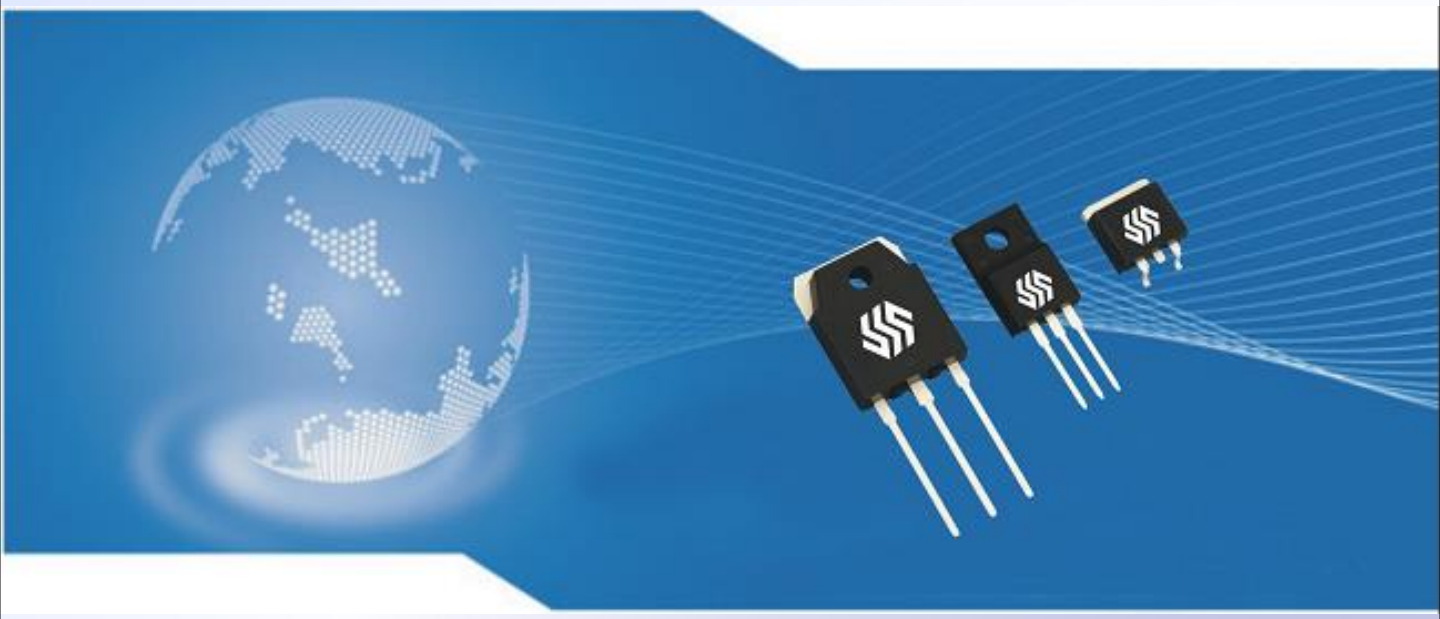
SUPER-SEMI



SUPER-MOSFET

Super Gate Metal Oxide Semiconductor Field Effect Transistor

30V Complementary Power Transistor
SGO4606T

Rev. 1.0
Aug. 2016

www.supersemi.com.cn

SGO4606T
30V Complementary MOSFET

Description

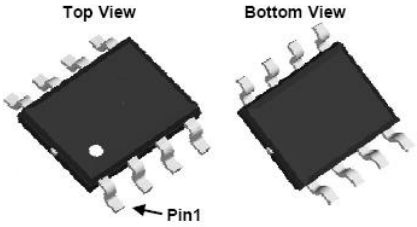
The SG-MOSFET uses trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of RDS(ON), Ciss and Coss. This complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

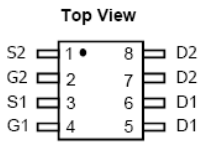
Features

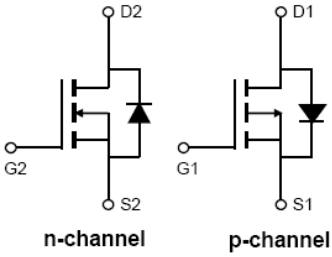
	N-Channel	P-Channel
• VDS	30V	-30V
• ID (at Vgs=10V)	6A	-6.5A
• RDS(on) (at Vgs=10V)	<29.0mΩ	<28.0mΩ
(at Vgs=4.5V)	<40.0mΩ	<42.0mΩ

• Excellent Avalanche Performance

SGO4606T







Absolute Maximum Ratings

Symbol	Parameter	SGO4606T-N ch	SGO4606T-P ch	Unit
V_{DS}	Drain-Source Voltage	30	-30	V
I_D	Drain Current -Continuous (TA = 25℃) -Continuous (TA = 70℃)	6* 5*	-6.5* -5.3*	A
I_{DM}	Drain Current - Pulsed (Note 1)	30*	-30*	A
V_{GS}	Gate-Source voltage	±20	±20	V
I_{AS}	Single Pulse Avalanche Current (Note 1)	18	34	A
E_{AS}	Single Pulse Avalanche Energy L=0.1mH (Note 1)	16	58	mJ
P_D	Power Dissipation - TA = 25℃ (Note 2) - TA = 70℃	2.0 1.3	2.0 1.3	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	-55 to +150	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SGO4606T	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient, t<10s(Note 3)	48(typ.)	℃/W
	Maximum Junction-to-Ambient, Steady-State(Note 3,4)	74(typ.)	℃/W
$R_{\theta JL}$	Maximum Junction-to-Lead, Steady-State	32(typ.)	℃/W

Electrical Characteristics TJ = 25℃ unless otherwise noted

N-Channel Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25℃	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 30V, V_{GS} = 0V -TJ = 55℃	-	- -	1 5	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20V, V_{DS} = 0V	-	-	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20V, V_{DS} = 0V	-	-	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.0	1.8	3.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 6A V_{GS} = 4.5V, I_D = 5A	-	24 34	29 40	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 6A	-	15	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	3.2	-	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f=1MHz	-	250	-	pF
C_{oss}	Output Capacitance		-	45	-	pF
C_{rss}	Reverse Transfer Capacitance		-	35	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 15V, R_G = 3Ω, I_D = 6A , V_{GS} = 10V (Note 5, 6)	-	4.5	-	ns
t_r	Turn-On Rise Time		-	2.5	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	14.5	-	ns
t_f	Turn-Off Fall Time		-	3.5	-	ns
Q_g(10V)	Total Gate Charge	V_{DS} = 15V, I_D = 6A, V_{GS} = 0~10V (Note 5, 6)	-	5.2	-	nC
Qg(4.5V)	Total Gate Charge		-	2.6	-	nC
Q_{gs}	Gate-Source Charge		-	0.8	-	nC
Q_{gd}	Gate-Drain Charge		-	1.3	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	3	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	12	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 1A	-	0.7	1.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_S =6A dIF/dt =100A/μs (Note 5)	-	8.5	-	ns
Q_{rr}	Reverse Recovery Charge		-	2.2	-	nC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature TJ(MAX)=150°C. Ratings are based on low frequency and duty cycles to keep initial TJ=25°C.
2. The power dissipation PD is based on TJ(MAX)=150°C, using ≤ 10s junction-to-ambient thermal resistance.
3. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with TA =25°C. The value in any given application depends on the user's specific board design.
4. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.
5. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
6. Essentially Independent of Operating Temperature Typical Characteristics

