N and P-Channel Enhancement Mode Power MOSFET

Description

The SM4606 uses advanced trench technology 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.

General Features

● **N-Channel**

V_{DS} = 30V, I_D =6.5A
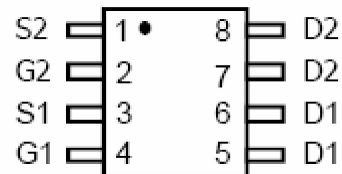
$R_{DS(ON)}$ < 30mΩ @ V_{GS}=10V

● **P-Channel**

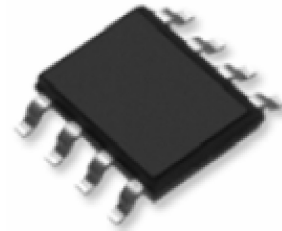V_{DS} = -30V, I_D = -7A

$R_{DS(ON)}$ < 33mΩ @ V_{GS}=-10V

● High power and current handing capability

● Lead free product is acquired

● Surface mount package

N-channel   P-channel

Schematic diagram

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

Marking and pin assignment

SOP-8   top view

◆ **Ordering Information**

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
SM4606 PR L	SM4606 SR G	SOP-8	S2	G2	S1	G1	D1	D1	D2	D2	Tape Reel

SM4606 X X X

(1)Package Type

(2)Packing Type

(3)Lead Free

(1) P：SOP-8

(2) R：Tape Reel

(3) G：Halogen Free；L：Lead Free

◆ **Absolute Maximum Ratings** (T$_A$=25°C, unless otherwise noted)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V$_{DS}$	30	-30	V
Gate-Source Voltage		V$_{GS}$	±20	±20	V
Continuous Drain Current	T$_A$=25℃	I$_D$	6.5	-7	A
	T$_A$=70℃		5.4	-5.8	
Pulsed Drain Current (Note 1)		I$_{DM}$	30	-30	A
Maximum Power Dissipation	T$_A$=25℃	P$_D$	2.0	2.0	W
Operating Junction and Storage Temperature Range		T$_J$,T$_{STG}$	-55 To 150	-55 To 150	℃

a:Fused current that based on wire numbers and diameter

b:Repetitive Rating: Pulse width limited by the maximum junction temperature
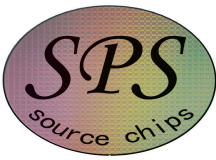
c:1-in^2 2oz Cu PCB board

◆ **Electrical Characteristics** (T$_A$=25°C, unless otherwise noted)

N-CH Electrical Characteristics (T$_A$=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=250μA	30	33	-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=30V,V$_{GS}$=0V	-	-	1	μA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±20V,V$_{DS}$=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=250μA	1	1.6	3	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=10V, I$_D$=6A	-	20	30	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=5V,I$_D$=6A	15	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C$_{Iss}$	V$_{DS}$=15V,V$_{GS}$=0V, F=1.0MHz	-	255	-	PF
Output Capacitance	C$_{oss}$		-	45	-	PF
Reverse Transfer Capacitance	C$_{rss}$		-	35	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=15V, R$_L$=2.5Ω V$_{GS}$=10V,R$_{GEN}$=3Ω	-	4.5	-	nS
Turn-on Rise Time	t$_r$		-	2.5	-	nS
Turn-Off Delay Time	t$_{d(off)}$		-	14.5	-	nS
Turn-Off Fall Time	t$_f$		-	3.5	-	nS
Total Gate Charge	Q$_g$	V$_{DS}$=15V,I$_D$=6A, V$_{GS}$=10V	-	13	-	nC
Gate-Source Charge	Q$_{gs}$		-	5.5	-	nC
Gate-Drain Charge	Q$_{gd}$		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V$_{SD}$	V$_{GS}$=0V,I$_S$=6A	-	0.8	1.2	V

