深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

General Description

The GX4606 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.
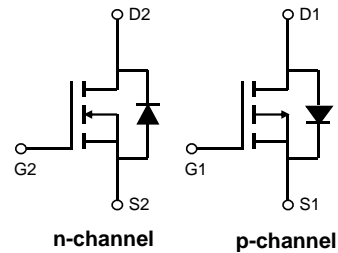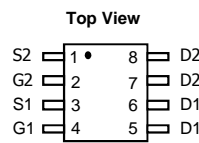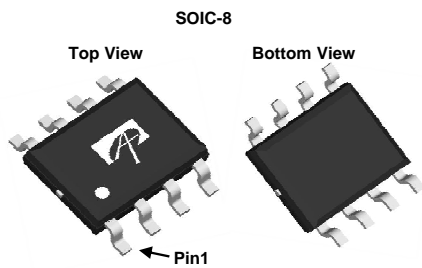
Product Summary

N-Channel
V_{DS}= 30V
I_D= 6A (V_{GS}=10V)
$R_{DS(ON)}$
< 30mΩ (V_{GS}=10V)
< 42mΩ (V_{GS}=4.5V)

100% UIS Tested
100% R_g Tested

P-Channel
-30V
-6.5A (V_{GS}=-10V)
$R_{DS(ON)}$
< 28mΩ (VGS=-10V)
< 44mΩ (VGS=-4.5V)

100% UIS Tested
100% R_g Tested

Green Product

SOIC-8

Top View   **Bottom View**

Pin1

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}	30	-30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current	T_A=25℃	I_D	6	-6.5	A
	T_A=70℃		5	-5.3	
Pulsed Drain Current ^{C}		I_{DM}	30	-30	
Avalanche Current ^{C}		I_{AS}, I_{AR}	10	23	A
Avalanche energy L=0.1mH ^{C}		E_{AS}, E_{AR}	5	26	mJ
Power Dissipation ^{B}	T_A=25℃	P_D	2	2	W
	T_A=70℃		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^{A}	t ≤ 10s	$R_{θJA}$	48	62.5	℃/W
Maximum Junction-to-Ambient $^{A D}$	Steady-State		74	90	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{θJL}$	32	40	℃/W

