GSR4606DT Dual-Channel MOS

Group-Semi N/P-Channel Complementary MOSFET

Dec 2016

GENERAL DESCRIPTION

The GSR4606DT uses advanced trench technology MOSFETs to provide excellent RDS(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. Standard Product GSR4606DT is Pb-free. GSR4606DT is electrically identical.

GENERAL FEATURES

N-channel

- V_{DS} =30V,I_D =5A
  $R_{DS(ON)}$ <35mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ <40mΩ @ V_{GS}=4.5V

P-channel

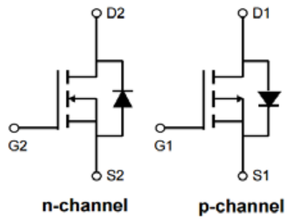
- VDS =-30V,ID =-5A
  RDS(ON) <50mΩ @ VGS=-10V
  RDS(ON) <80mΩ @ VGS=-4.5V

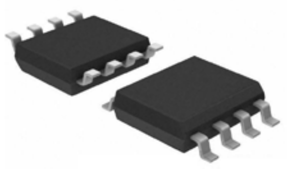
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- H-bridge
- Inverters

PIN CONFIGURAT ION

Package	Pin Configuration (Top View)
SOP-8	



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Max N-channel	Max P-channel	Unit
V_{DS}	Drain-Source Voltage	30	-30	V
I_D	Drain Current -Continuous (TA = 25℃) -Continuous (TA = 70℃)	25 15	-19 -14	A
I_{DM}	Drain Current - Pulsed (Note 1)	75	-70	A
V_{GS}	Gate-Source voltage	±20	±20	V
I_{AS}	Single Pulse Avalanche Current (Note 1)	14	24	A
E_{AS}	Single Pulse Avalanche Energy L=0.1mH (Note 1)	10	29	mJ
P_D	Power Dissipation - TA = 25℃ (Note 2) - TA = 70℃	21	21	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	-55 to +150	℃

Thermal Characteristics

Symbol	Parameter	GSR4606DT	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient, t<10s	7	℃/W
	Maximum Junction-to-Ambient, Steady-State	20	℃/W
$R_{\theta JL}$	Maximum Junction-to-Lead, Steady-State	32	℃/W

N-Channel Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = 250μA, TJ = 25℃	30	-	-	V
IDSS	Zero Gate Voltage Drain Current	VDS = 30V, VGS = 0V -TJ = 55℃	-	- -	1 5	μA μA
IGSSF	Gate-Body Leakage Current, Forward	VGS = 20V, VDS = 0V	-	-	100	nA
IGSSR	Gate-Body Leakage Current, Reverse	VGS = -20V, VDS = 0V	-	-	-100	nA
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS = VGS, ID = 250μA	0.6	1	1.5	V
RDS(on)	Static Drain-Source On-Resistance	VGS = 10V, ID = 5A VGS = 4.5V, ID = 5A	-	35 45	40 60	mΩ
gFS	Forward Transconductance	VDS = 5V, ID = 6A	-	15	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	3.2	-	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS = 15V, VGS = 0V, f=1MHz	-	400	-	pF
Coss	Output Capacitance		-	45	-	pF
Crss	Reverse Transfer Capacitance		-	70	-	pF
Switching Characteristics						
td(on)	Turn-On Delay Time	VDS = 15V, RG = 3Ω, ID = 6A , VGS = 10V (Note 5, 6)	-	4.5	-	ns
tr	Turn-On Rise Time		-	2.5	-	ns
td(off)	Turn-Off Delay Time		-	14.5	-	ns
tf	Turn-Off Fall Time		-	3.5	-	ns
Qg(10V)	Total Gate Charge	VDS = 15V, ID = 6A, VGS = 0~10V (Note 5, 6)	-	5.2	-	nC
Qg(4.5V)	Total Gate Charge		-	2.6	-	nC
Qgs	Gate-Source Charge		-	0.8	-	nC
Qgd	Gate-Drain Charge		-	1.3	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	25	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	50	A
VSD	Drain-Source Diode Forward Voltage	VGS = 0V, IS = 1A	-	0.7	1.0	V
trr	Reverse Recovery Time	VGS = 0V, IS =6A dIF/dt =100A/μs (Note 5)	-	8.5	-	ns
Qrr	Reverse Recovery Charge		-	2.2	-	nC