N-Channel Typical Performance Characteristics

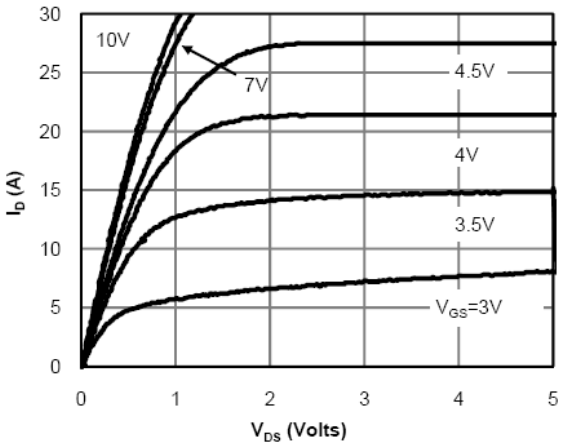


Figure 1: On-Region Characteristics

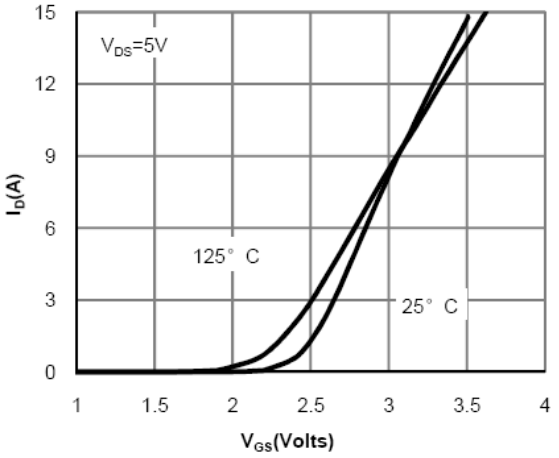


Figure 2: Transfer Characteristics

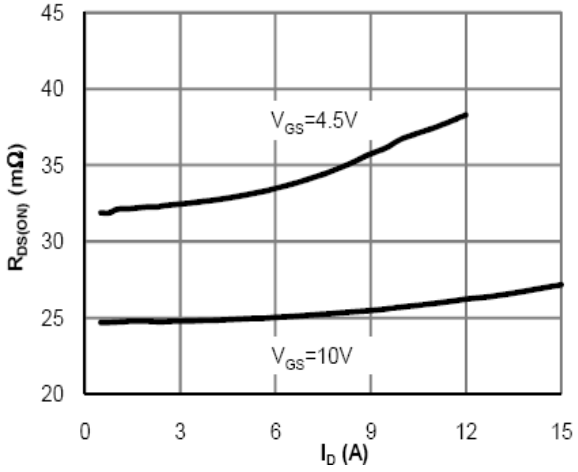


Figure 3: On-Resistance vs Drain current and Gate voltage

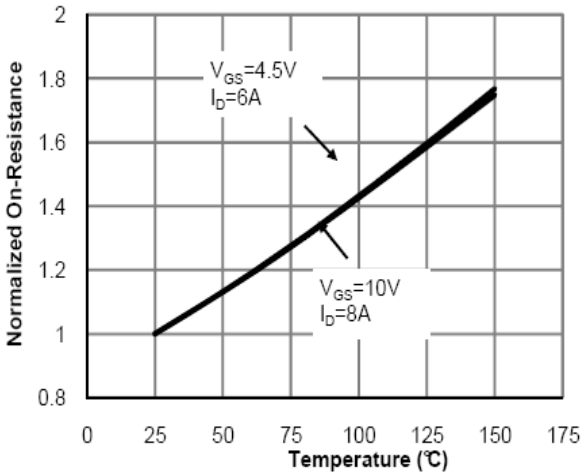


Figure 4: On-Resistance vs Junction Temperature

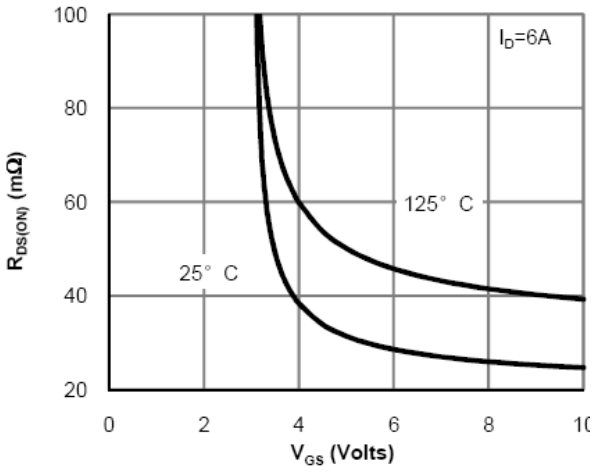


Figure 5: On-Resistance vs Gate-Source voltage

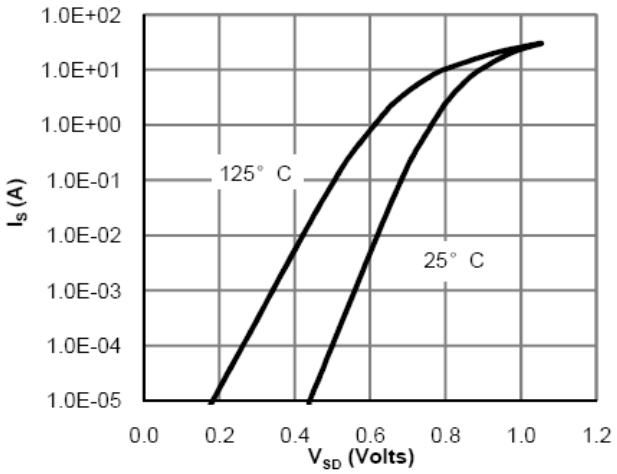


Figure 6: Body-Diode Characteristics

N-Channel Typical Performance Characteristics

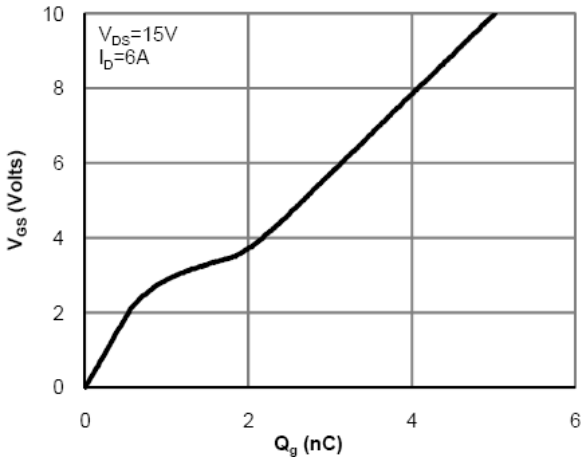


Figure 7: Gate-Charge Characteristics

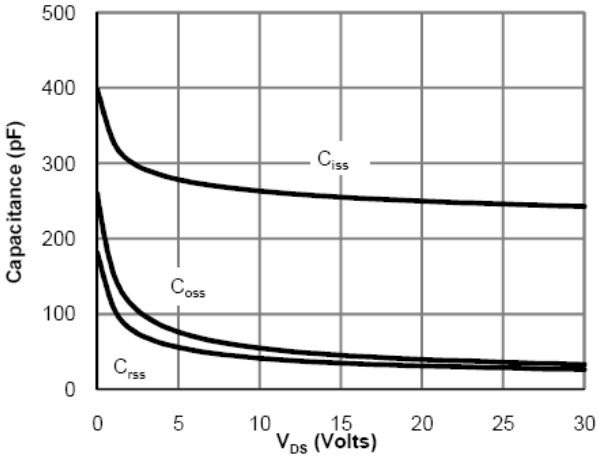


Figure 8: Capacitance Characteristics

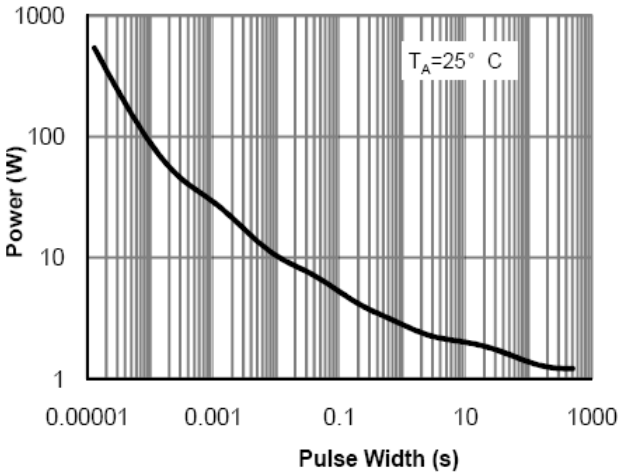


Figure 9: Single Pulse Power Rating Junction-to-Ambient

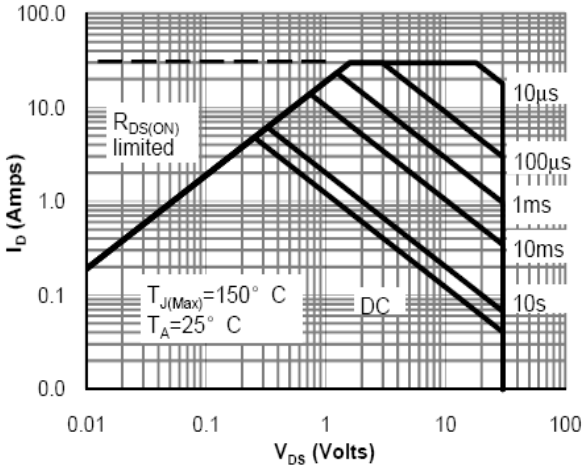


Figure 10: Maximum Forward Biased Safe Operating Area

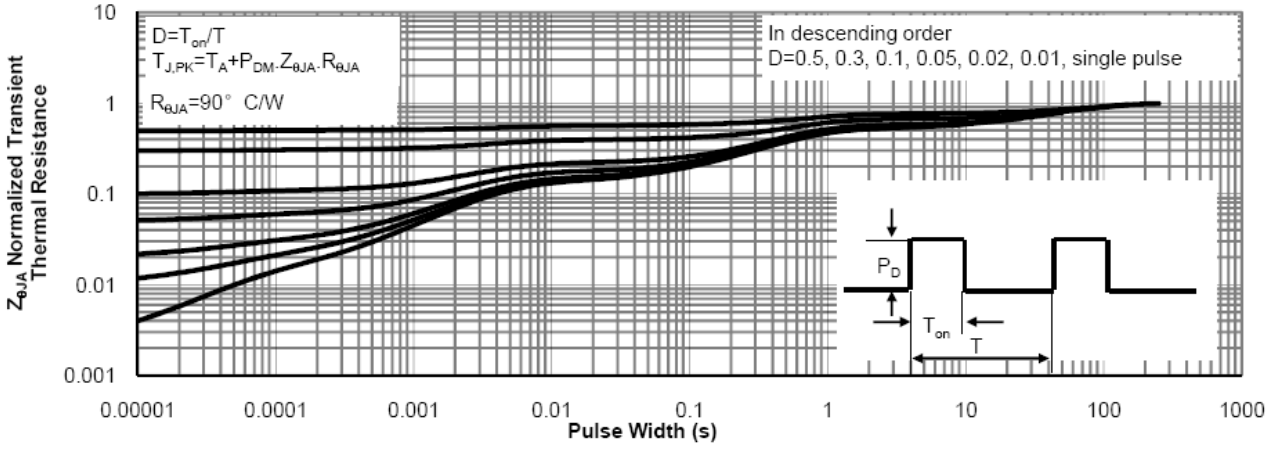
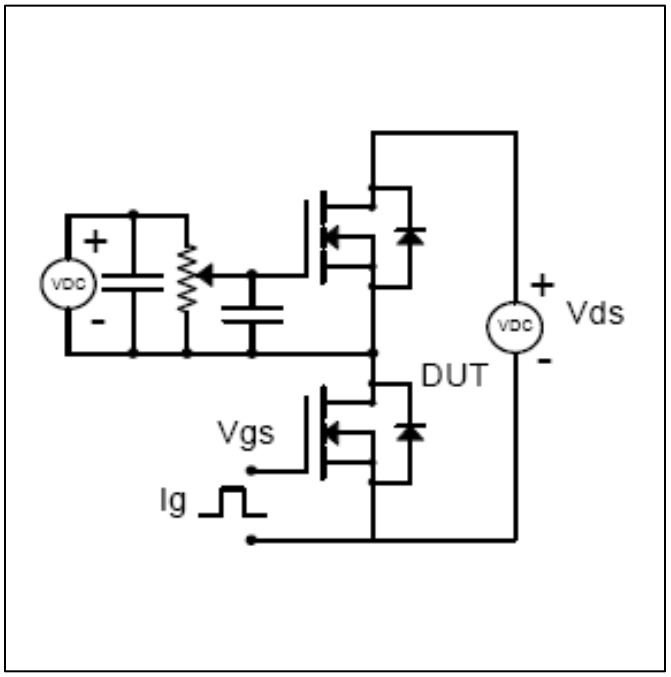
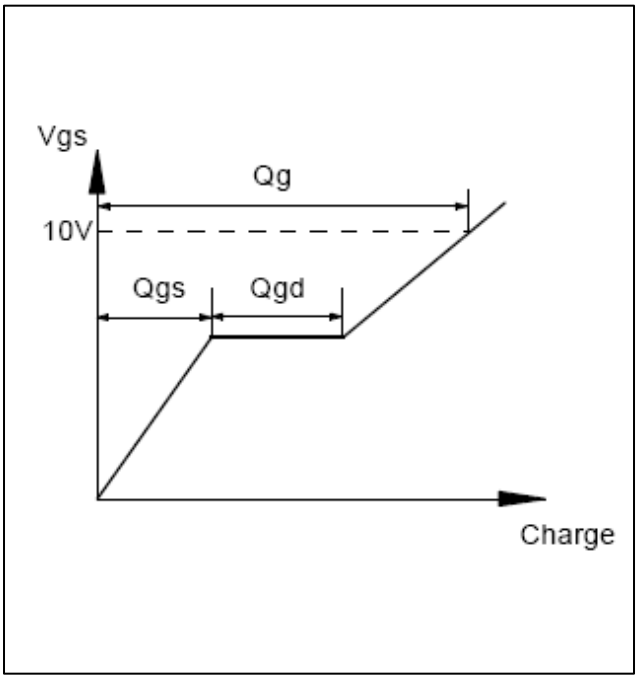