深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

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		30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=30V, 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		1.2	1.8	2.4	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			25	30	mΩ
			T$_J$=125℃		40	48	
		V$_{GS}$=4.5V, I$_D$=5A			33.5	42	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=6A			15		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.76	1	V
I$_S$	Maximum Body-Diode Continuous Current					2.5	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz		200	255	310	pF
C$_{oss}$	Output Capacitance			30	45	60	pF
C$_{rss}$	Reverse Transfer Capacitance			20	35	50	pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		1.6	3.25	4.9	Ω
SWITCHING PARAMETERS							
Q$_g$(10V)	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=15V, I$_D$=6A		4	5.2	6	nC
Q$_g$(4.5V)	Total Gate Charge			2	2.55	3	nC
Q$_{gs}$	Gate Source Charge				0.85		nC
Q$_{gd}$	Gate Drain Charge				1.3		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=2.5Ω, R$_{GEN}$=3Ω			4.5		ns
t$_r$	Turn-On Rise Time				2.5		ns
t$_{D(off)}$	Turn-Off DelayTime				14.5		ns
t$_f$	Turn-Off Fall Time				3.5		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=6A, dI/dt=100A/μs			8.5	12	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=6A, dI/dt=100A/μs			2.2	3	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°C. The value in any given application depends on the user's specific board design.
B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25°C.
D. The R$_{θJA}$ is the sum of the thermal impedence from junction to lead R$_{θJL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T$_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
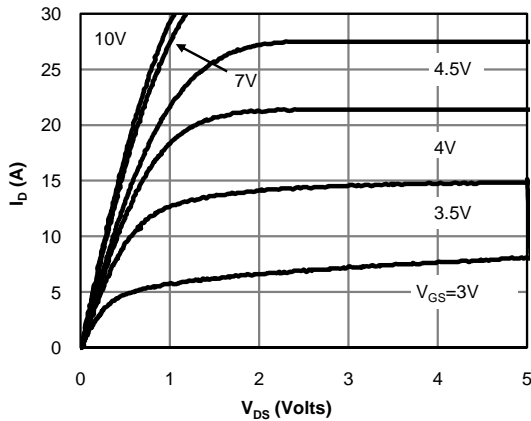
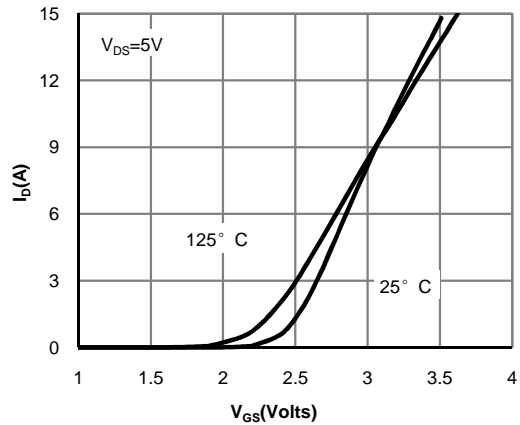Fig 1: On-Region Characteristics (Note E)
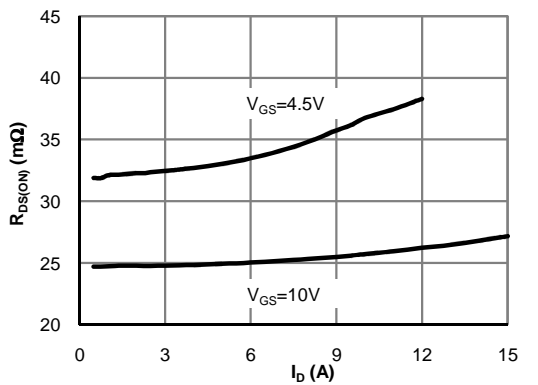
Figure 2: Transfer Characteristics (Note E)

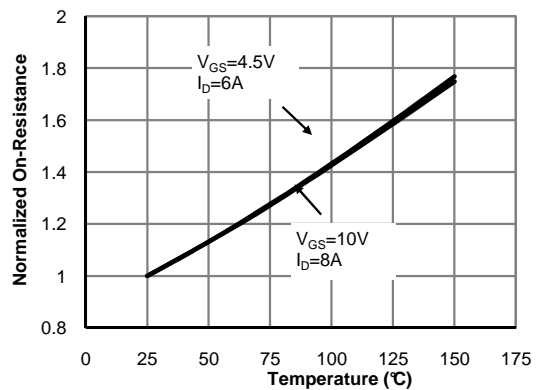Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

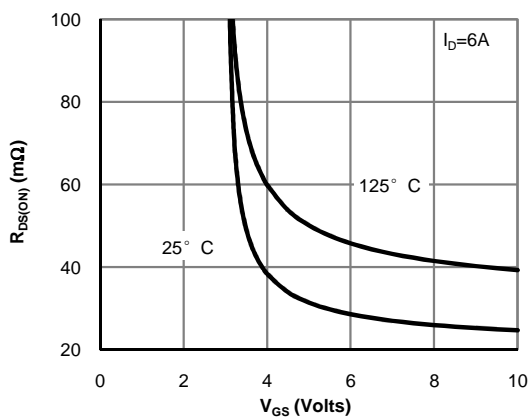Figure 4: On-Resistance vs. Junction Temperature (Note E)