N-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

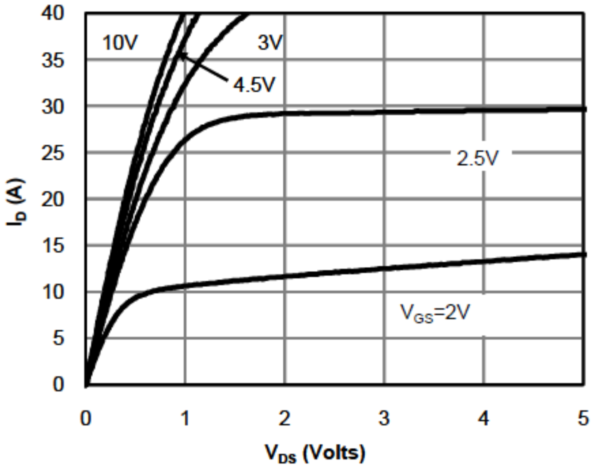


Fig 1: On-Region Characteristics (Note E)

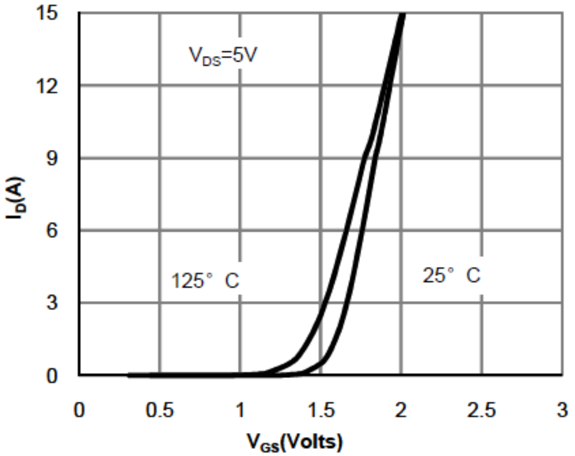


Figure 2: Transfer Characteristics (Note E)

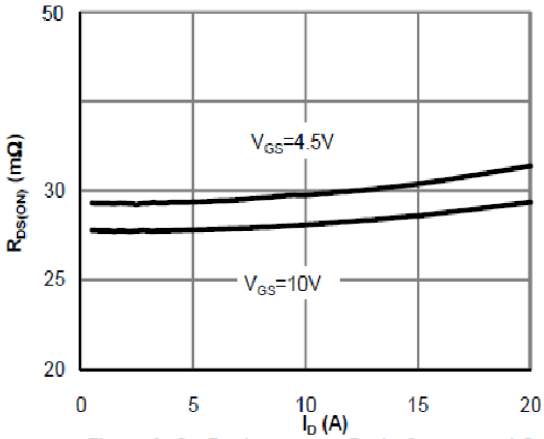


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

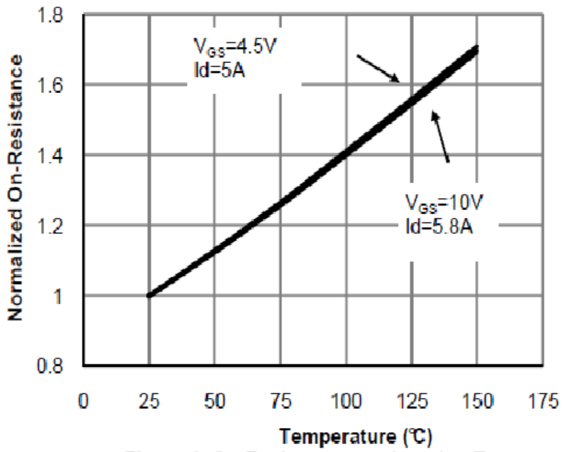


Figure 4: On-Resistance vs. Junction Temperature (Note E)