Figure 11: Maximum Transient Thermal Impedance

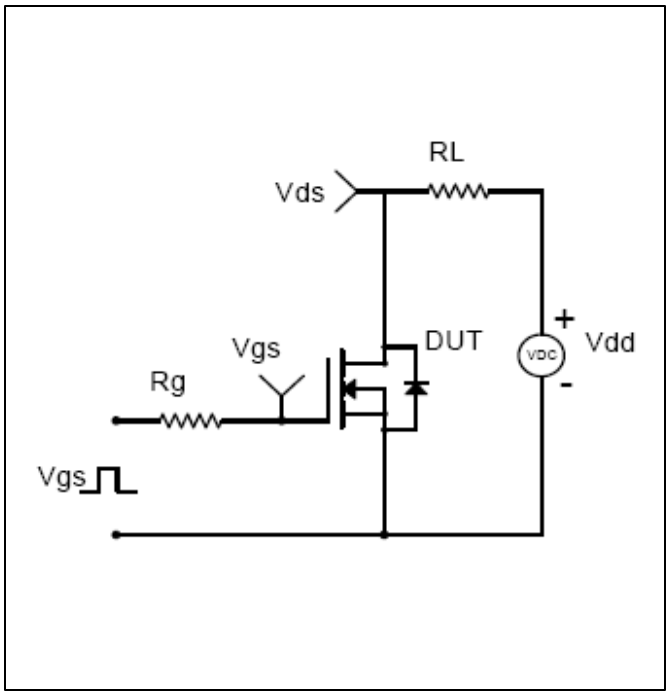
Test circuits for N-Channel

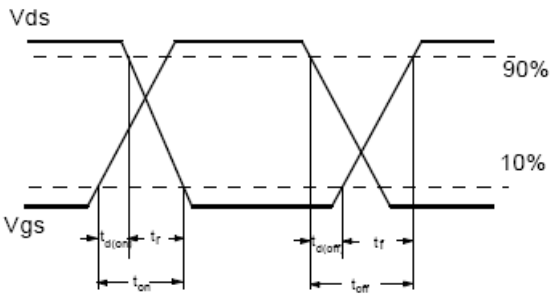
Gate Charge Test Circuit and Waveform





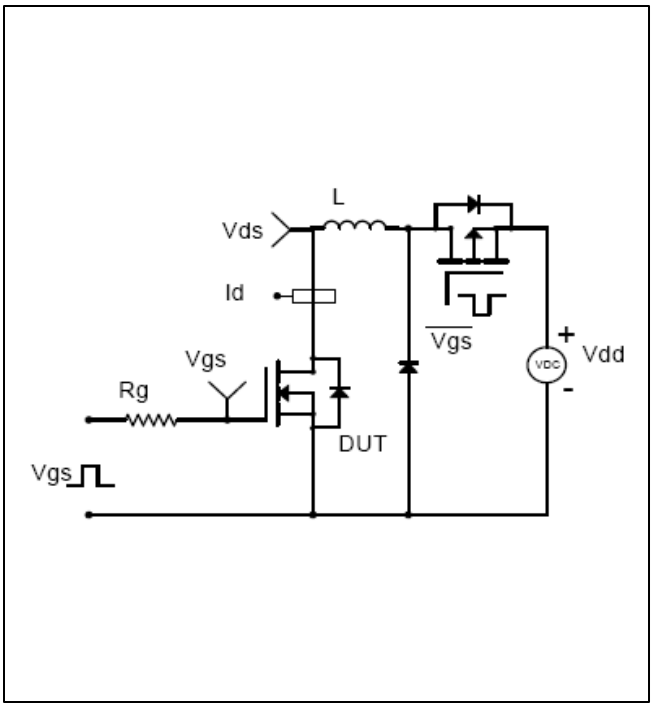
Resistive Switching Test Circuit and Waveforms

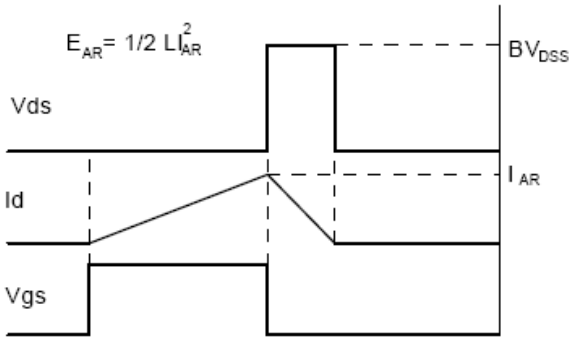




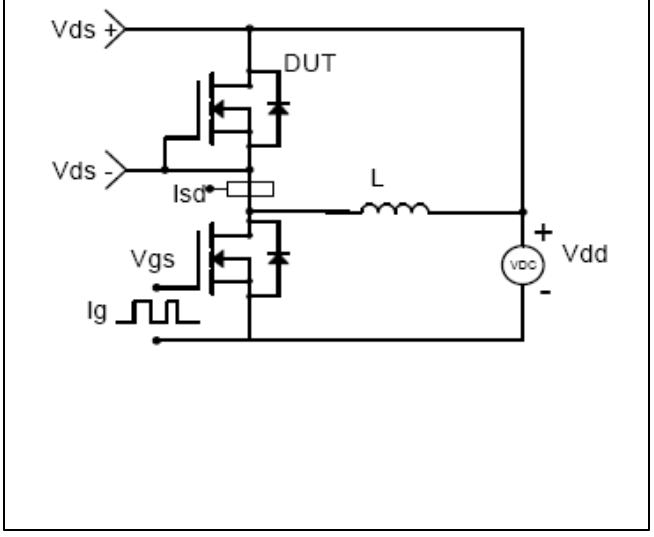
Test circuits for N-Channel

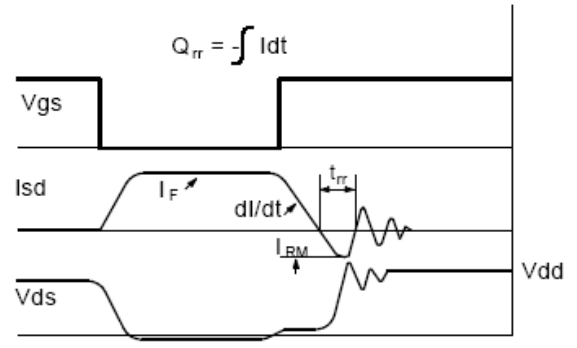
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms





Electrical Characteristics TJ = 25℃ unless otherwise noted

P-Channel Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25℃	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -30V, V_{GS} = 0V -TJ = 55℃	-	- -	-1 -5	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20V, V_{DS} = 0V	-	-	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20V, V_{DS} = 0V	-	-	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	-1.0	-1.8	-3.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10V, I_D = -6.5A V_{GS} = -4.5V, I_D = -5A	-	23 35	28 42	mΩ
g_{FS}	Forward Transconductance	V_{DS} = -5V, I_D = -6.5A	-	18	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	3.2	-	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	V_{DS} = -15V, V_{GS} = 0V, f=1MHz	-	760	-	pF
Coss	Output Capacitance		-	140	-	pF
Crss	Reverse Transfer Capacitance		-	95	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = -15V, R_G = 3Ω, I_D = -6.5A , V_{GS} = -10V (Note 5, 6)	-	8	-	ns
t_r	Turn-On Rise Time		-	6	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	17	-	ns
t_f	Turn-Off Fall Time		-	5	-	ns
Q_g(10V)	Total Gate Charge	V_{DS} = -15V, I_D = -6.5A, V_{GS} = 0~-10V (Note 5, 6)	-	13.6	-	nC
Qg(4.5V)	Total Gate Charge		-	6.7	-	nC
Q_{gs}	Gate-Source Charge		-	2.5	-	nC
Q_{gd}	Gate-Drain Charge		-	3.2	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	-3	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	-12	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = -1A	-	-0.7	-1.0	V
trr	Reverse Recovery Time	V_{GS} = 0V, I_S =-6.5A dIF/dt =100A/μs (Note 5)	-	15	-	ns
Qrr	Reverse Recovery Charge		-	9.7	-	nC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature TJ(MAX)=150°C. Ratings are based on low frequency and duty cycles to keep initial TJ=25°C.
2. The power dissipation PD is based on TJ(MAX)=150°C, using ≤ 10s junction-to-ambient thermal resistance.
3. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with TA =25°C. The value in any given application depends on the user's specific board design.
4. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.
5. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
6. Essentially Independent of Operating Temperature Typical Characteristics