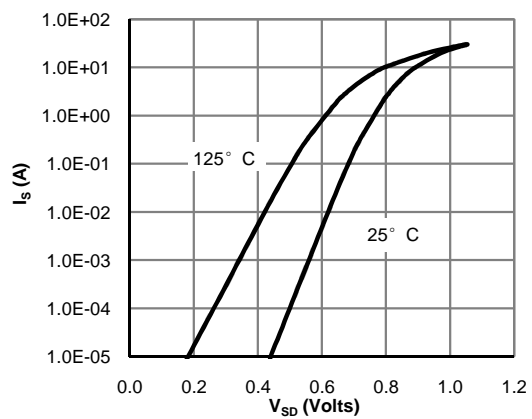Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)
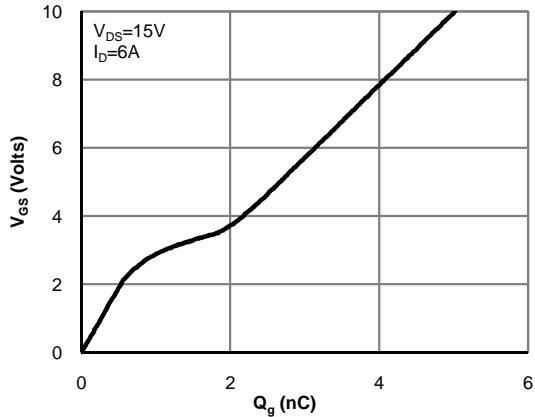
N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

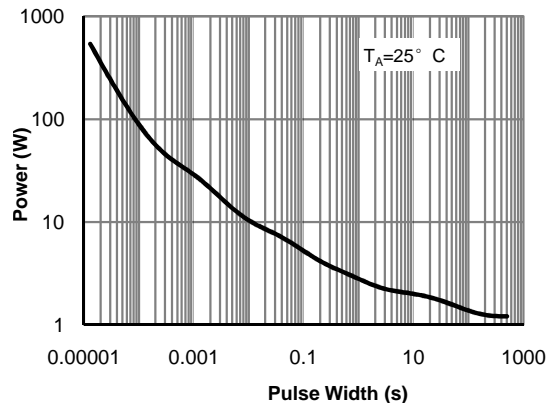Figure 9: Maximum Forward Biased
Safe Operating Area (Note F)

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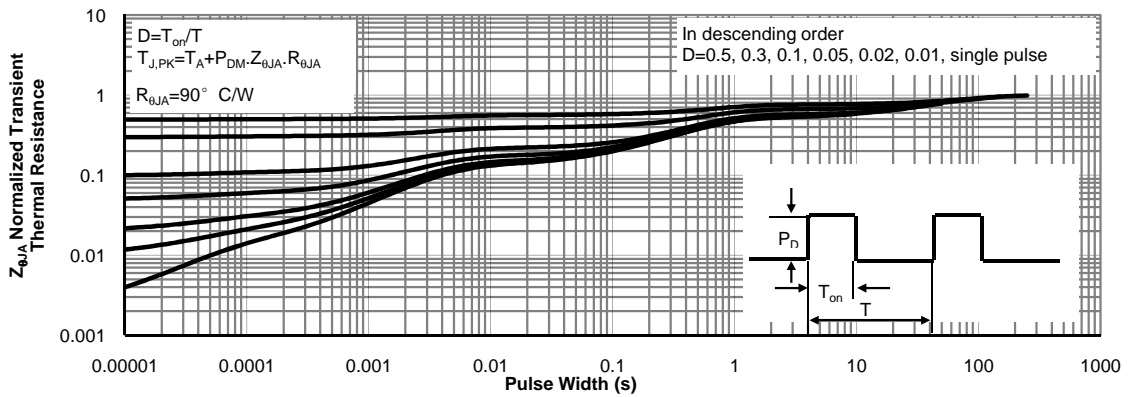to-Ambient (Note F)