Note: Pulse Test: Pulse Width ≤300us, Duty Cycle≤2%

　　　d: Guaranteed by design: not subject to production testing

P-CH Electrical Characteristics (T$_A$=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=-250μA	-30	-33	-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=-30V,V$_{GS}$=0V	-	-	-1	μA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±20V,V$_{DS}$=0V	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=-250μA	-1.5	-1.9	-2.5	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=-10V, I$_D$=-6.5A	-	28	33	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=-5V,I$_D$=-6.5A	10	-	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C$_{Iss}$	V$_{DS}$=-15V,V$_{GS}$=0V, F=1.0MHz	-	520	-	PF
Output Capacitance	C$_{oss}$		-	100	-	PF
Reverse Transfer Capacitance	C$_{rss}$		-	65	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=-15V, R$_L$=2.3Ω V$_{GS}$=-10V,R$_{GEN}$=6Ω	-	7.5	-	nS
Turn-on Rise Time	t$_r$		-	5.5	-	nS
Turn-Off Delay Time	t$_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t$_f$		-	7	-	nS
Total Gate Charge	Q$_g$	V$_{DS}$=-15V,I$_D$=-6.5A V$_{GS}$=-10V	-	9.2	-	nC
Gate-Source Charge	Q$_{gs}$		-	1.6	-	nC
Gate-Drain Charge	Q$_{gd}$		-	2.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V$_{SD}$	V$_{GS}$=0V,I$_S$=-6.5A	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

N- Channel Typical Electrical and Thermal Characteristics (Curves)
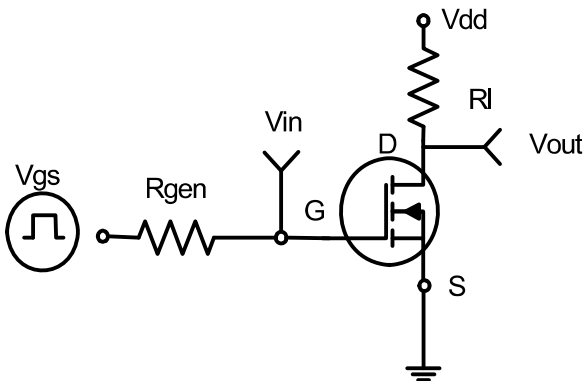
Figure 1:Switching Test Circuit
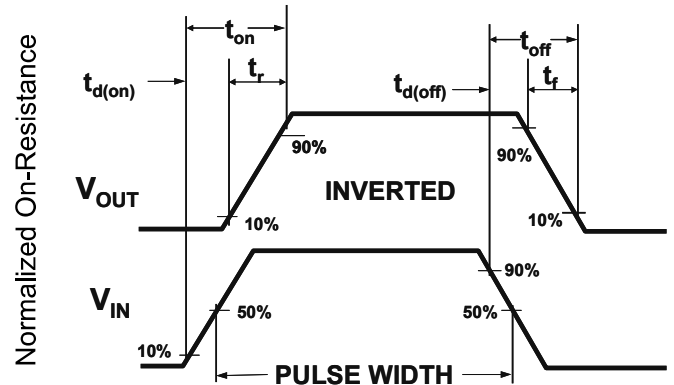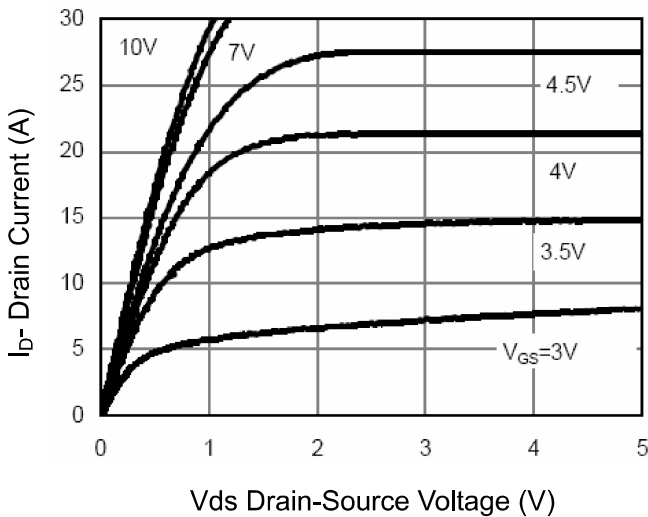
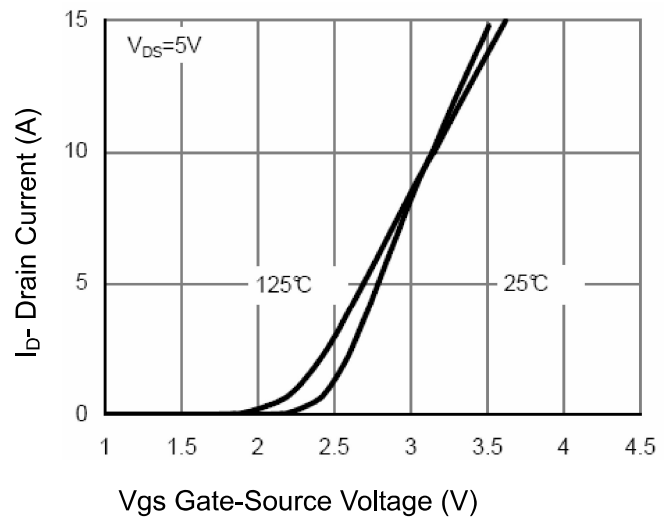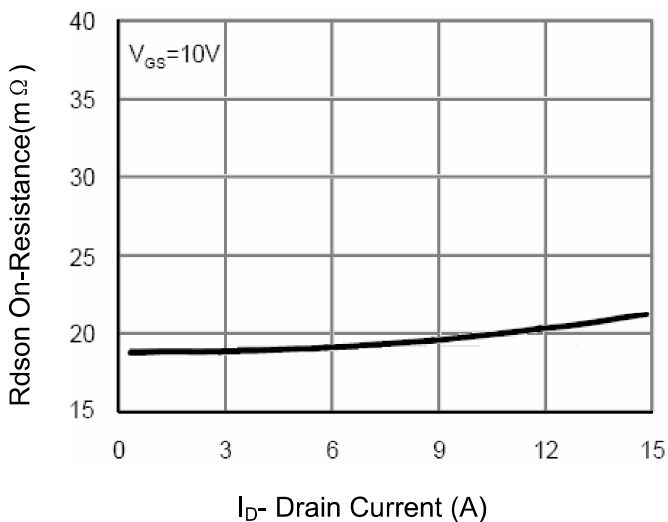**Figure 2:Switching Waveforms**

