

N and P Channel Enhancement Mode Power MOSFET

Description

This Product 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.

General Features● **NMOS**

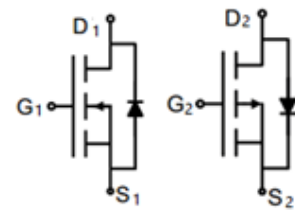
- V_{DS} 20V
- I_D (at $V_{GS} = 10V$) 10A
- $R_{DS(ON)}$ (at $V_{GS} = 4.5V$) < 18m Ω
- $R_{DS(ON)}$ (at $V_{GS} = 2.5V$) < 22m Ω

● **PMOS**

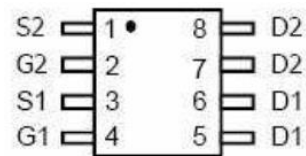
- V_{DS} -30V
- I_D (at $V_{GS} = -10V$) -5A
- $R_{DS(ON)}$ (at $V_{GS} = -10V$) < 65m Ω
- $R_{DS(ON)}$ (at $V_{GS} = -4.5V$) < 75m Ω
- $R_{DS(ON)}$ (at $V_{GS} = -2.5V$) < 130m Ω
- 100% Avalanche Tested
- RoHS Compliant

Application

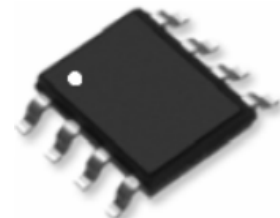
- Power switch
- DC/DC converters



Schematic diagram



Marking and pin assignment



SOP-8

Device	Package	Marking	Packaging
HQ4606S2	SOP-8双基	HQ4606上点	4000pcs/Reel

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	NMOS	PMOS	Unit
Drain-Source Voltage	V_{DS}	20	-30	V
Continuous Drain Current	I_D	10	-5	A
Pulsed Drain Current (note1)	I_{DM}	40	-20	A
Gate-Source Voltage	V_{GS}	± 10	± 12	V
Power Dissipation	P_D	2	2	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 To 150	-55 To 150	$^\circ\text{C}$

Thermal Resistance

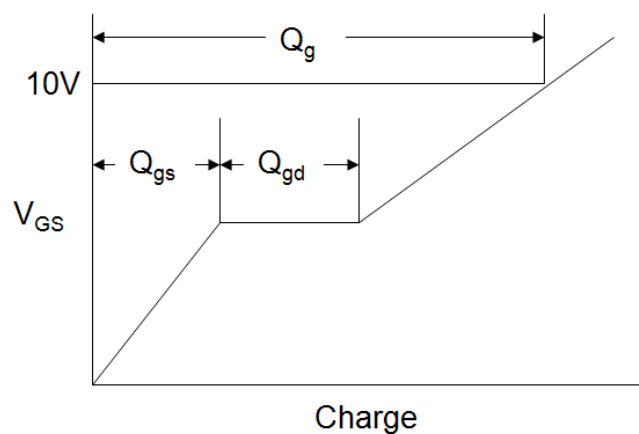
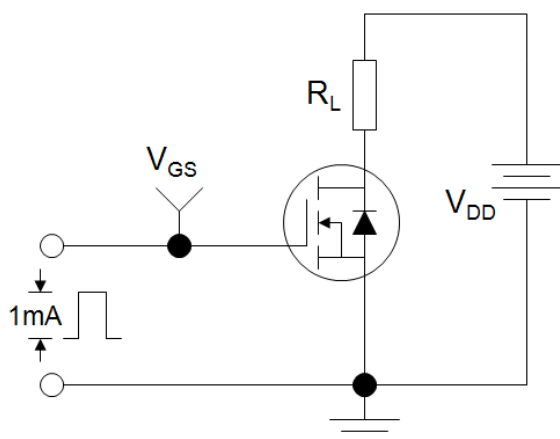
Parameter	Symbol	NMOS	PMOS	Unit
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	62.5	$^\circ\text{C/W}$

NMOS Specifications T _J = 25°C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 250μA	20	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
Gate-Source Leakage	I _{GSS}	V _{GS} = ±10V	--	--	±100	nA
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	0.5	0.66	0.9	V
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} = 4.5V, I _D = 3.4A	--	12	18	mΩ
		V _{GS} = 2.5V, I _D = 3.4A	--	15	22	
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =10A	10	--	--	S
Dynamic Parameters						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 20V, f = 1.0MHz	--	691	--	pF
Output Capacitance	C _{oss}		--	128	--	
Reverse Transfer Capacitance	C _{rss}		--	115	--	
Total Gate Charge	Q _g	V _{DD} = 10V, I _D = 10A, V _{GS} = 4.5V	--	10	--	nC
Gate-Source Charge	Q _{gs}		--	1	--	
Gate-Drain Charge	Q _{gd}		--	4	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10V, I _D = 10A, R _G = 3Ω	--	9	--	ns
Turn-on Rise Time	t _r		--	13	--	
Turn-off Delay Time	t _{d(off)}		--	14.5	--	
Turn-off Fall Time	t _f		--	3	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I _S	T _C = 25°C	--	--	10	A
Body Diode Voltage	V _{SD}	T _J = 25°C, I _{SD} = 3A, V _{GS} = 0V	--	--	1.2	V