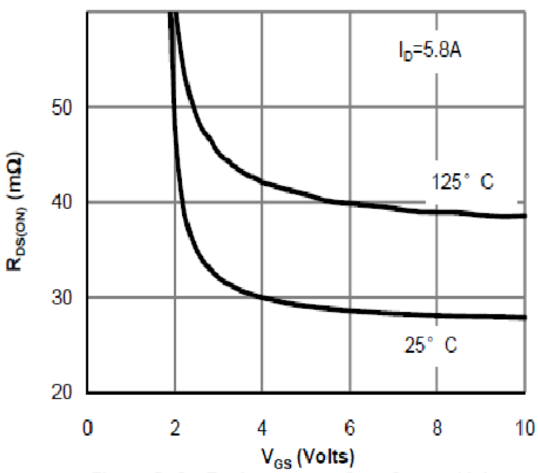


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

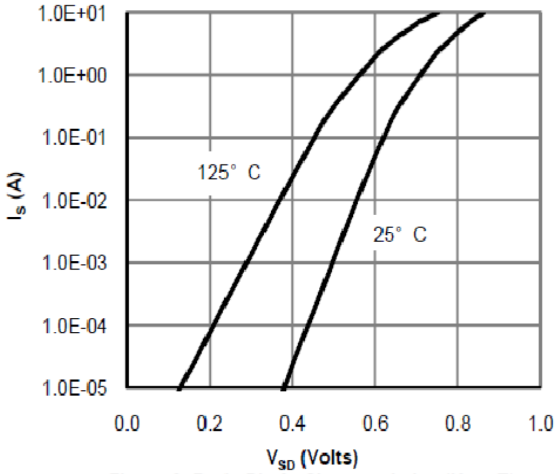


Figure 6: Body-Diode Characteristics (Note E)