Figure 3 Output Characteristics

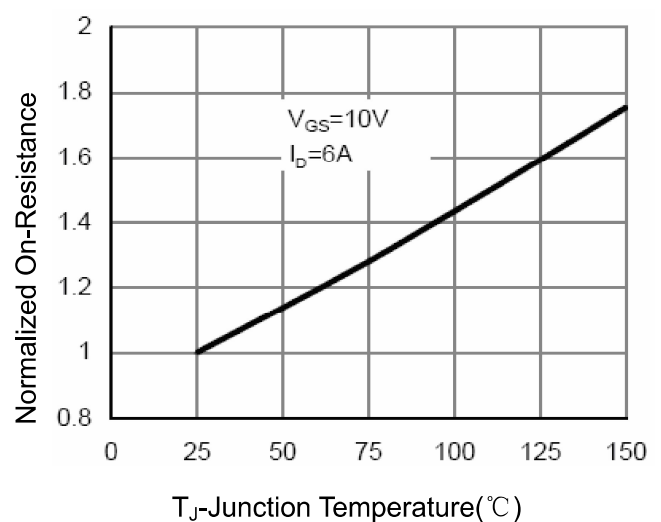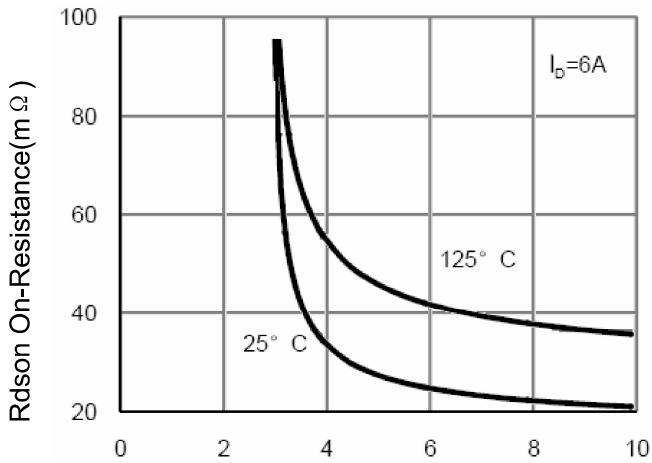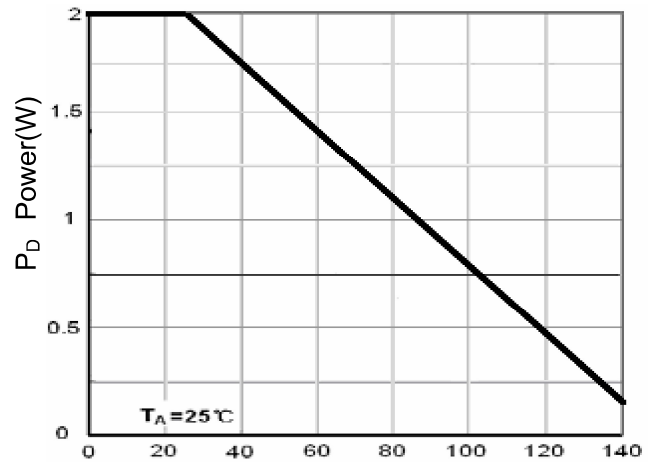**Figure 4 Transfer Characteristics**