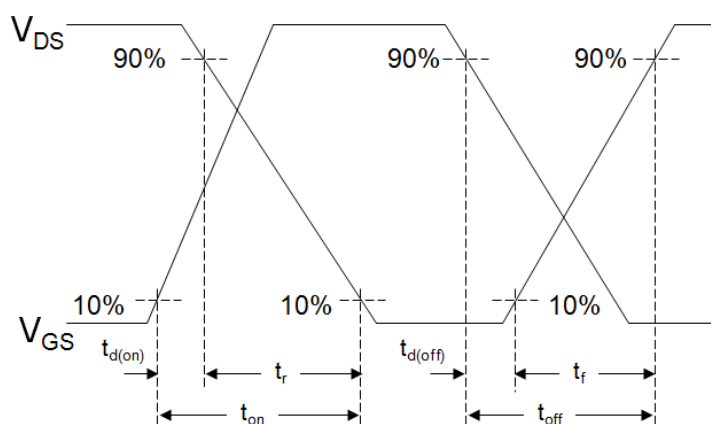
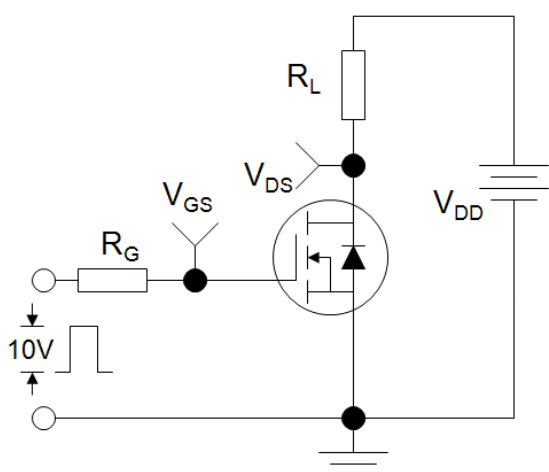
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Identical low side and high side switch with identical R_G

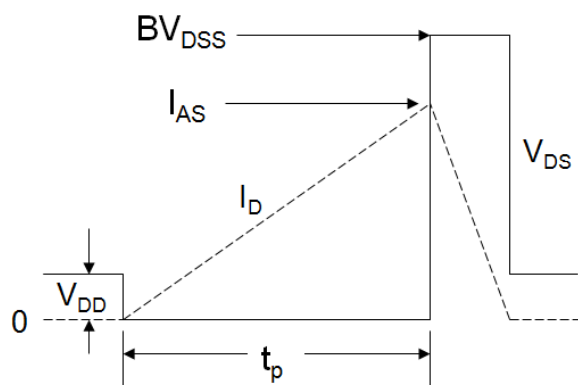
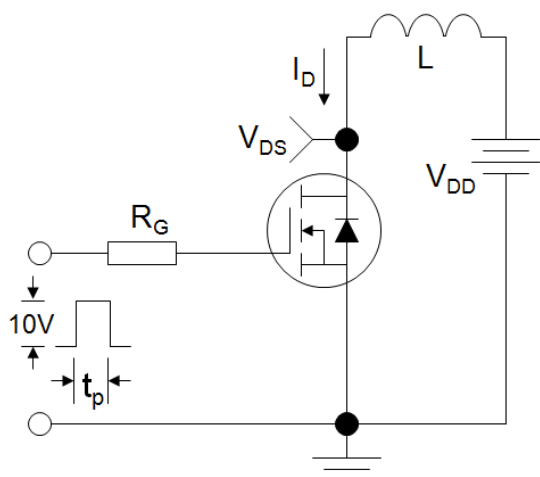
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