N-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

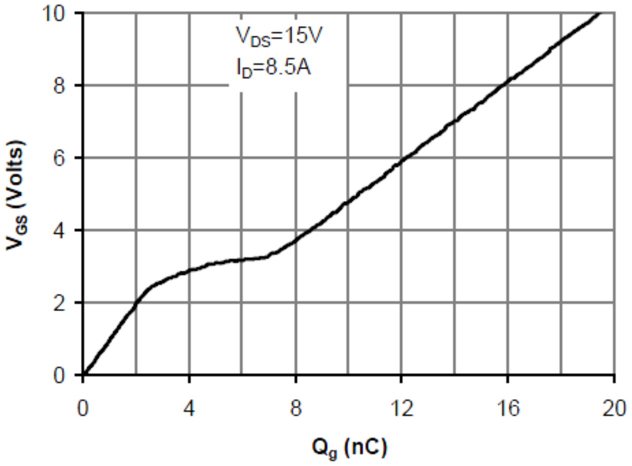


Figure 7: Gate-Charge Characteristics

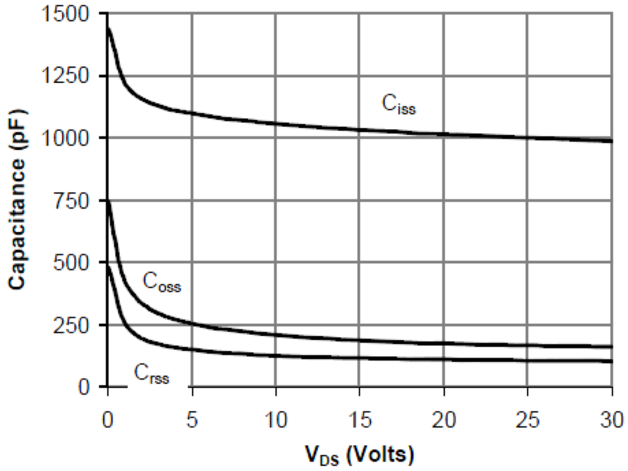


Figure 8: Capacitance Characteristics

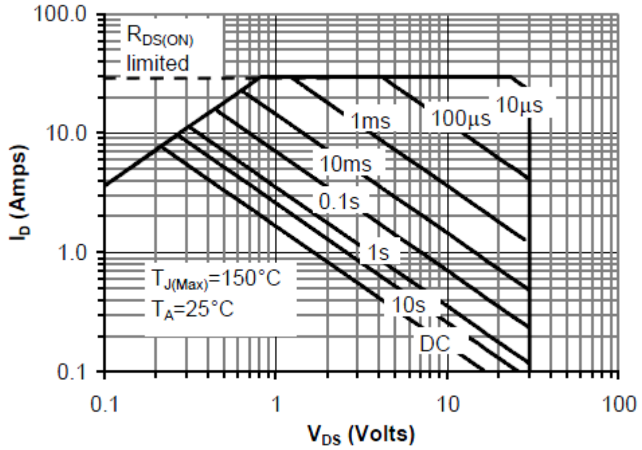


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

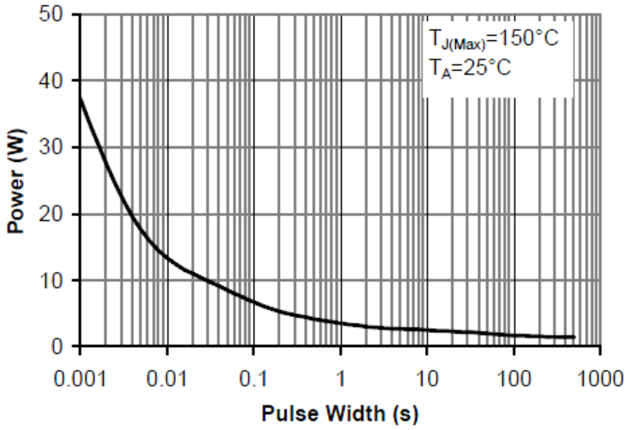


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

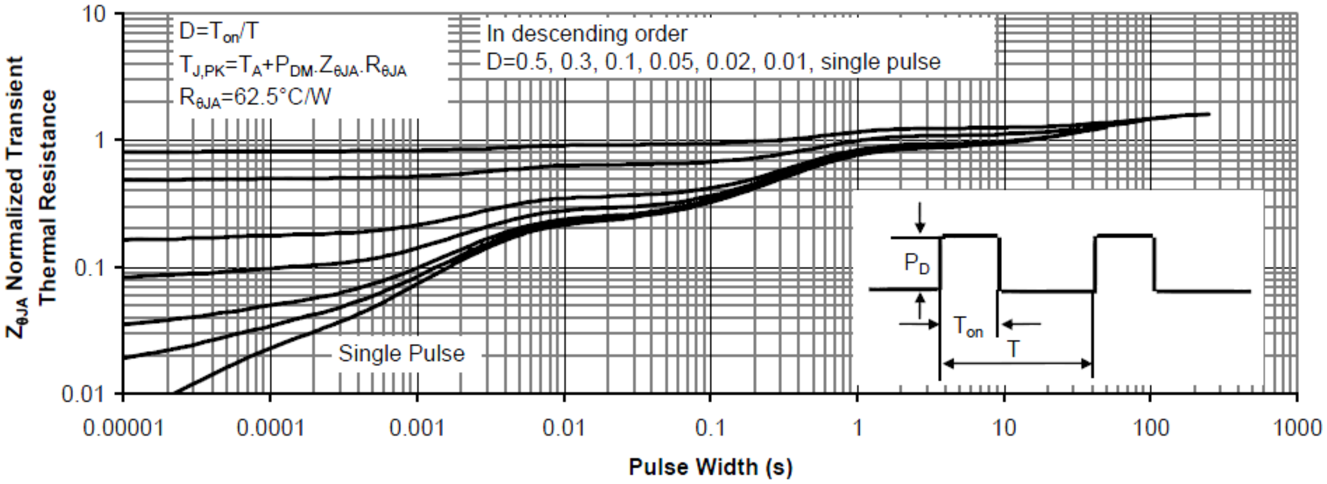


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = -250μA, TJ = 25℃	-30	-	-	V
IDSS	Zero Gate Voltage Drain Current	VDS = -30V, VGS = 0V -TJ = 55℃	-	- -	-1 -5	μA μA
IGSSF	Gate-Body Leakage Current, Forward	VGS = 12V, VDS = 0V	-	-	100	nA
IGSSR	Gate-Body Leakage Current, Reverse	VGS = -12V, VDS = 0V	-	-	-100	nA
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS = VGS, ID = 250μA	-1.0	-1.5	-2.0	V
RDS(on)	Static Drain-Source On-Resistance	VGS = -10V, ID = -6A VGS = -4.5V, ID = -5A	-	46 60	50 80	mΩ
gFS	Forward Transconductance	VDS = -5V, ID = -6A	-	3	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	3.2	-	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS = -15V, VGS = 0V, f=1MHz	-	1000	-	pF