Figure 5 Drain-Source On-Resistance

Figure 6 Drain-Source On-Resistance

Figure7 Rdson vs Vgs

Figure 8 Power Dissipation
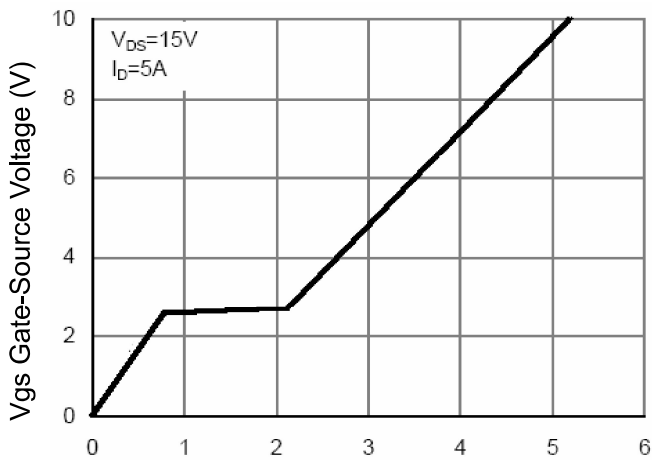
Figure 9 Gate Charge
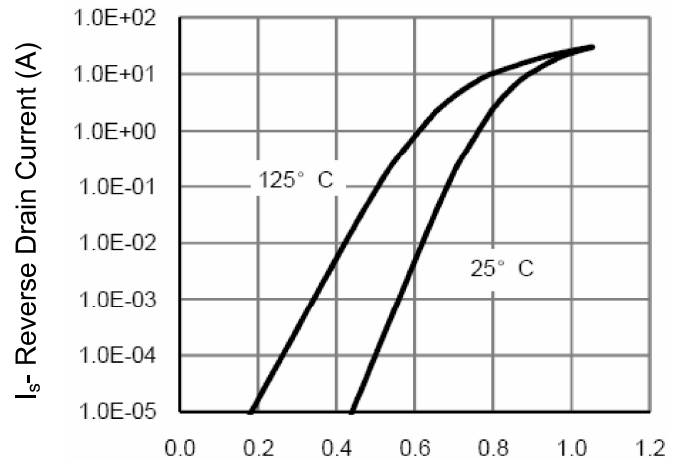
Figure 10 Source- Drain Diode Forward
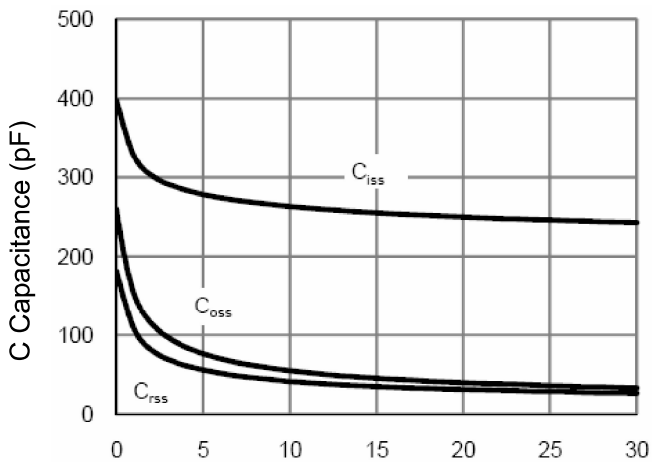