NMOS Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

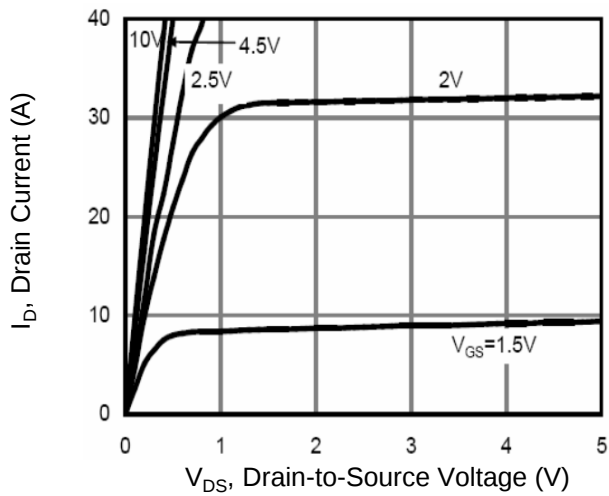


Figure 2. Transfer Characteristics

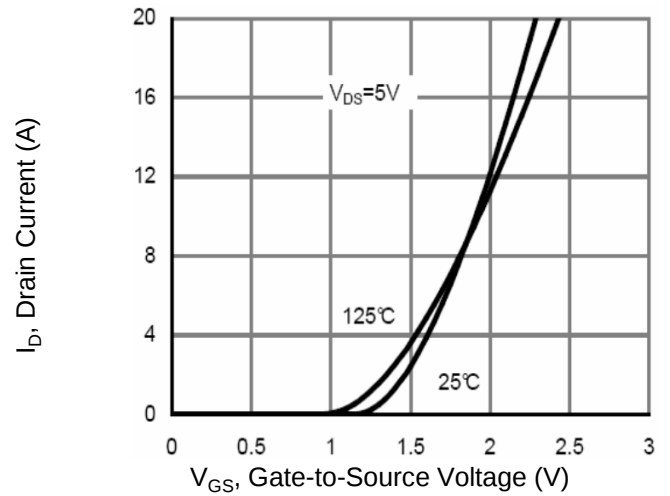


Figure 3. Drain-Source On-Resistance

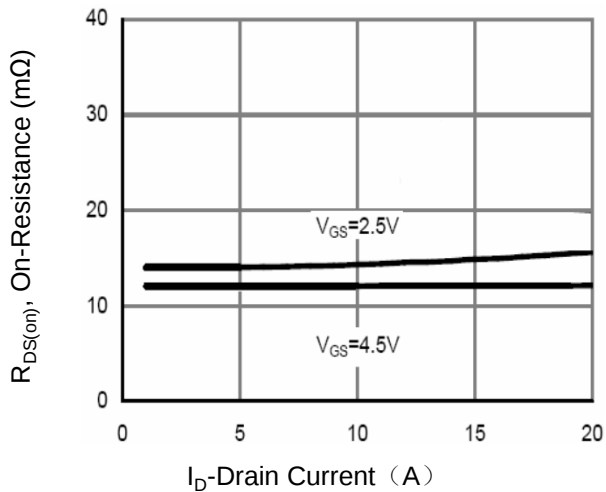


Figure 4. Gate Charge