Coss	Output Capacitance		-	175	-	pF
Crss	Reverse Transfer Capacitance		-	105	-	pF
Switching Characteristics						
td(on)	Turn-On Delay Time	VDS = -15V, RG = 3Ω, ID = -6A , VGS = -10V (Note 5, 6)	-	10	-	ns
tr	Turn-On Rise Time		-	31	-	ns
td(off)	Turn-Off Delay Time		-	24	-	ns
tf	Turn-Off Fall Time		-	28	-	ns
Qg(10V)	Total Gate Charge	VDS = -15V, ID = -6A, VGS =- 0~10V (Note 5, 6)	-	18	-	nC
Qg(4.5V)	Total Gate Charge		-	14	-	nC
Qgs	Gate-Source Charge		-	3.2	-	nC
Qgd	Gate-Drain Charge		-	4.4	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	-	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	-25	A
VSD	Drain-Source Diode Forward Voltage	VGS = 0V, IS = -1A	-	-0.7	-1.2	V
trr	Reverse Recovery Time	VGS = 0V, IS =-6A dIF/dt =-100A/μs (Note 5)	-	24	-	ns
Qrr	Reverse Recovery Charge		-	30	-	nC

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

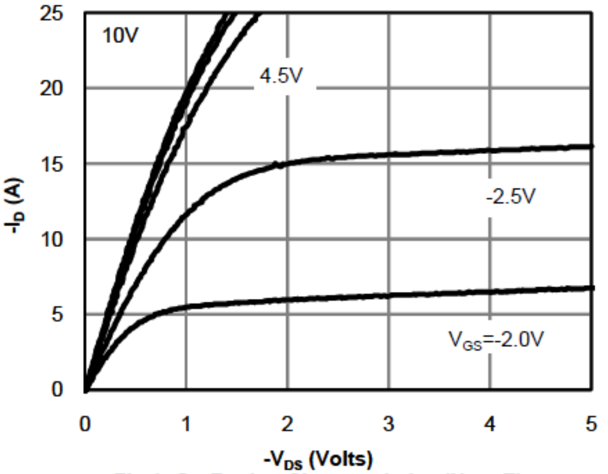


Fig 1: On-Region Characteristics (Note E)

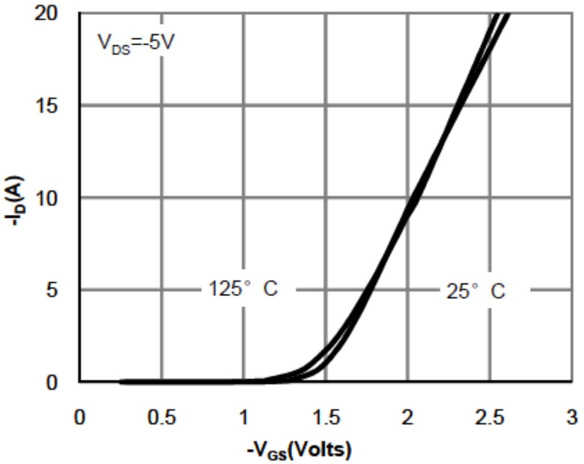


Figure 2: Transfer Characteristics (Note E)

