			17	22	nC
Q_g (-4.5V)	Total Gate Charge				7.9	10	nC
Q_{gs}	Gate Source Charge				3.4		nC
Q_{gd}	Gate Drain Charge				3.2		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}= -10V, V_{DS}= -20V, R_L=4Ω, R_{GEN}=3Ω			6.2		ns
t_r	Turn-On Rise Time				8.4		ns
$t_{D(off)}$	Turn-Off DelayTime				44.8		ns
t_f	Turn-Off Fall Time				41.2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F= -5A, dI/dt=100A/μs			21	27	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F= -5A, dI/dt=100A/μs			14		nC

A: The value of $R_{θJA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25℃. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{θJA}$ is the sum of the thermal impedance from junction to lead $R_{θJL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using <300 μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25℃. The SOA curve provides a single pulse rating .

Rev1 : Jan 2010

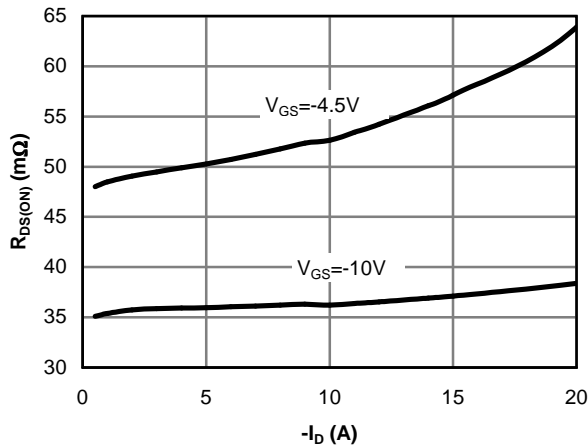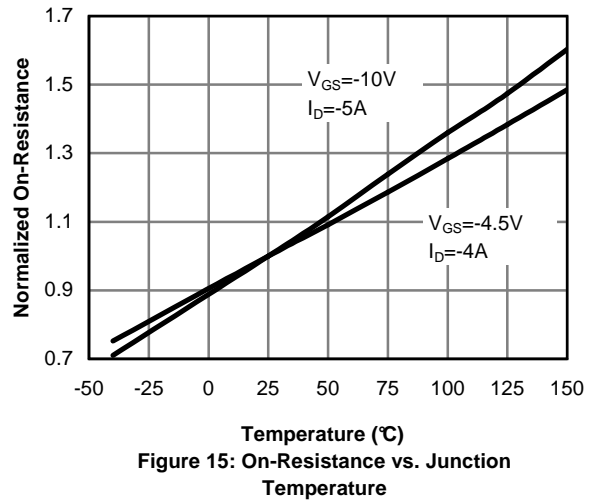## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL
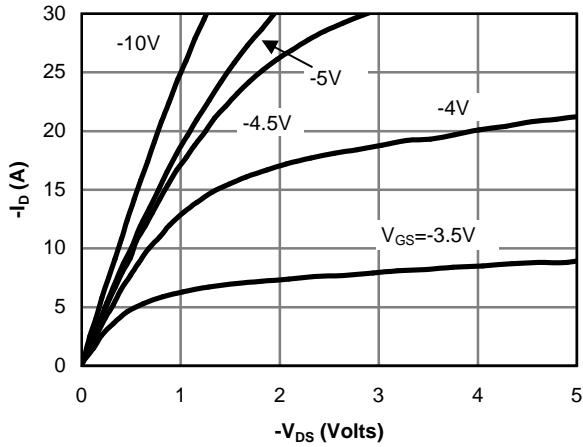
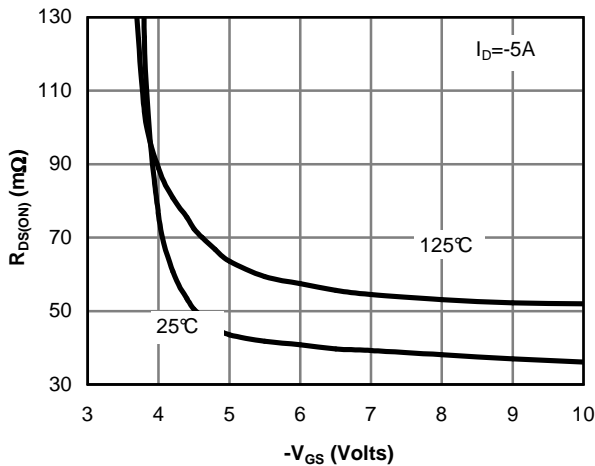**Fig 12: On-Region Characteristics**
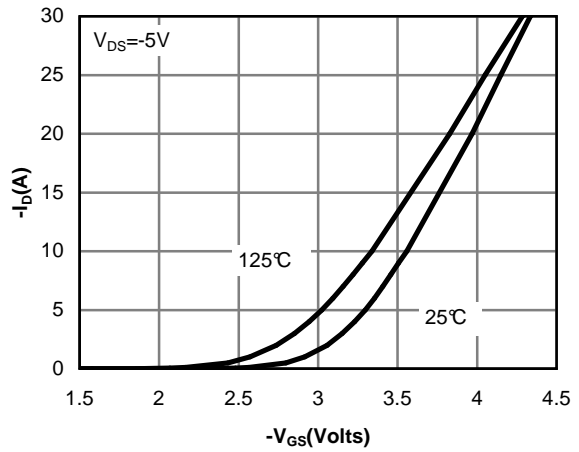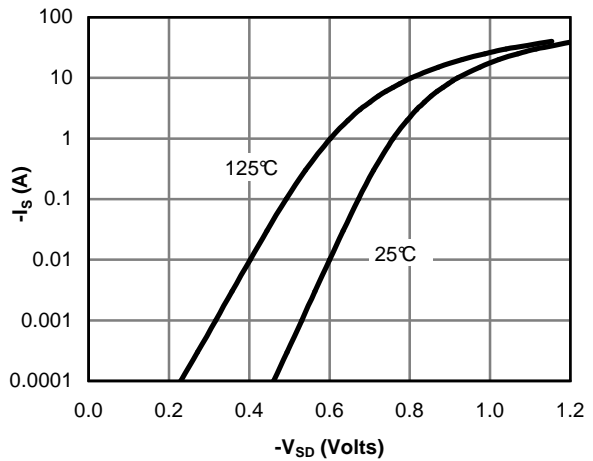
Figure 13: Transfer Characteristics