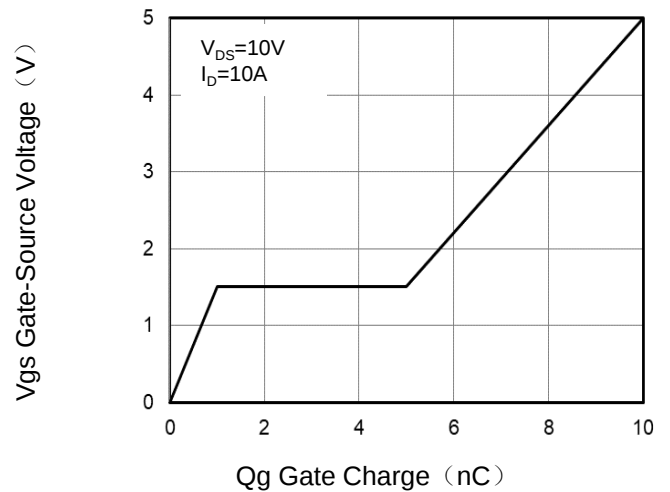


Figure 5. Capacitance

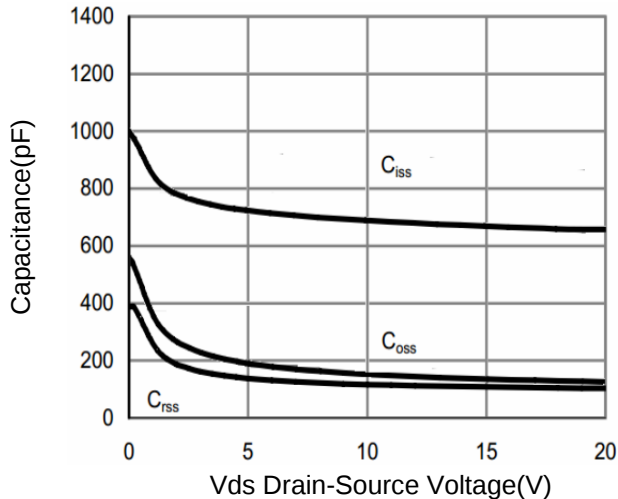
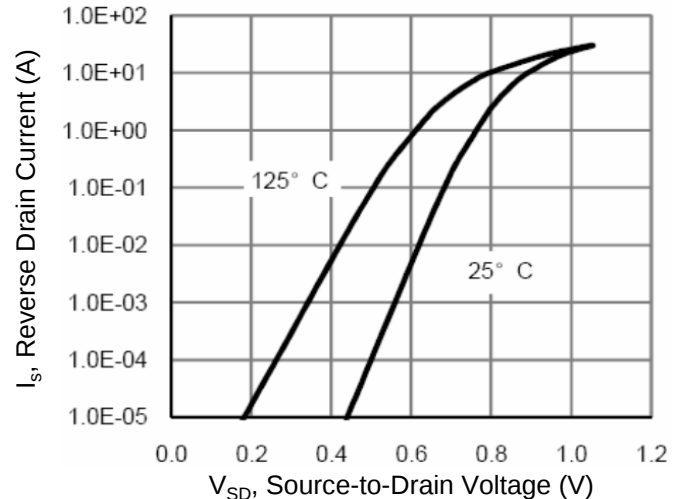
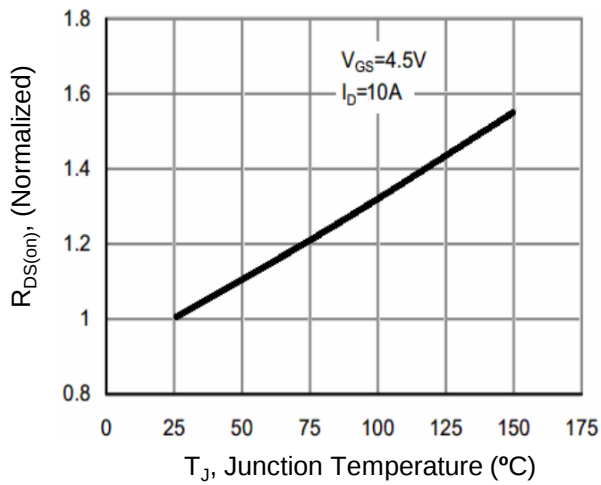
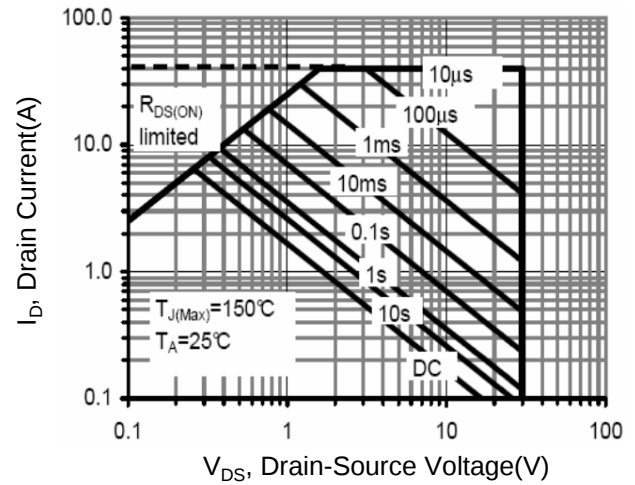
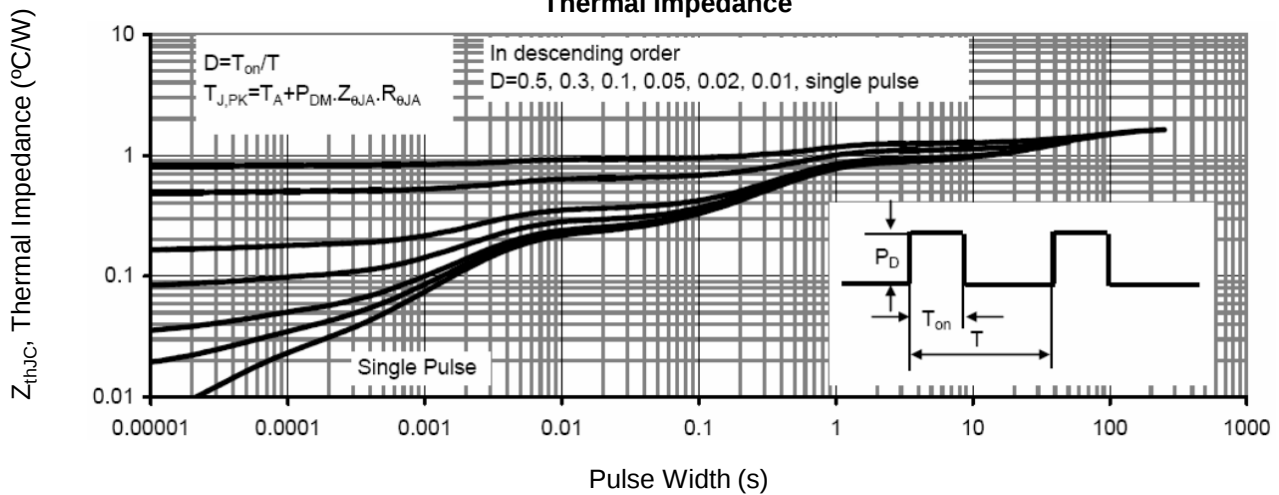