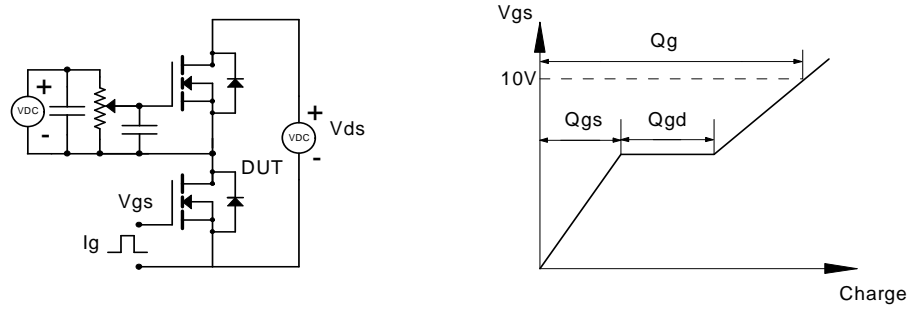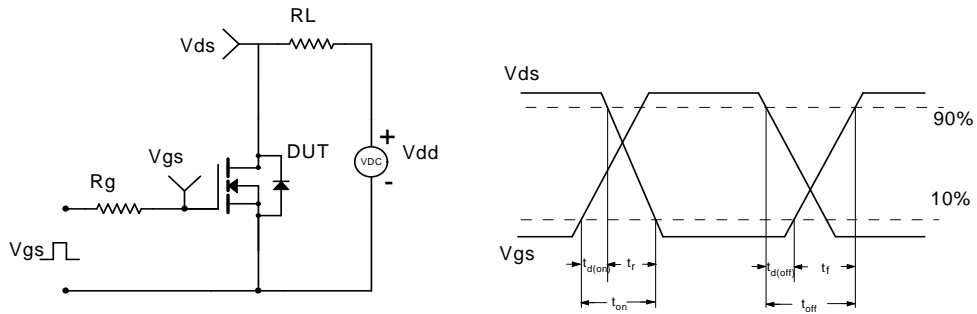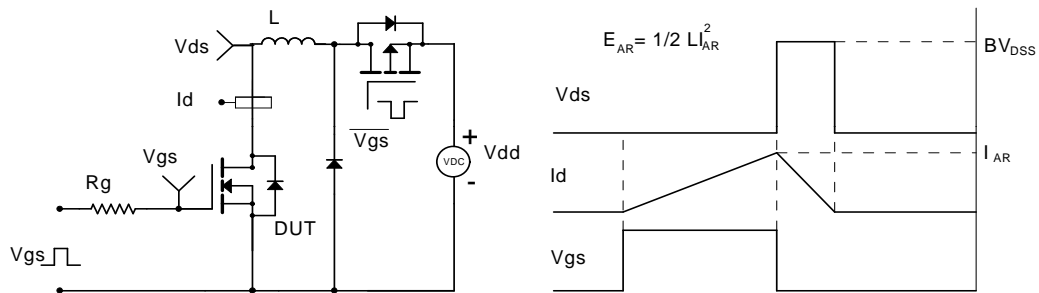Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