P-Channel Typical Performance Characteristics

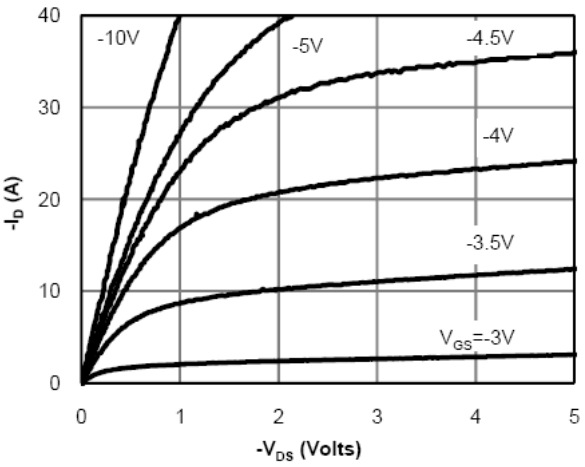


Figure 1: On-Region Characteristics

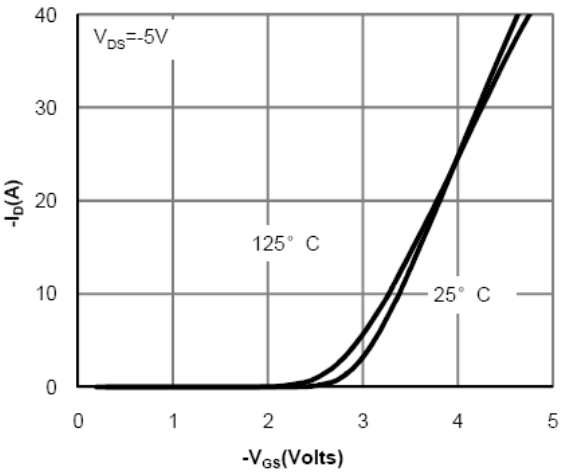


Figure 2: Transfer Characteristics

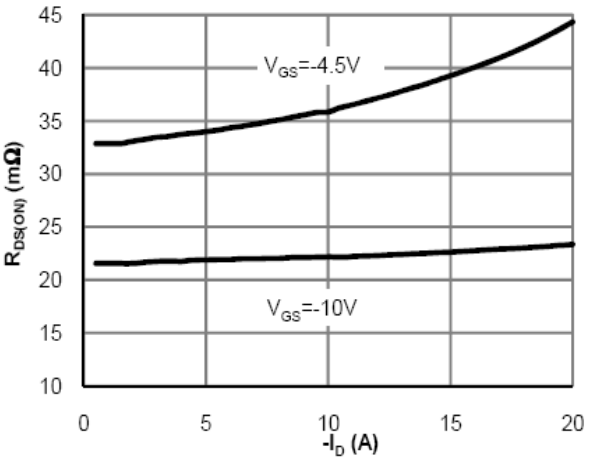


Figure 3: On-Resistance vs Drain current and Gate voltage

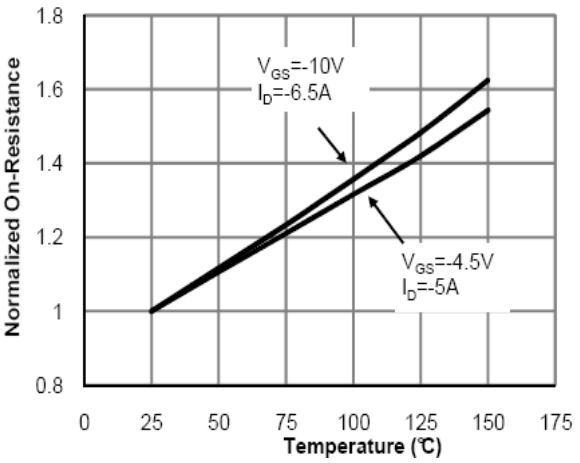


Figure 4: On-Resistance vs Junction Temperature

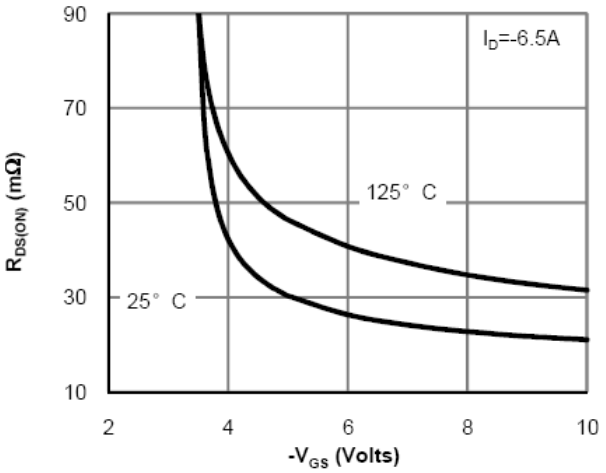


Figure 5: On-Resistance vs Gate-Source voltage

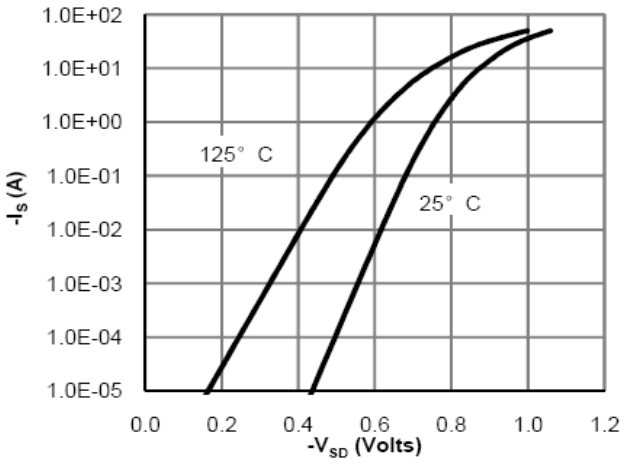