Figure 6. Source-Drain Diode Forward



NMOS Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

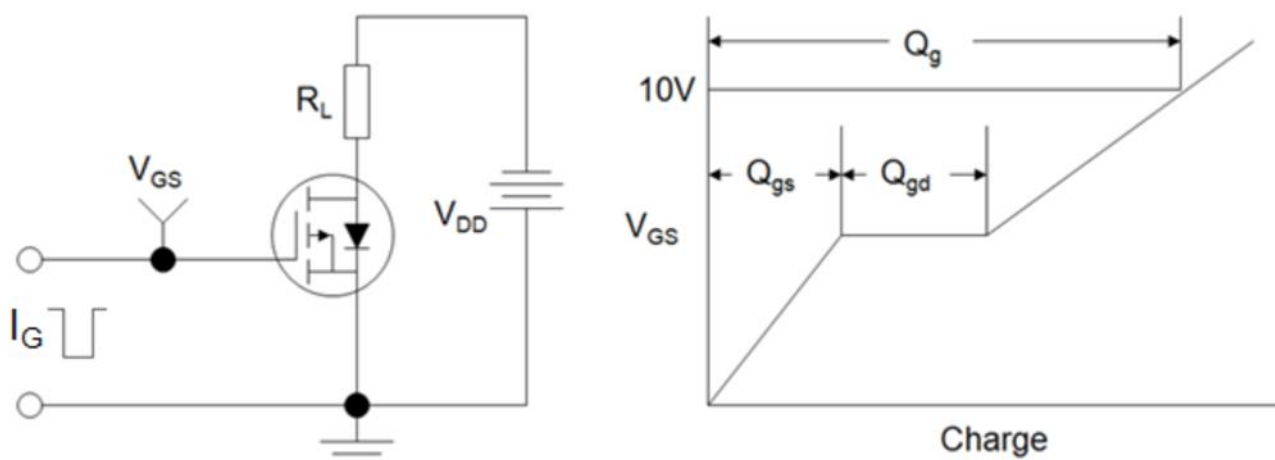
Figure 7. Drain-Source On-Resistance

Figure 10. Safe Operation Area

Figure 9. Normalized Maximum Transient Thermal Impedance


PMOS Specifications T _J = 25°C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = -250μA	-30	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -30V, V _{GS} = 0V, T _J = 25°C	--	--	-1	μA
Gate-Source Leakage	I _{GSS}	V _{GS} = ±12V	--	--	±100	nA
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250μA	-0.7	1	-1.3	V
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} = -10V, I _D = -4A	--	42	65	mΩ
		V _{GS} = -4.5V, I _D = -3A	--	48	75	
		V _{GS} = -2.5V, I _D = -1A	--	63	130	
Forward Transconductance	g _{FS}	V _{DS} =-5V,I _D =-8A	--	10	--	S
Dynamic Parameters						
Input Capacitance	C _{ISS}	V _{GS} = 0V, V _{DS} = -15V, f = 1.0MHz	--	880	--	pF
Output Capacitance	C _{OSS}		--	105	--	
Reverse Transfer Capacitance	C _{rss}		--	65	--	
Total Gate Charge	Q _g	V _{DD} = -15V, I _D = -5A, V _{GS} = -4.5V	--	8.5	--	nC
Gate-Source Charge	Q _{gs}		--	1.8	--	
Gate-Drain Charge	Q _{gd}		--	2.7	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = -15V, I _D = -5A, R _G = 6Ω	--	7	--	ns
Turn-on Rise Time	t _r		--	3	--	
Turn-off Delay Time	t _{d(off)}		--	30	--	
Turn-off Fall Time	t _f		--	12	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I _S	T _C = 25°C	--	--	-5	A
Body Diode Voltage	V _{SD}	T _J = 25°C, I _{SD} = -3A, V _{GS} = 0V	--	--	-1.2	V

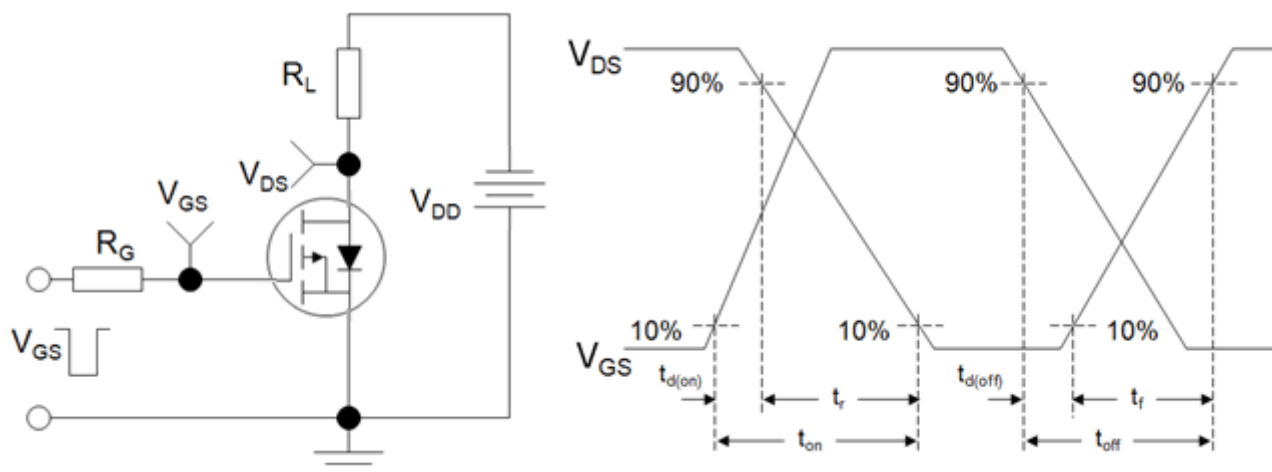
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Identical low side and high side switch with identical R_G