Gate Charge Test Circuit & Waveform

VDC
Vds
VDC
DUT
Vgs
Ig

Vgs
10V
Qg
Qgs
Qgd
Charge

Resistive Switching Test Circuit & Waveforms

RL
Vds
Rg
Vgs
DUT
VDC
Vdd

Vgs

Vds
90%
10%
Vgs
$t_{d(on)}$ t_r $t_{d(off)}$ t_f
t_{on} t_{off}

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

L
Vds
Id
$\overline{Vgs}$
Vgs
Rg
VDC
Vdd
DUT
Vgs

$E_{AR}= 1/2 \ LI_{AR}^{2}$
BV_{DSS}
Vds
I_{AR}
Id
Vgs

Diode Recovery Test Circuit & Waveforms

Vds +
DUT
Vds -
Isd
L
Vgs
VDC
Vdd
Ig

$Q_{rr} = -\int Idt$
Vgs
Isd
I_F
t_{rr}
dI/dt
I_{RM}
Vds
Vdd

深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

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		-30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=-30V, 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		-1.3	-1.85	-2.4	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$_D$=-6.5A			22	28	mΩ
			T$_J$=125℃		32	40	
		V$_{GS}$=-4.5V, I$_D$=-5A			34	44	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=-5V, I$_D$=-6.5A			18		S
V$_{SD}$	Diode Forward Voltage	I$_S$=-1A,V$_{GS}$=0V			-0.8	-1	V
I$_S$	Maximum Body-Diode Continuous Current					-2.5	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=-15V, f=1MHz			760		pF
C$_{oss}$	Output Capacitance				140		pF
C$_{rss}$	Reverse Transfer Capacitance				95		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		1.5	3.2	5	Ω
SWITCHING PARAMETERS							
Q$_g$(10V)	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=-15V, I$_D$=-6.5A			13.6	16	nC
Q$_g$(4.5V)	Total Gate Charge				6.7	8	nC
Q$_{gs}$	Gate Source Charge				2.5		nC
Q$_{gd}$	Gate Drain Charge				3.2		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=-15V, R$_L$=2.3Ω, R$_{GEN}$=3Ω			8		ns
t$_r$	Turn-On Rise Time				6		ns
t$_{D(off)}$	Turn-Off DelayTime				17		ns
t$_f$	Turn-Off Fall Time				5		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=-6.5A, dI/dt=100A/μs			15		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=-6.5A, dI/dt=100A/μs			9.7		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°C. The value in any given application depends on the user's specific board design.
B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25°C.
D. The R$_{θJA}$ is the sum of the thermal impedence from junction to lead R$_{θJL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T$_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

深圳市国芯佳品半导体有限公司
SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.,LTD

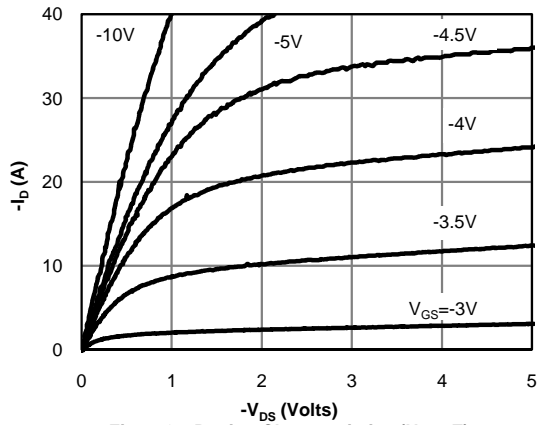**P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

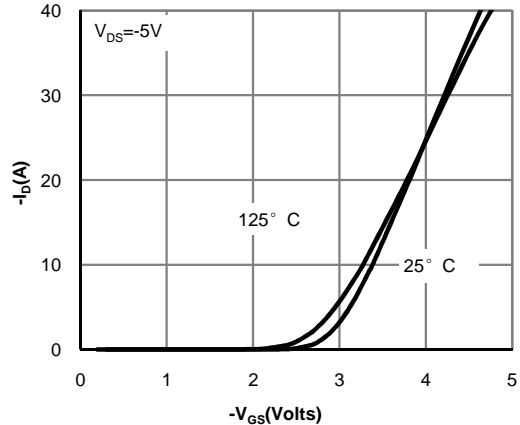Fig 1: On-Region Characteristics (Note E)
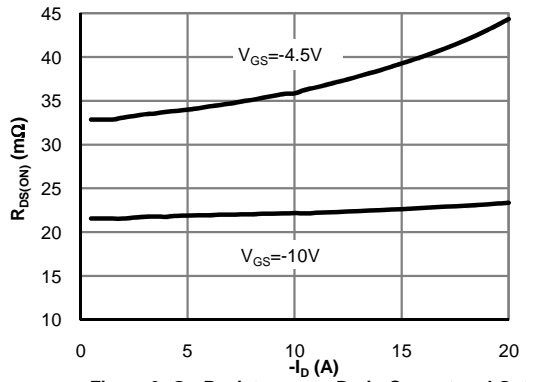
Figure 2: Transfer Characteristics (Note E)

Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)
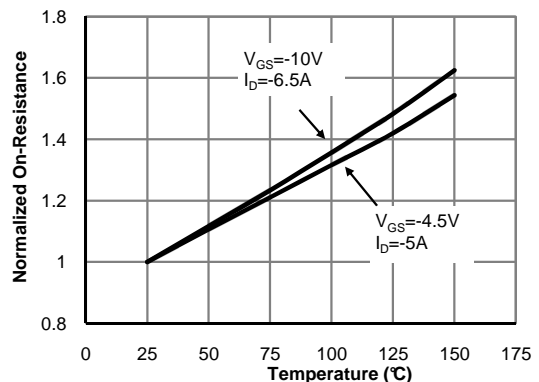
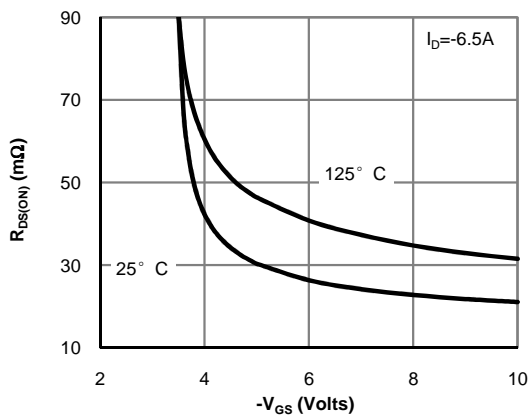Figure 4: On-Resistance vs. Junction Temperature (Note E)
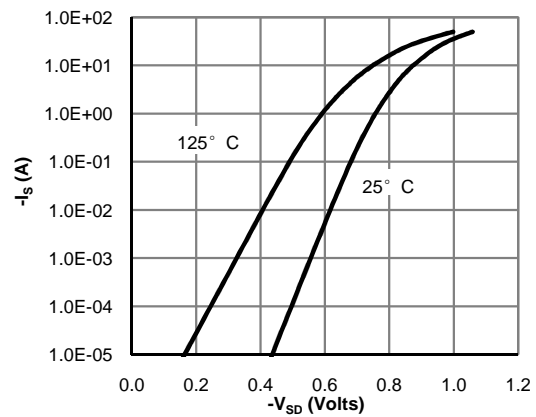
Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)
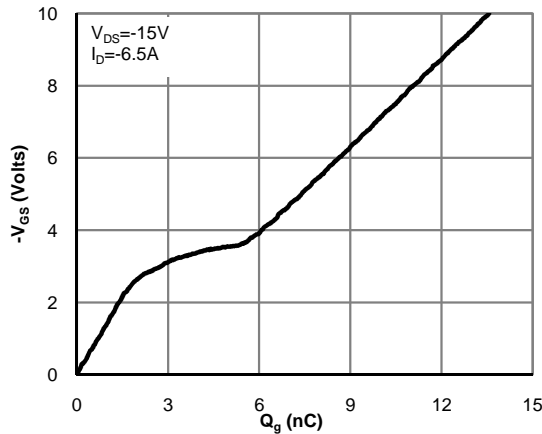
P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

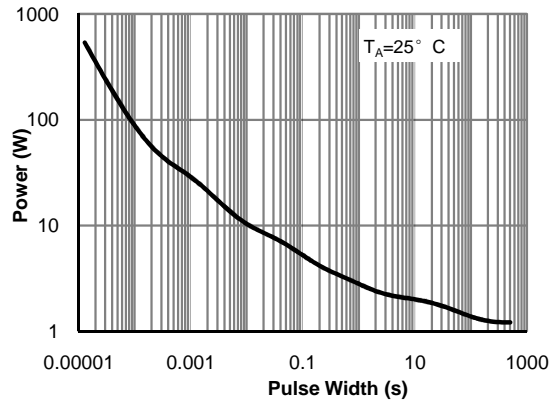
Figure 9: Maximum Forward Biased Safe
Operating Area (Note F)