Figure 6: Body-Diode Characteristics

P-Channel Typical Performance Characteristics

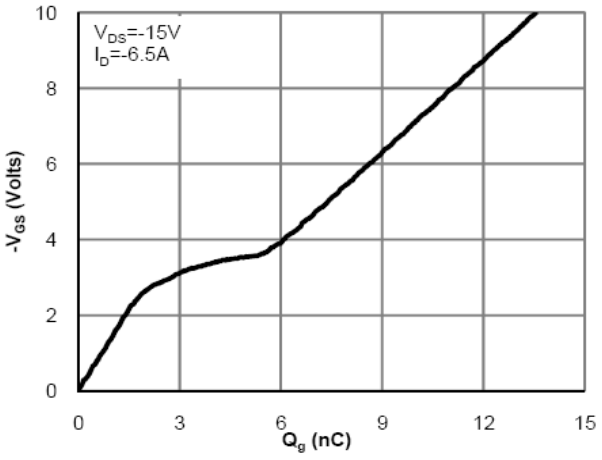


Figure 7: Gate-Charge Characteristics

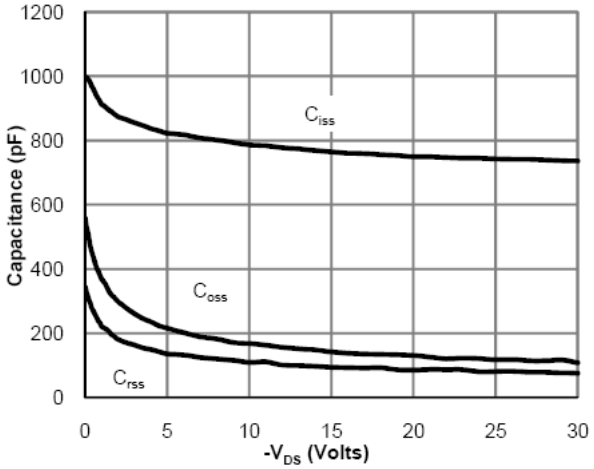


Figure 8: Capacitance Characteristics

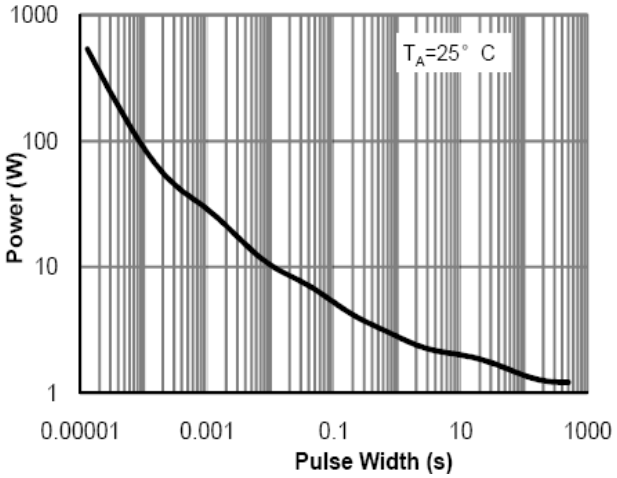


Figure 9: Single Pulse Power Rating Junction-to-Ambient

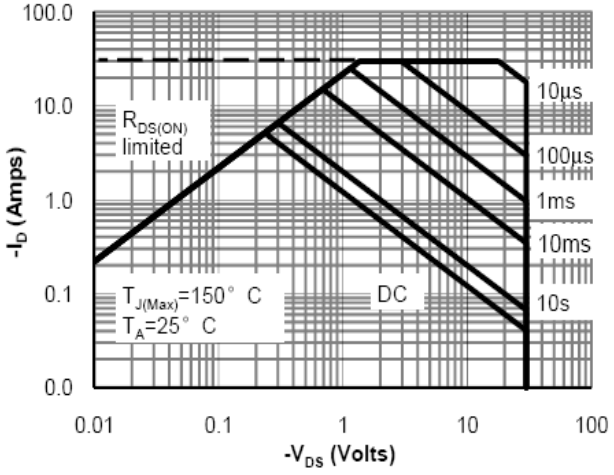


Figure 10: Maximum Forward Biased Safe Operating Area

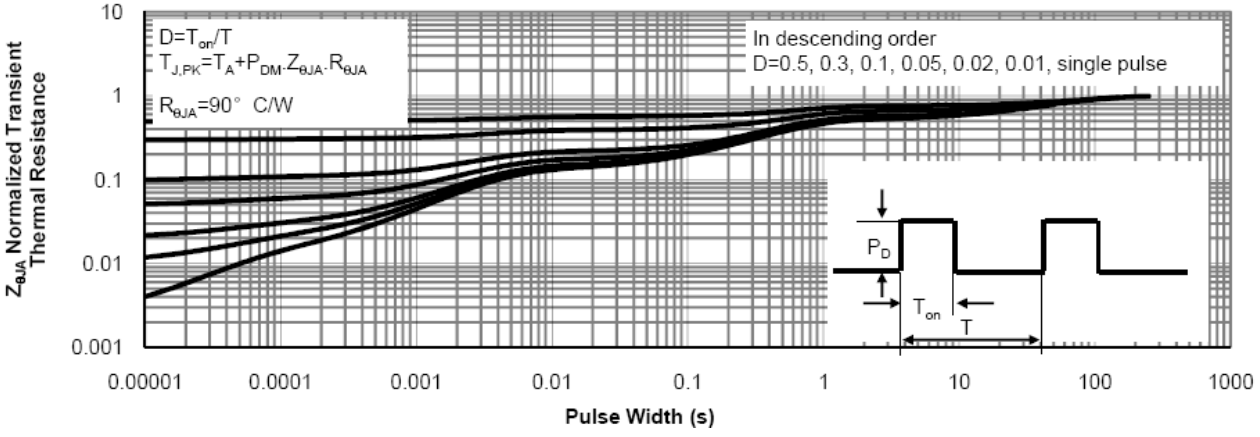
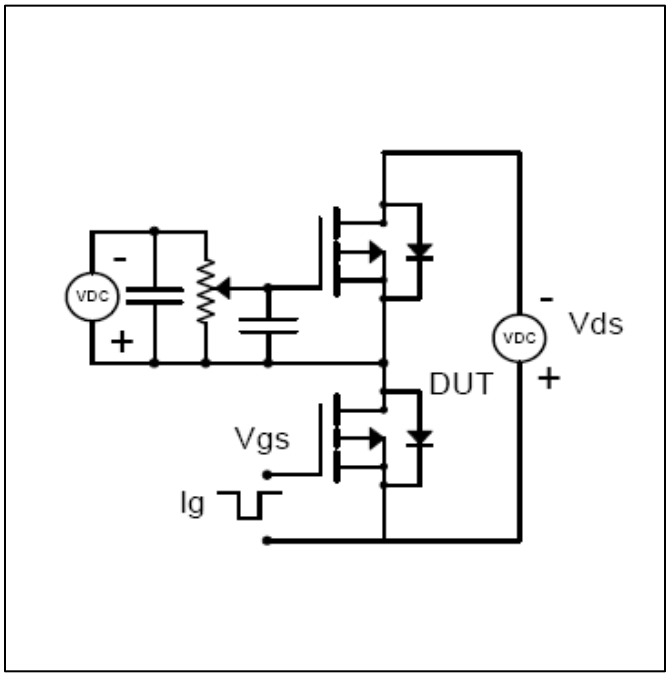
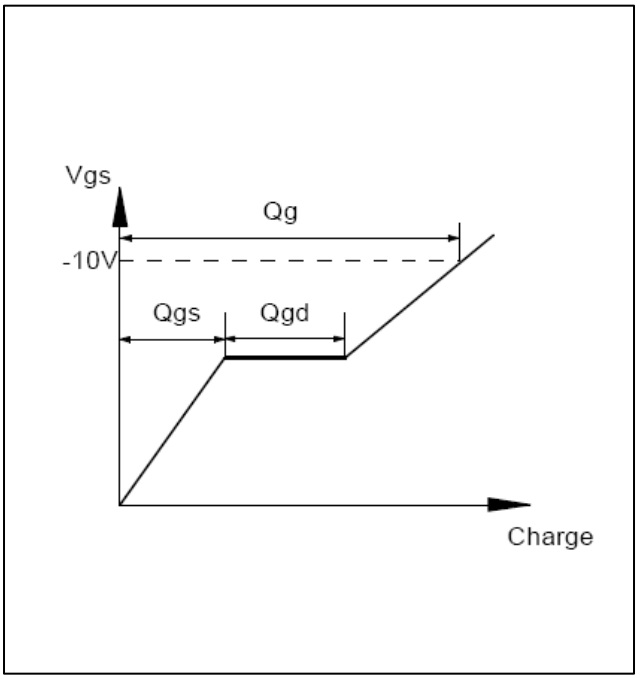