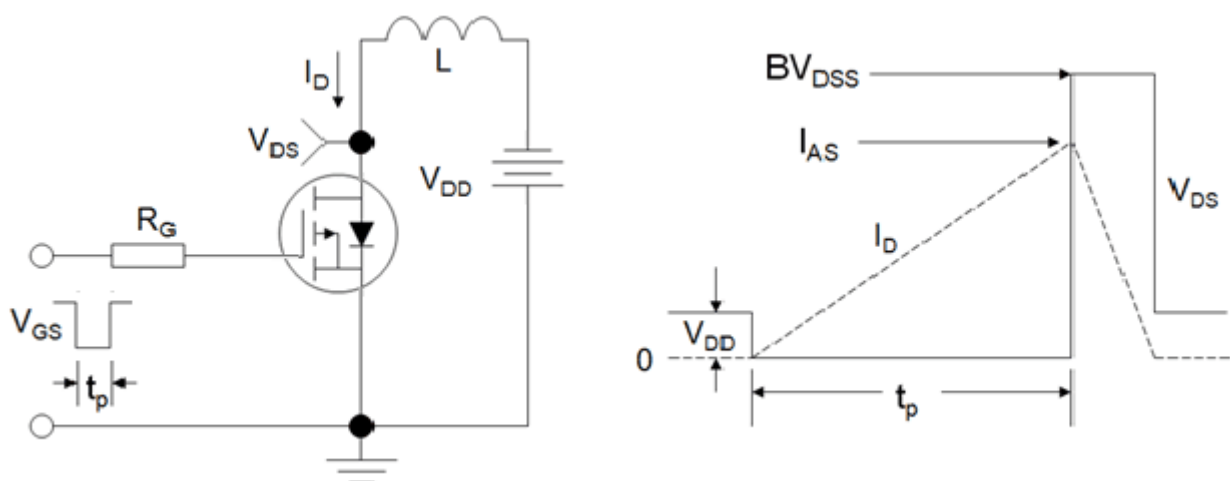
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



PMOS Typical Characteristics $T_j = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