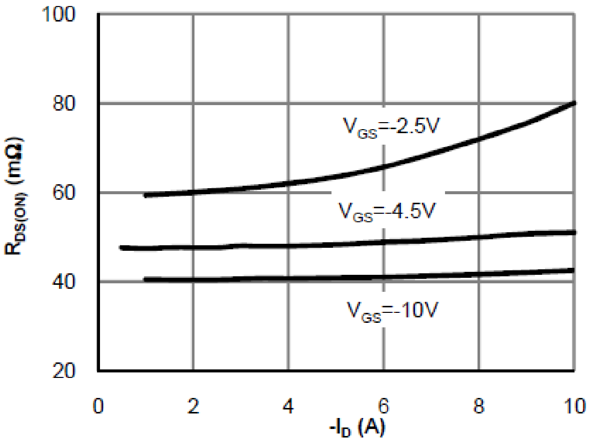


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

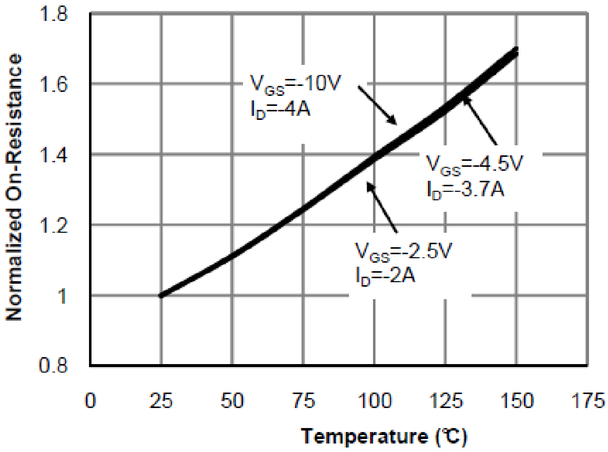


Figure 4: On-Resistance vs. Junction Temperature (Note E)

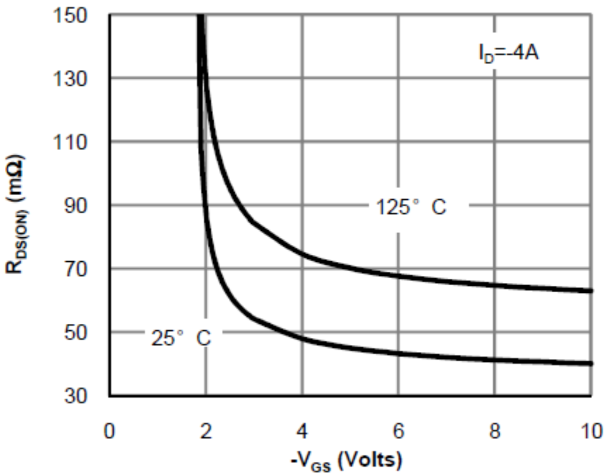


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

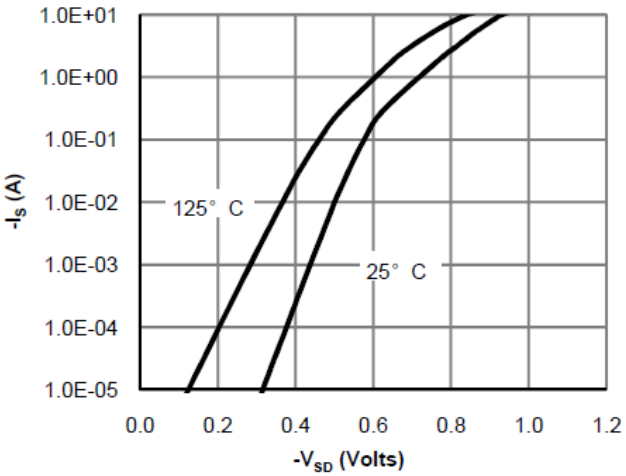


Figure 6: Body-Diode Characteristics (Note E)