Figure 11: Maximum Transient Thermal Impedance

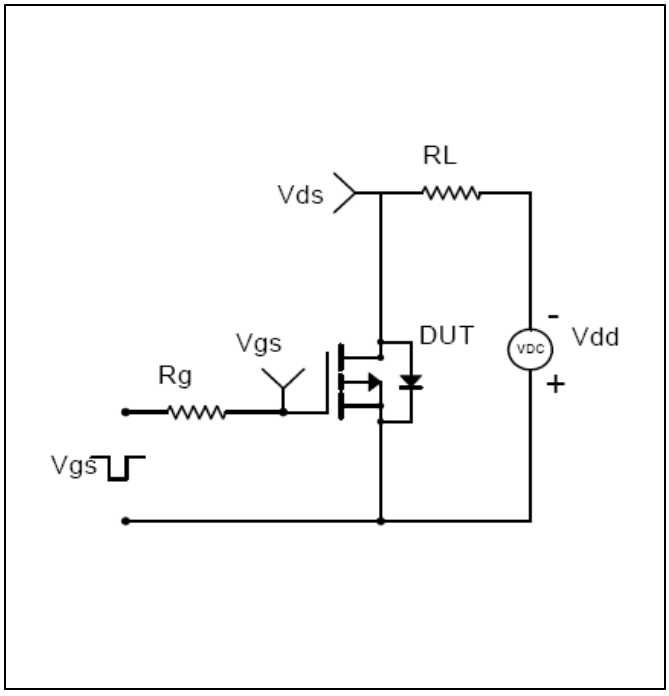
Test circuits for P-Channel

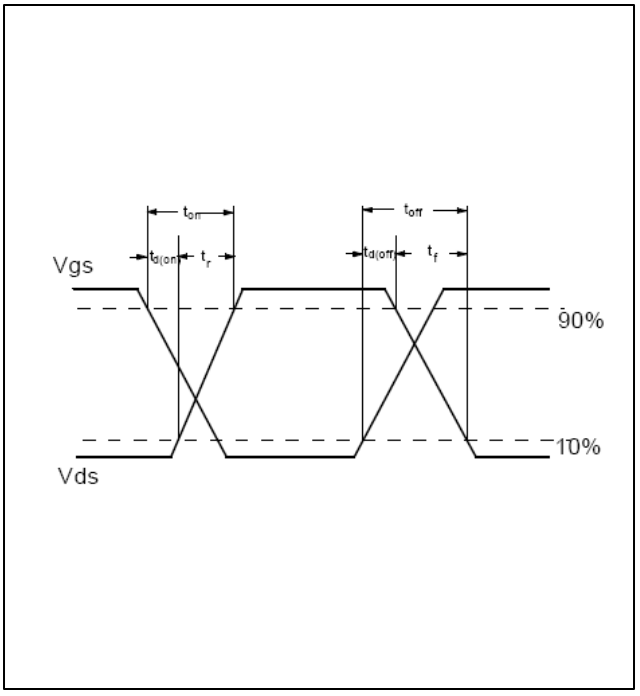
Gate Charge Test Circuit and Waveform





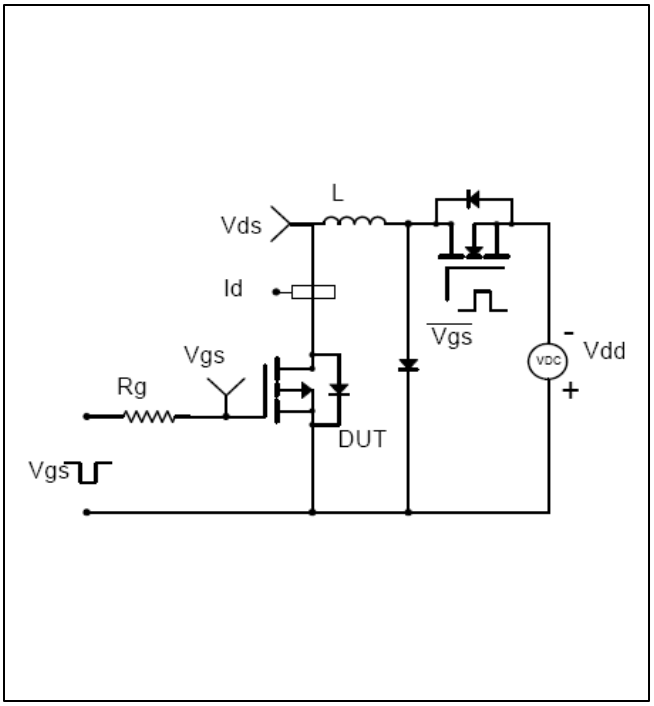
Resistive Switching Test Circuit and Waveforms