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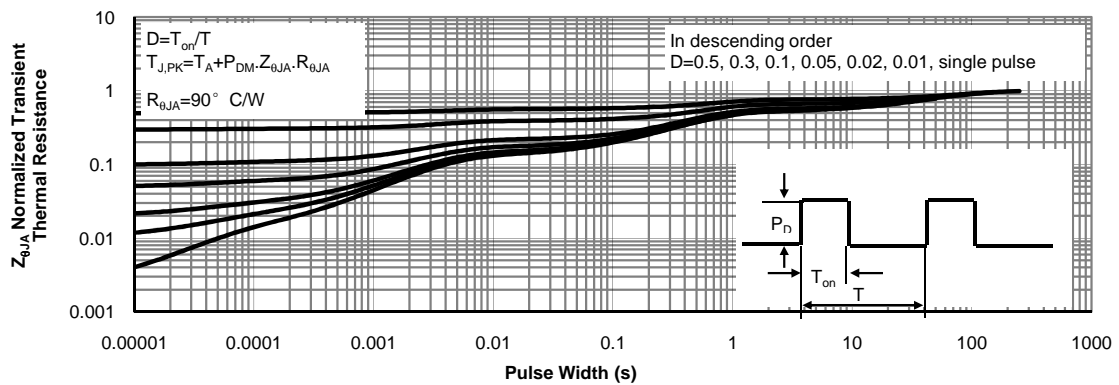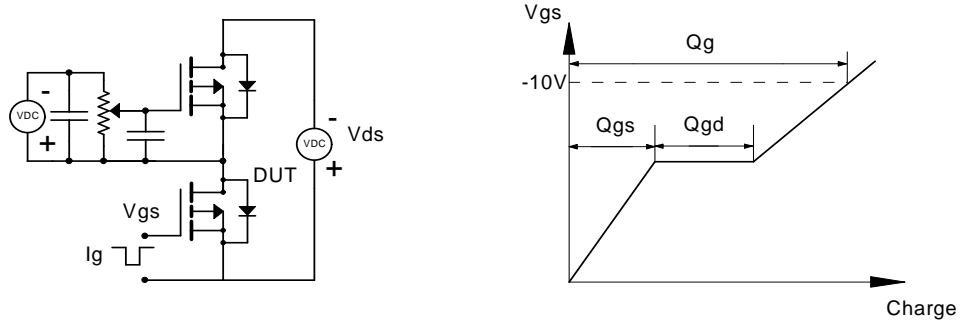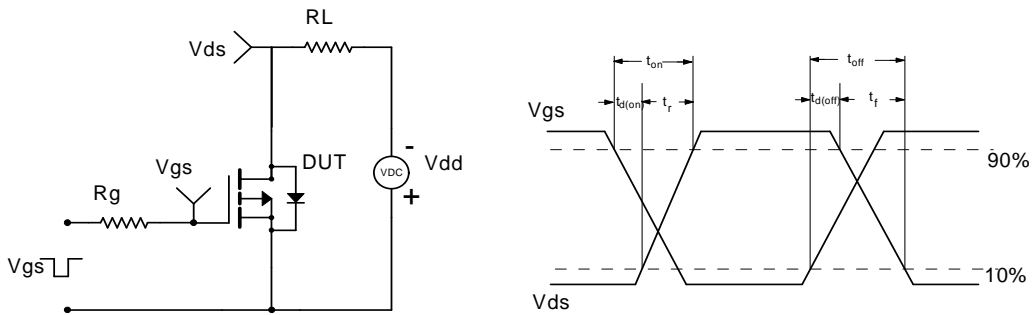to-Ambient (Note F)

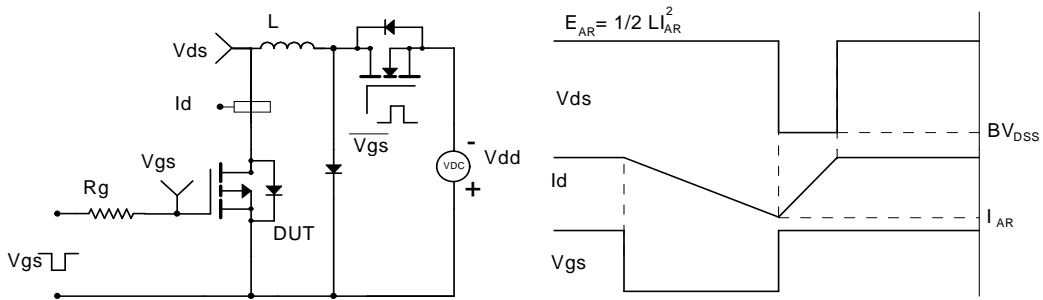Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$