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

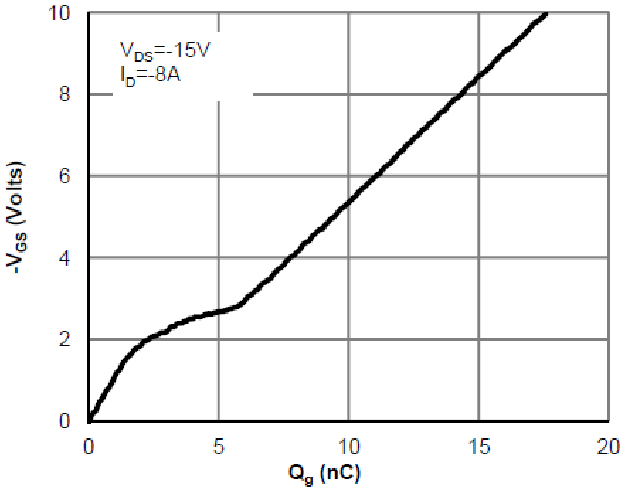


Figure 7: Gate-Charge Characteristics

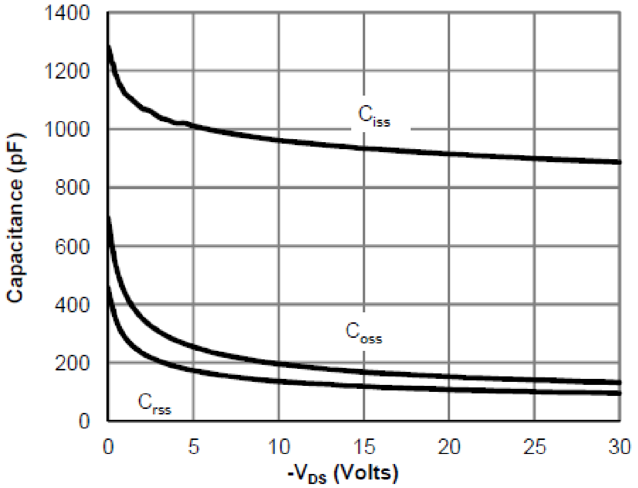


Figure 8: Capacitance Characteristics

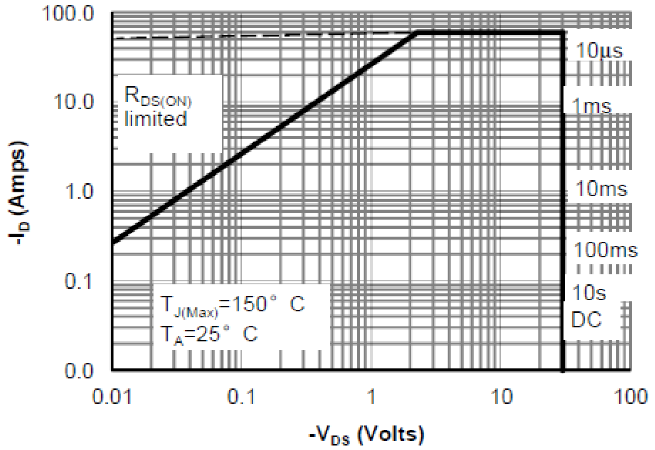


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