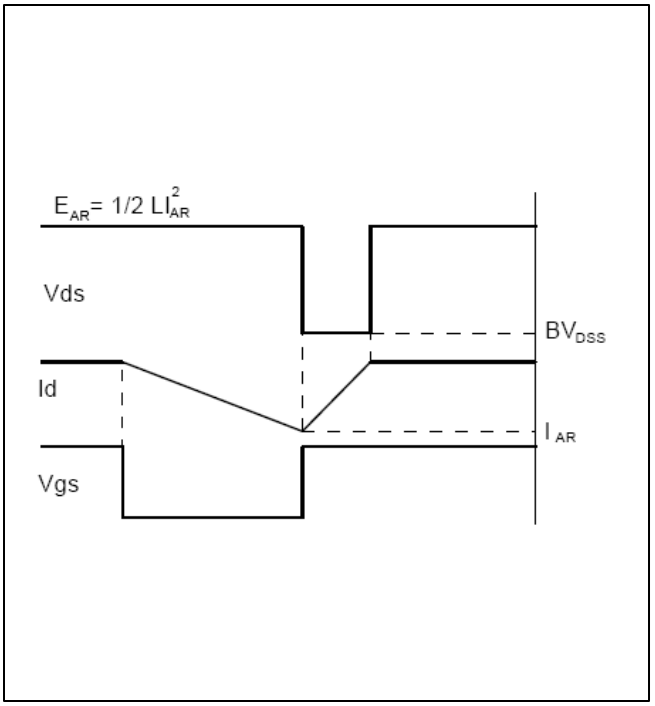




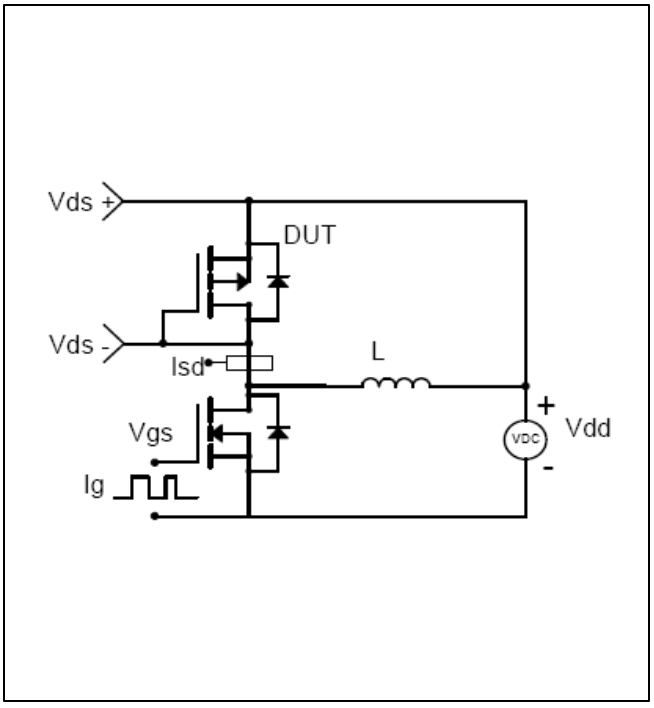
Test circuits for P-Channel

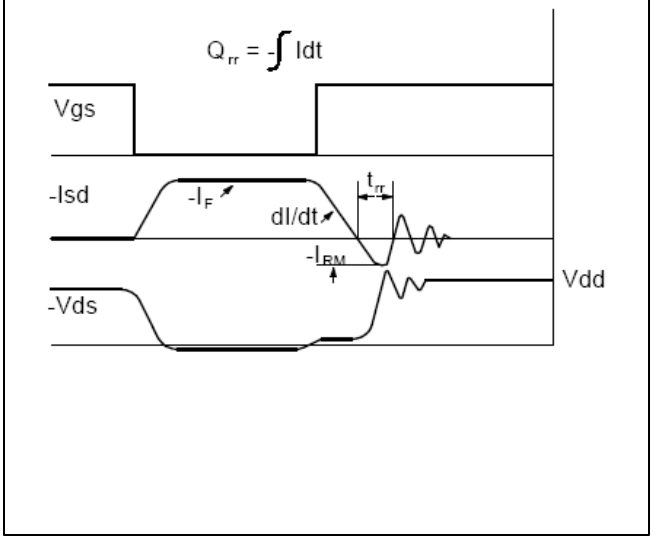
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





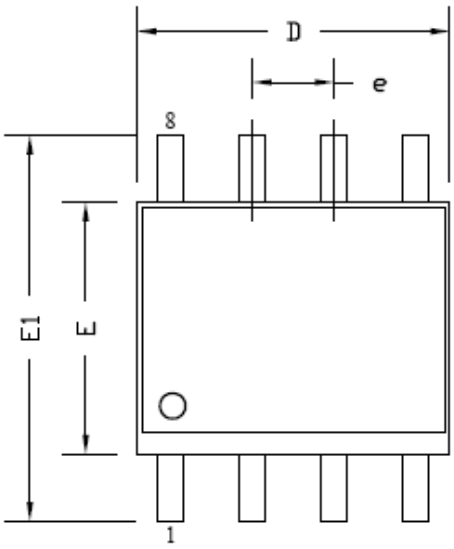
Diode Recovery Test Circuit & Waveforms

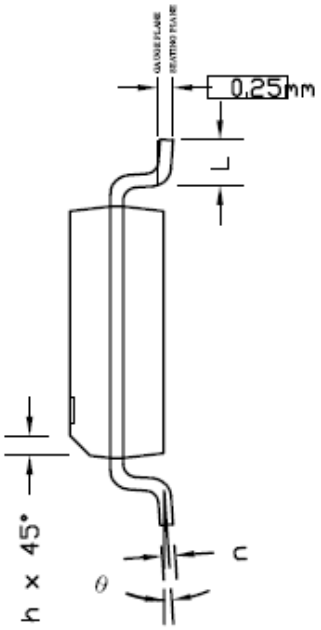


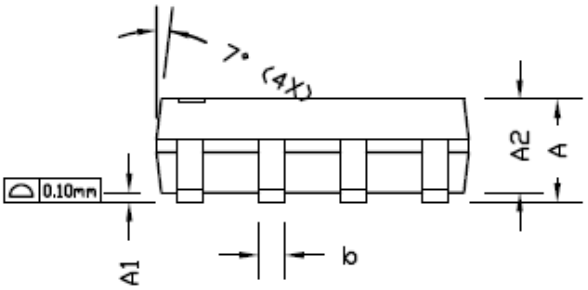


Package Outline

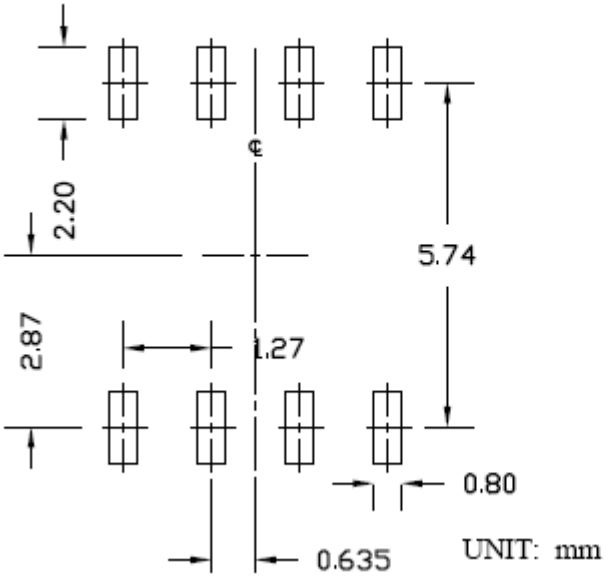
SOIC-8







RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.35	1.65	1.75
A1	0.10	0.15	0.25
A2	1.25	1.50	1.65
b	0.31	0.41	0.51
c	0.17	0.20	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27 BSC		
E1	5.80	6.00	6.20
h	0.25	0.30	0.50
L	0.40	0.69	1.27
θ	0°	4°	8°

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