Figure 11 Capacitance vs Vds
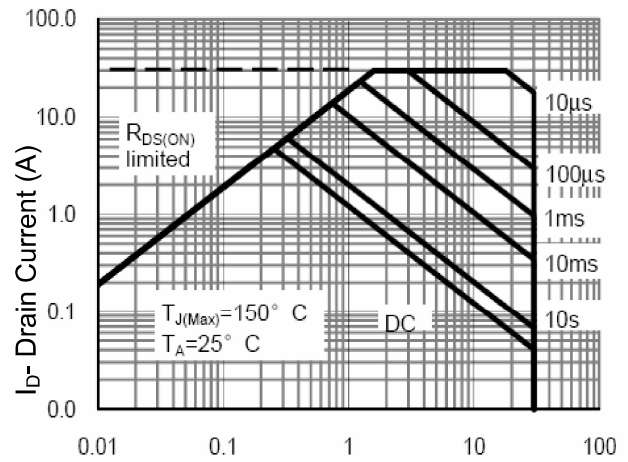
Figure 12 Safe Operation Area
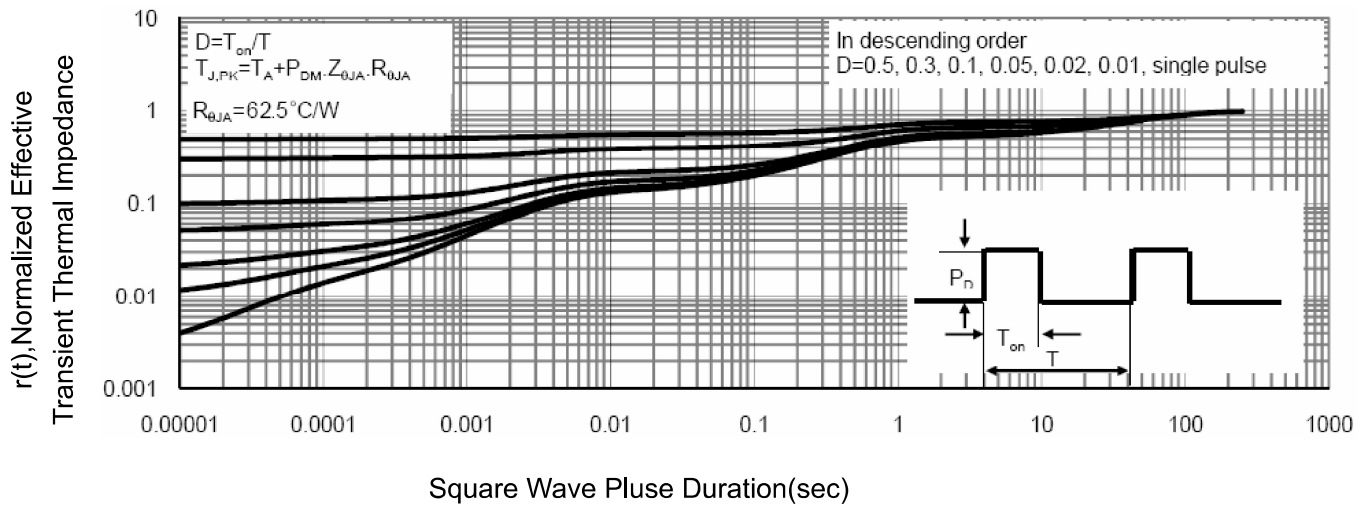
Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics (Curves)
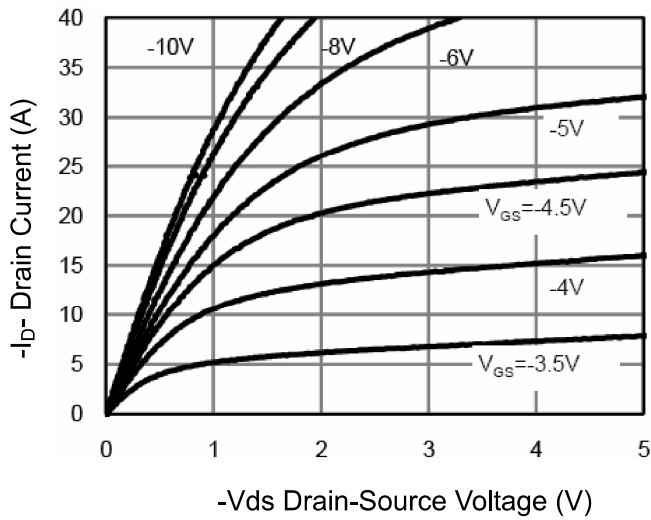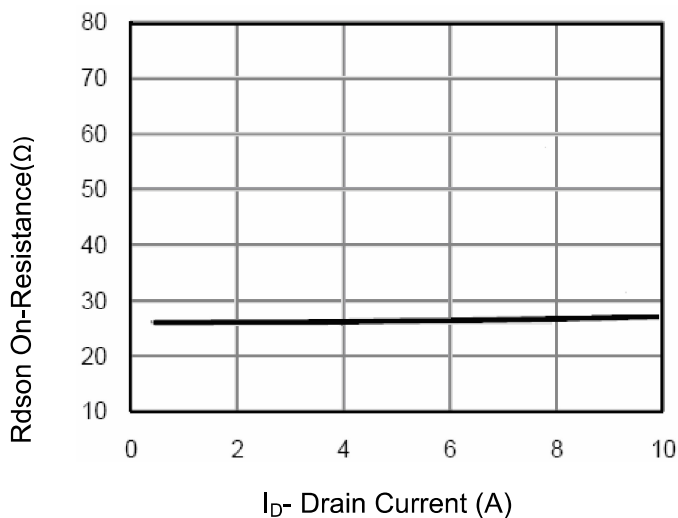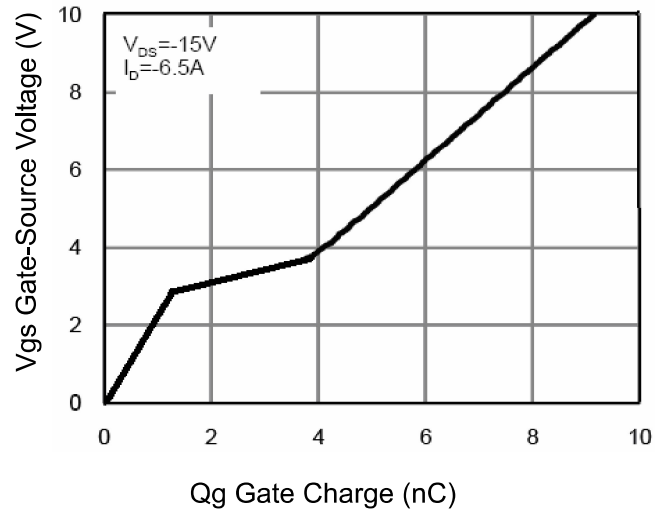

Figure 1 Output Characteristics

Figure 4 Rdson-Junction Temperature

Figure 2 Transfer Characteristics

Figure 5 Gate Charge

Figure 3 Rdson- Drain Current
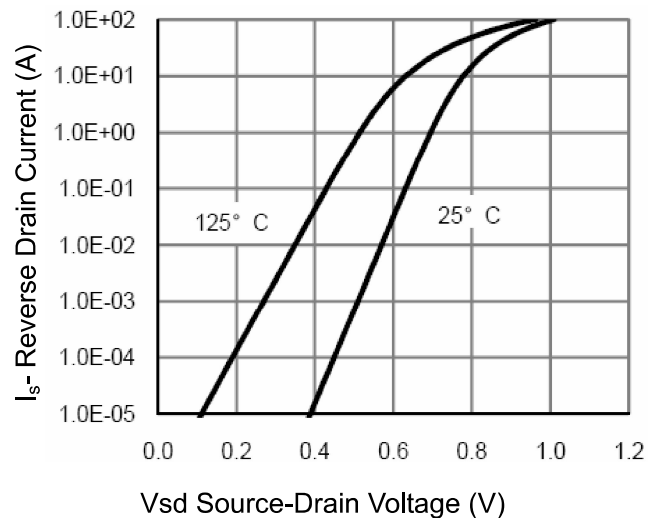
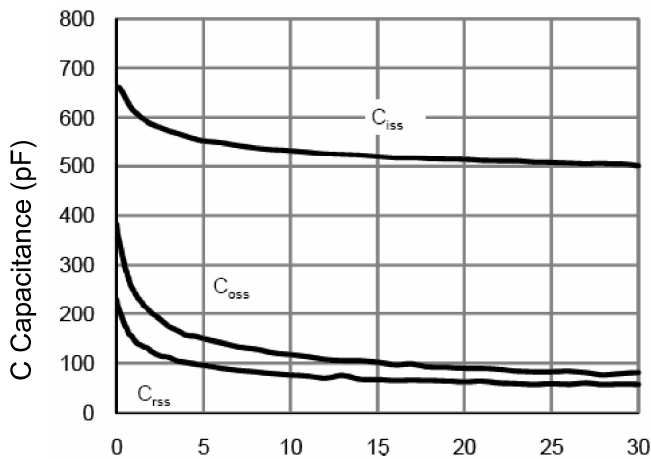**Figure 6 Source- Drain Diode Forward**

V01

7

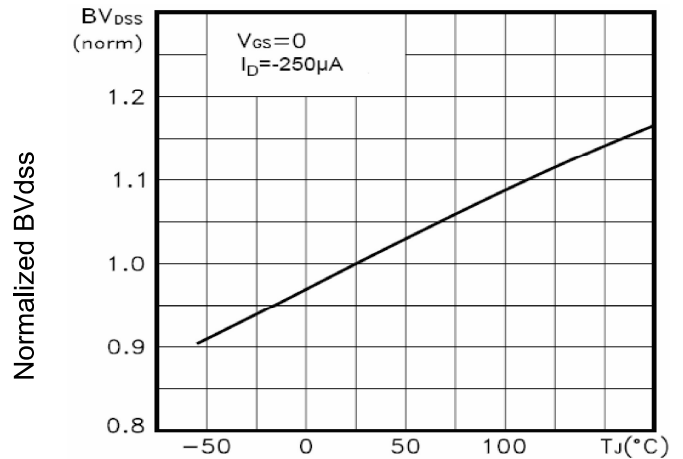**Figure 7 Capacitance vs Vds**
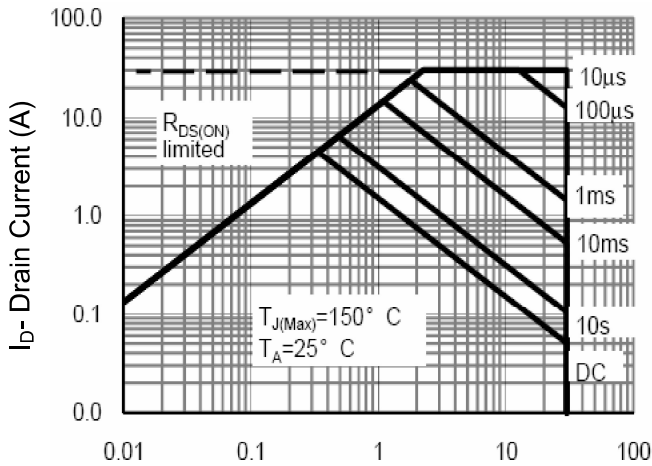
Figure 9 BV$_{DSS}$ vs Junction Temperature
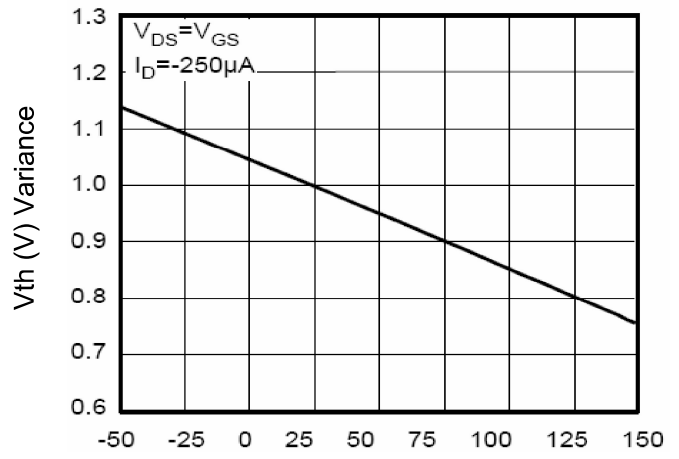
Figure 8 Safe Operation Area