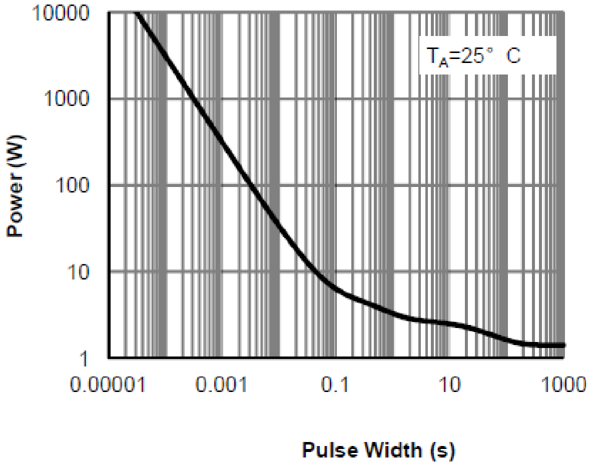


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

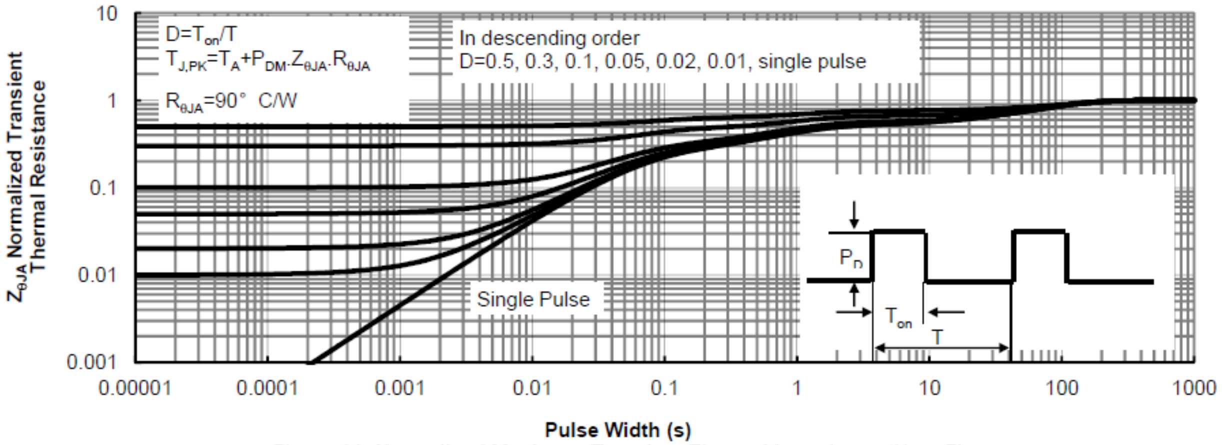
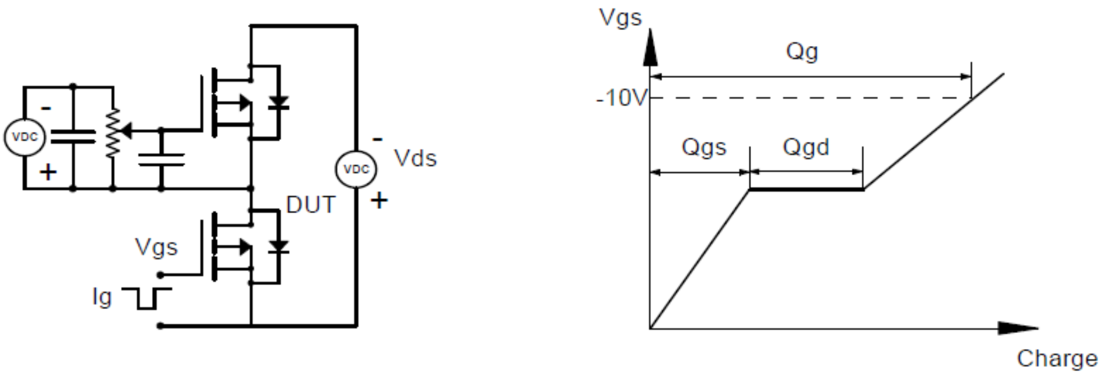
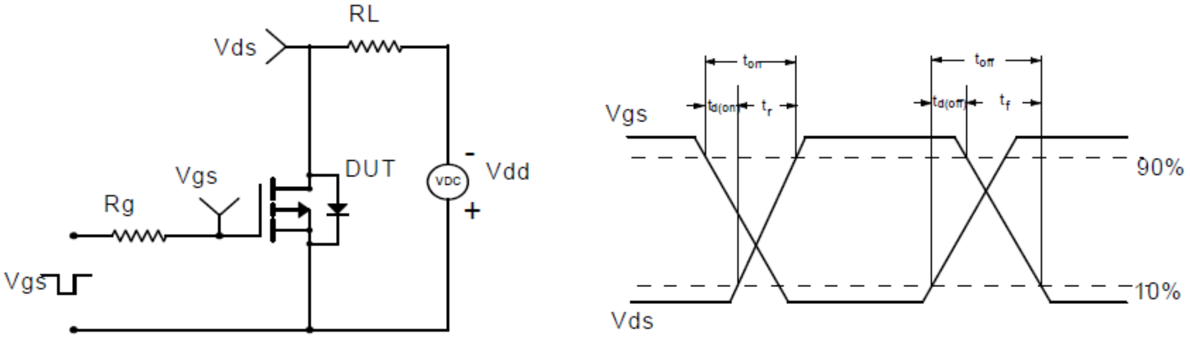


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms