

30V Full-Bridge of MOSFET

Description

The HM4923 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a H-Bridge, and for a host of other applications.

General Features

- ◆ **N-channel:**
 $V_{DS} = 30V, I_D = 12A$
 $R_{DS(ON)} = 14m\Omega$ (typical) @ $V_{GS} = 4.5V$
 $R_{DS(ON)} = 12m\Omega$ (typical) @ $V_{GS} = 10V$
- ◆ **P-Channel:**
 $V_{DS} = -30V, I_D = -8A$
 $R_{DS(ON)} = 11m\Omega$ (typical) @ $V_{GS} = -4.5V$
 $R_{DS(ON)} = 8m\Omega$ (typical) @ $V_{GS} = -10V$
- ◆ Excellent gate charge x $R_{DS(ON)}$ product(FOM)
- ◆ Very low on-resistance $R_{DS(ON)}$
- ◆ 150 °C operating temperature
- ◆ Pb-free lead plating
- ◆ 100% UIS tested

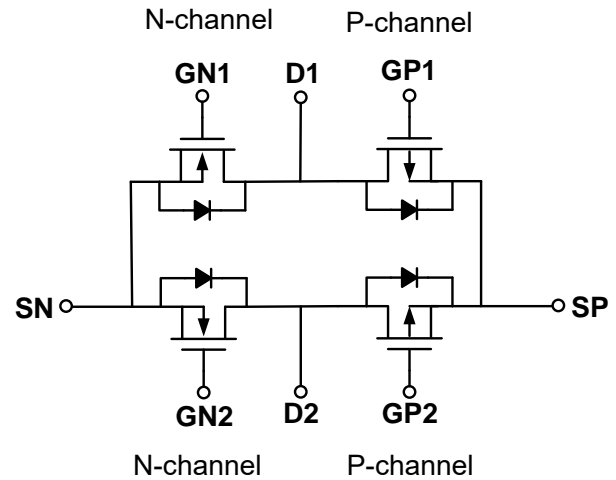
Application

- ◆ Complementary MOSFET for DC FAN, Motor
- ◆ Wireless Charging

Package

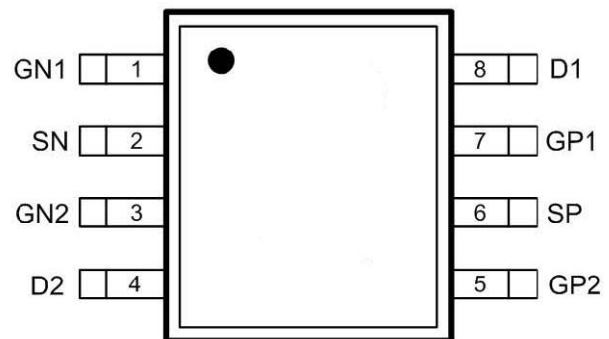
- ◆ SOP-8

Schematic diagram



Marking and pin assignment

SOP-8 (TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HM4923SR	-55°C to +150°C	SOP-8	3000
HM4923SF	-55°C to +150°C	SOP-8	4000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit		Unit
		N	P	
Drain-source voltage	V_{DS}	30	-30	V

Gate-source voltage	V_{GS}	± 12	± 12	V	
Maximum power dissipation	P_D	2.0	2.0	W	
Operating junction Temperature range	T_J	-55—150	-55—150	$^{\circ}\text{C}$	
Drain Current-Continuous (Silicon Limited)	$T_A=25^{\circ}\text{C}$	I_D	12	-8	A
	$T_A=75^{\circ}\text{C}$		8.4	-5.6	
Pulsed Drain Current (Package Limited)	I_{DM}	36	-24	A	
Power Dissipation ^B	$T_A=25^{\circ}\text{C}$	P_D	2	2	W
	$T_A=75^{\circ}\text{C}$		1.3	1.3	
Junction and Storage Temperature Range	T_J, T_{STG}	-55—150		$^{\circ}\text{C}$	

N-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu\text{A}$	30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0		2.5	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=12A$	-		14	m Ω
		$V_{GS}=10V, I_D=2.8A$	-		12	
Forward transconductance	gfs	$V_{GS}=5V, I_D=12A$	-	5	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=10V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	240	-	pF
Output capacitance	C_{OSS}		-	45	-	
Reverse transfer capacitance	C_{RSS}		-	23	-	
Gate resistance	R_g	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0\text{MHz}$	-	3.3	4.9	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(on)}$	$V_{DD}=10V$ $R_L=3.3\text{ohm}$ $V_{GEN}=4.5V$ $R_{GEN}=6\text{ohm}$	-	2.3	-	ns
Rise time	tr		-	3.1	-	
Turn-off delay time	$t_{D(off)}$		-	21	-	
Fall time	tf		-	2.6	-	
Total gate charge	Qg	$V_{DS}=10V$ $I_D=12A$ $V_{GS}=4.5V$	-	2.7	-	nC
Gate-source charge	Qgs		-	0.4	-	
Gate-drain charge	Qgd		-	0.5	-	

Thermal Characteristics

Thermal Resistance junction-to ambient	Rth JA	100	$^{\circ}\text{C/W}$
--	--------	-----	----------------------

N-Channel: Typical Electrical And Thermal Characteristics

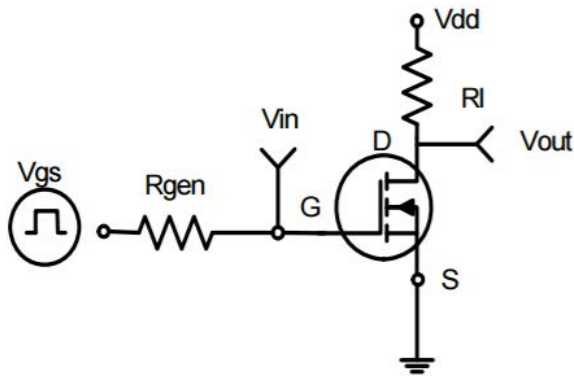


Figure 1: Switching Test Circuit

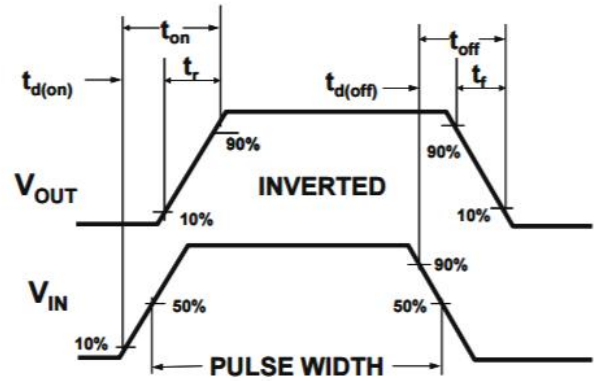


Figure 2: Switching Waveforms

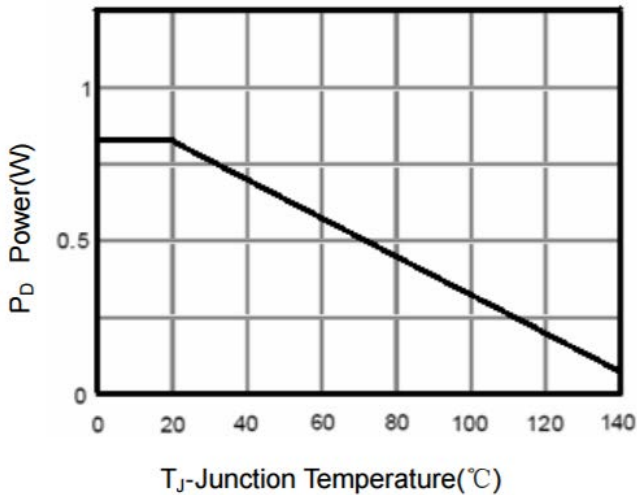


Figure 3 Power Dissipation

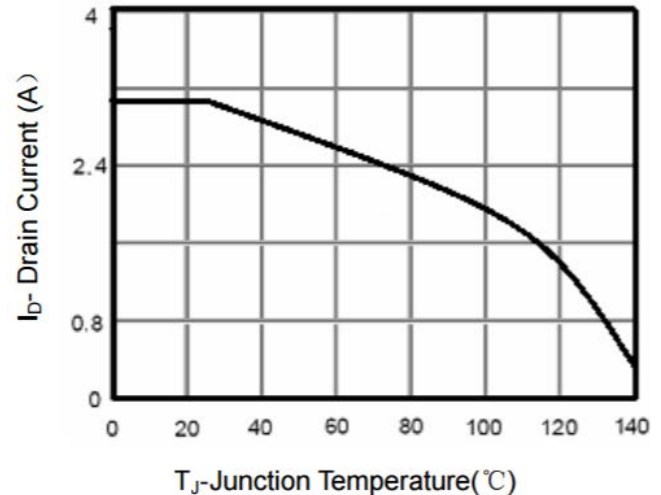


Figure 4 Drain Current

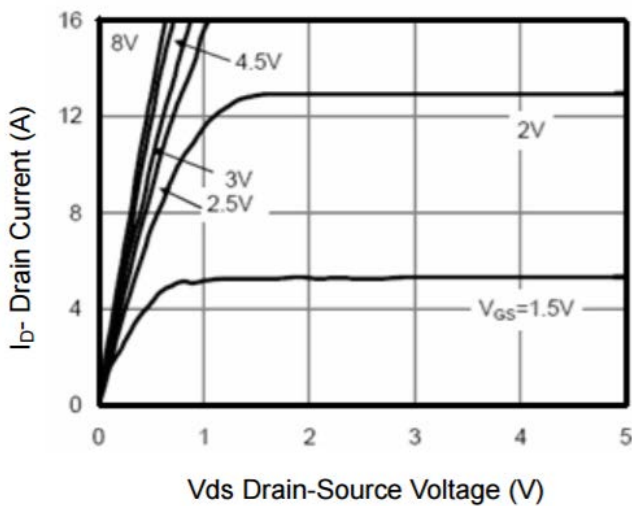


Figure 5 Output Characteristics

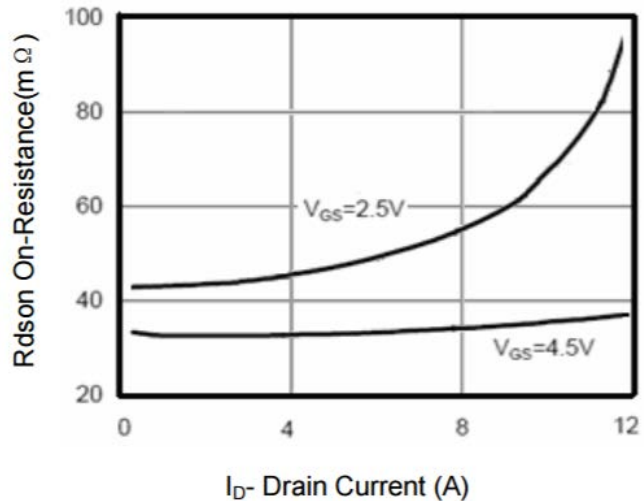


Figure 6 Drain-Source On-Resistance