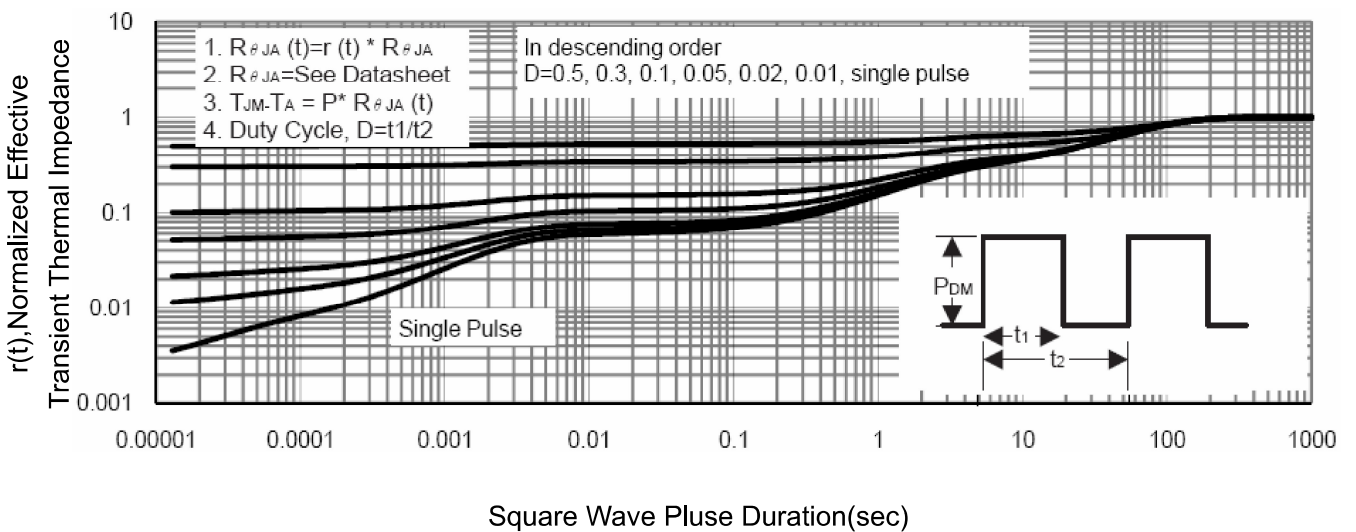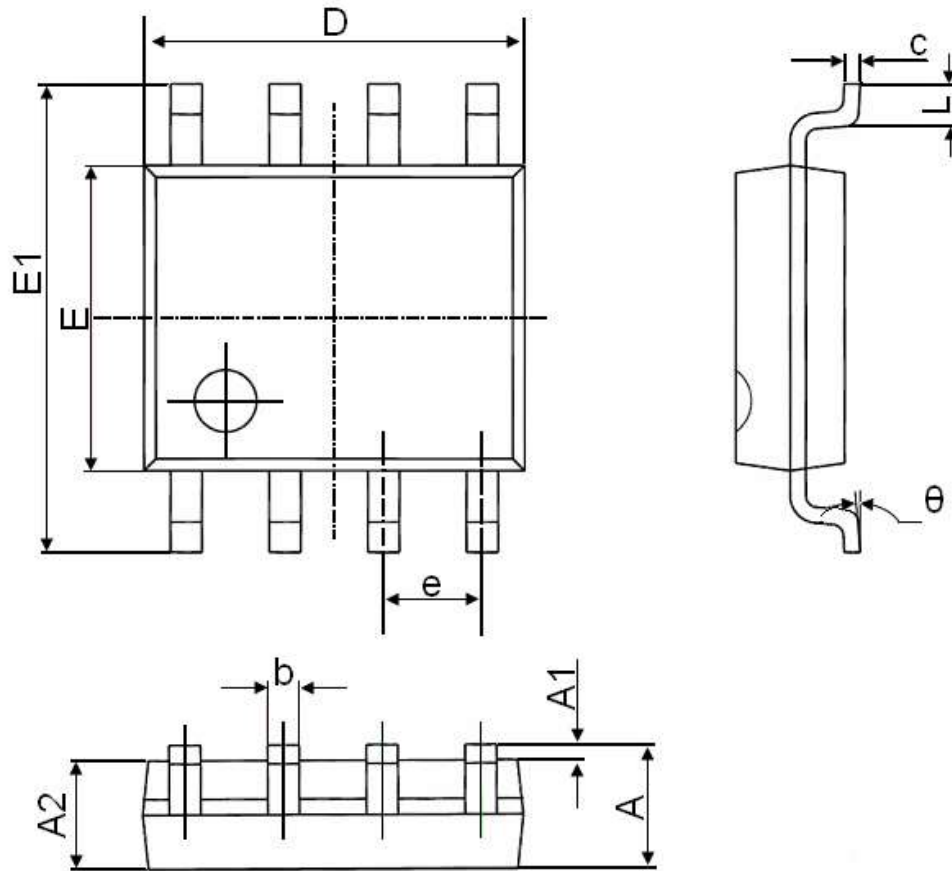**Figure 10 V$_{GS(th)}$ vs Junction Temperature**

Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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