Figure 14: On-Resistance vs. Drain Current and Gate Voltage

Figure 15: On-Resistance vs. Junction Temperature

Figure 16: On-Resistance vs. Gate-Source Voltage

Figure 17: Body-Diode Characteristics

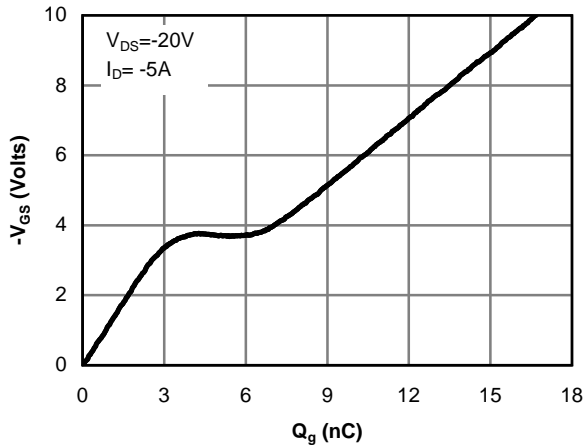## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

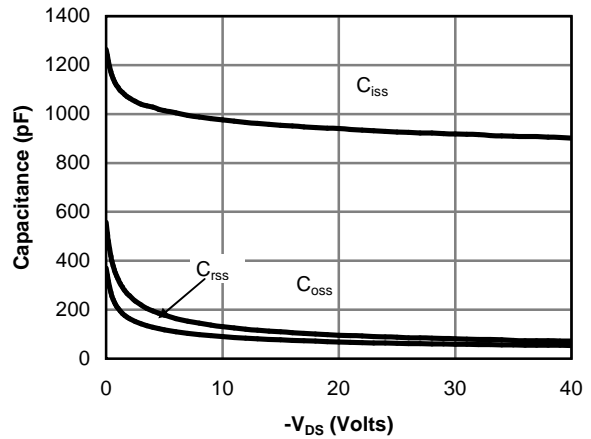Figure 18: Gate-Charge Characteristics

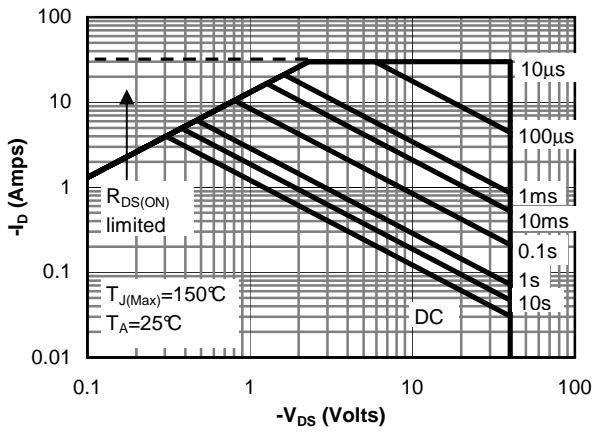Figure 19: Capacitance Characteristics

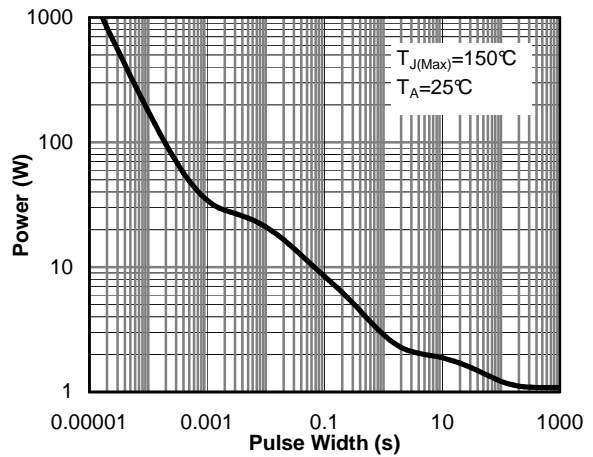Figure 20: Maximum Forward Biased Safe Operating Area (Note E)
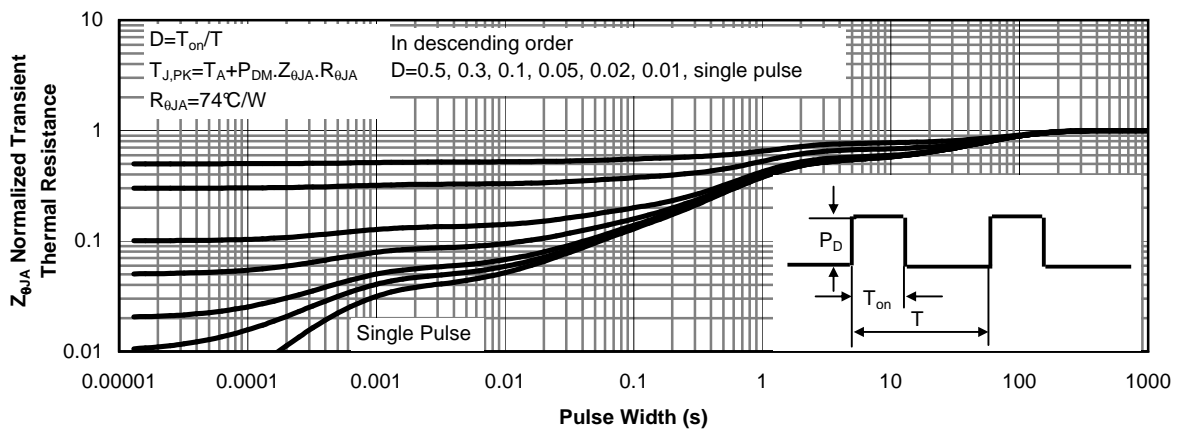

Figure 21: Single Pulse Power Rating Junction-to-Ambient (Note E)

Figure 22: Normalized Maximum Transient Thermal Impedance