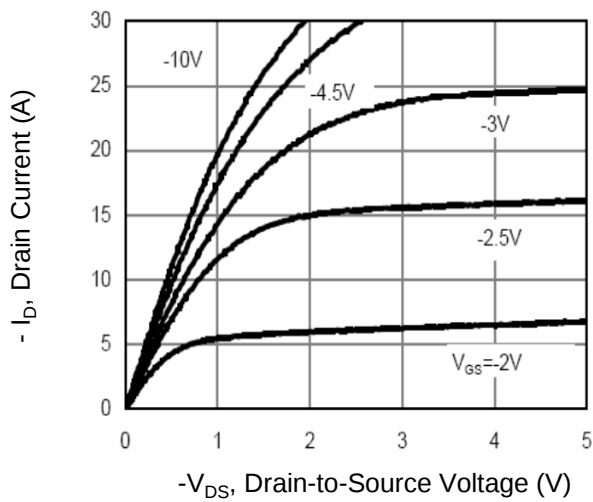


Figure 2. Transfer Characteristics

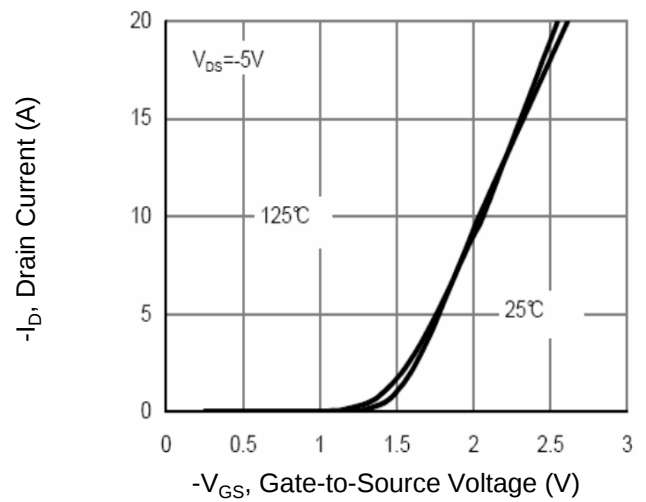


Figure 3. $R_{DS(on)}$ -Drain Current

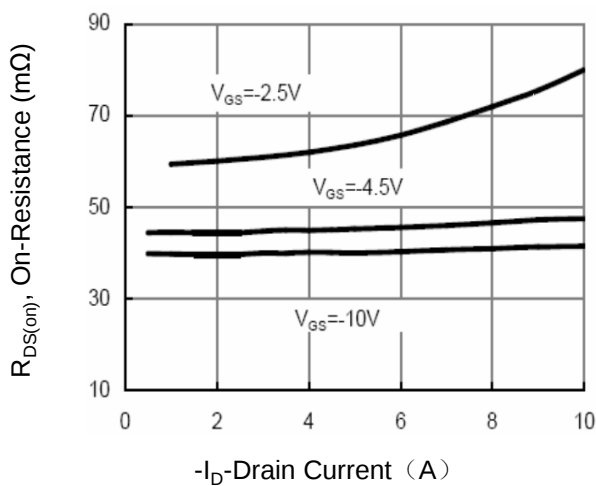


Figure 4. Gate Charge

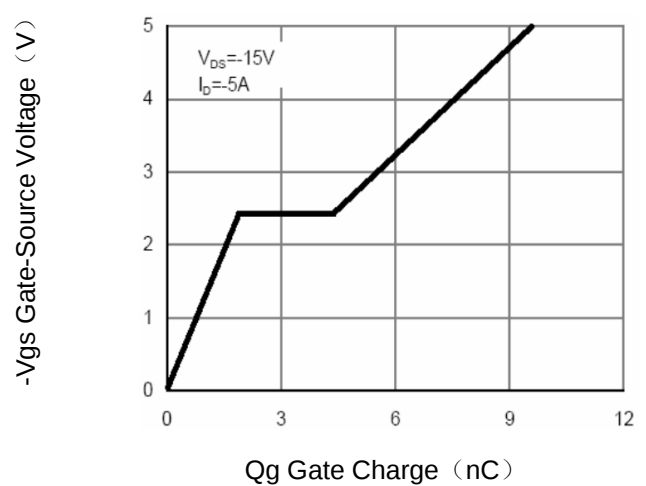


Figure 5. Capacitance

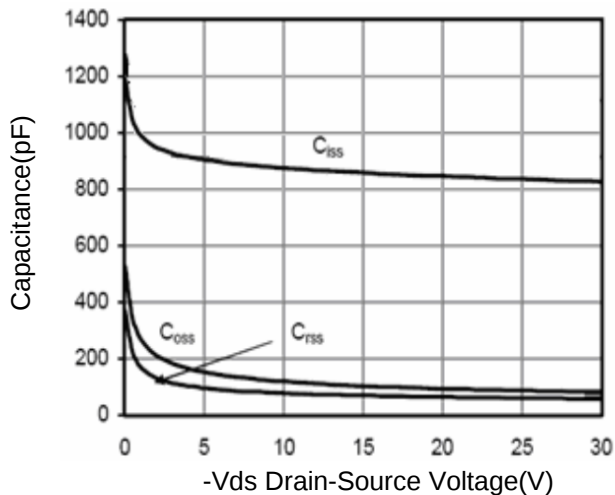
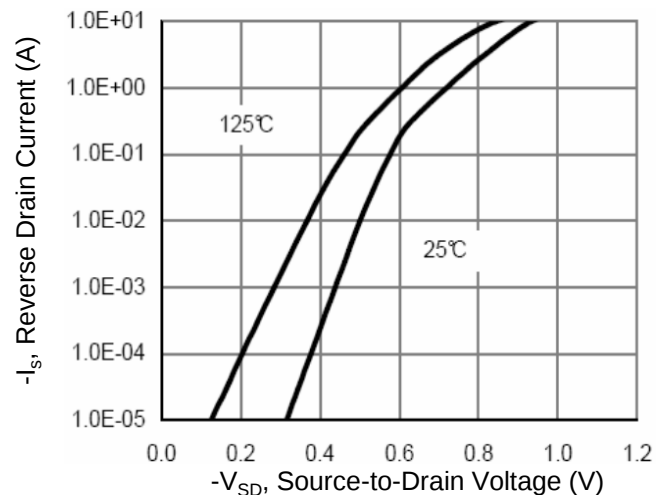


Figure 6. Source-Drain Diode Forward



PMOS Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Drain-Source On-Resistance

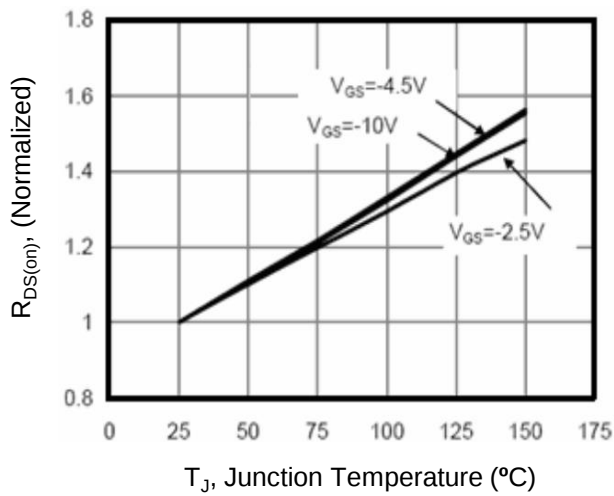


Figure 8. Safe Operation Area

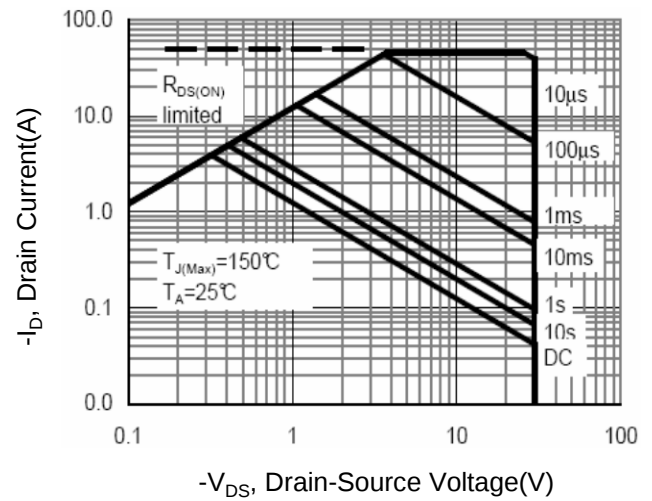
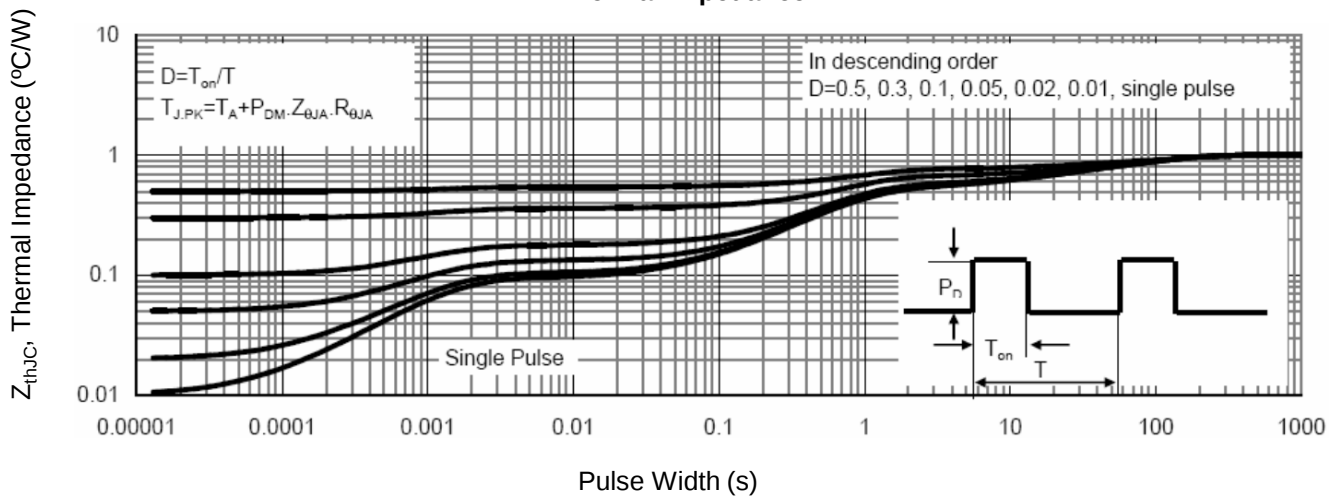
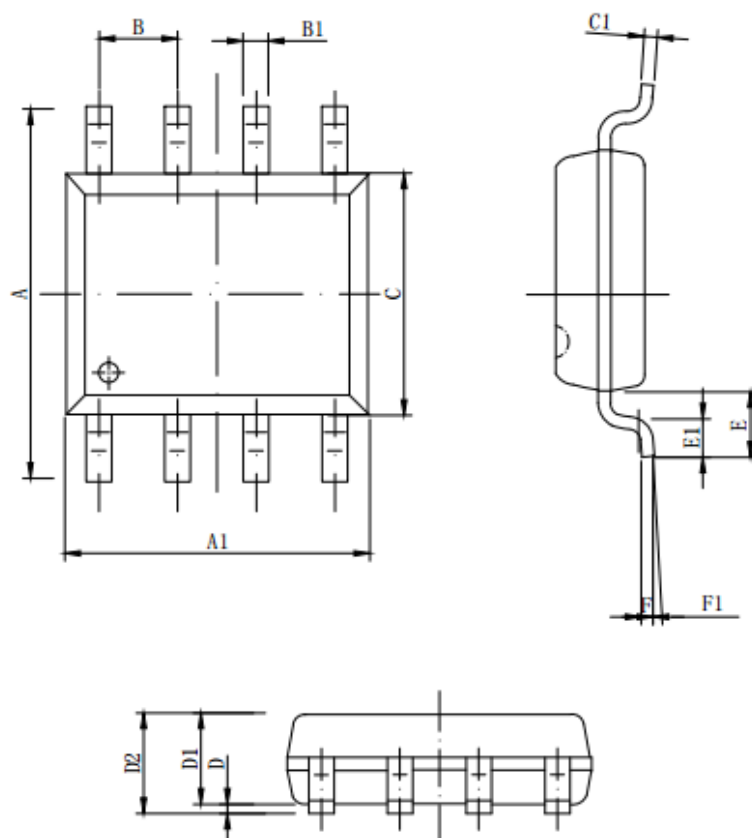


Figure 9. Normalized Maximum Transient Thermal Impedance



SOP-8 Package Information



Symbol	Dimensions in Millimeters		
	MIN.	NOM.	MAX.
A	5.800	6.000	6.200
A1	4.800	4.900	5.000
B	1.270BSC		
B1	0.35 ^{8x}	0.40 ^{8x}	0.45 ^{8x}
C	3.780	3.880	3.980
C1	--	0.203	0.253
D	0.050	0.150	0.250
D1	1.350	1.450	1.550
D2	1.500	1.600	1.700
D2	1.500	1.600	1.700
E	1.060REF		
E1	0.400	0.700	0.100
F	0.250BSC		
F1	2°	4°	6°