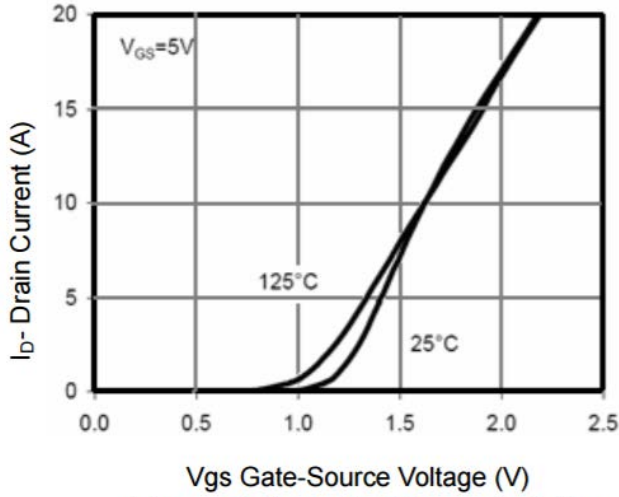


Figure 7 Transfer Characteristics

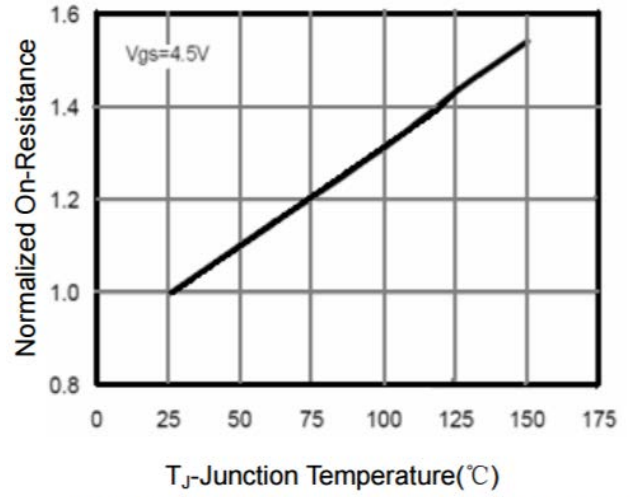


Figure 8 Drain-Source On-Resistance

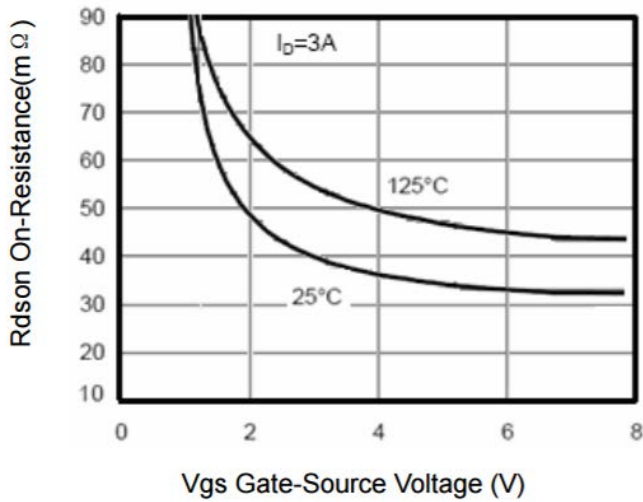


Figure 9 Rdson vs Vgs

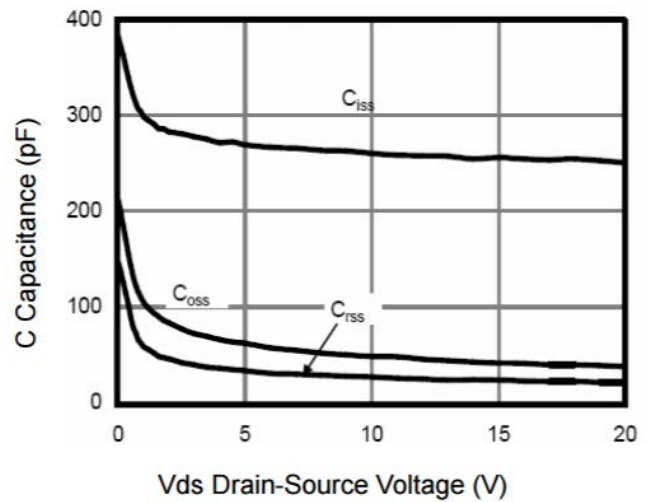


Figure 10 Capacitance vs Vds

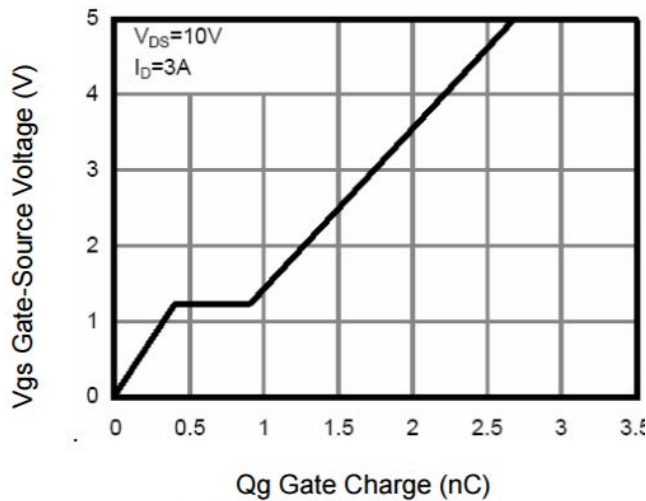


Figure 11 Gate Charge

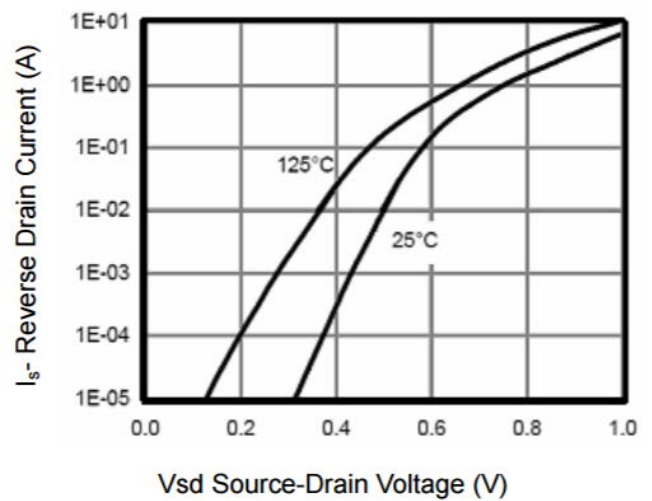


Figure 12 Source- Drain Diode Forward

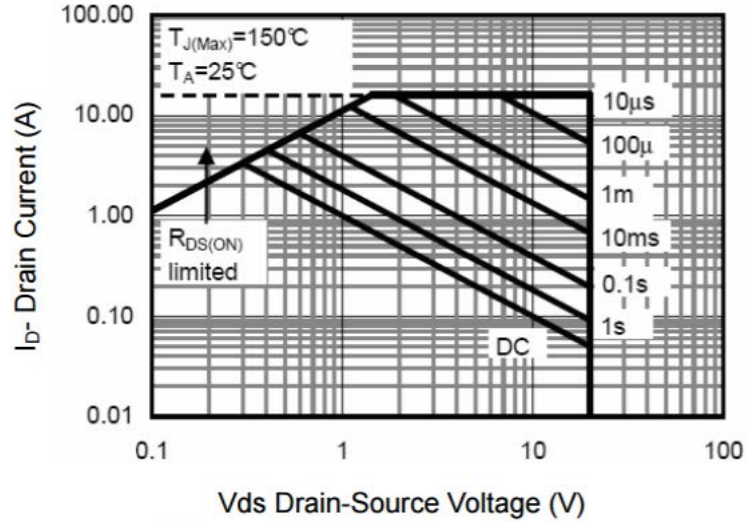


Figure 13 Safe Operation Area

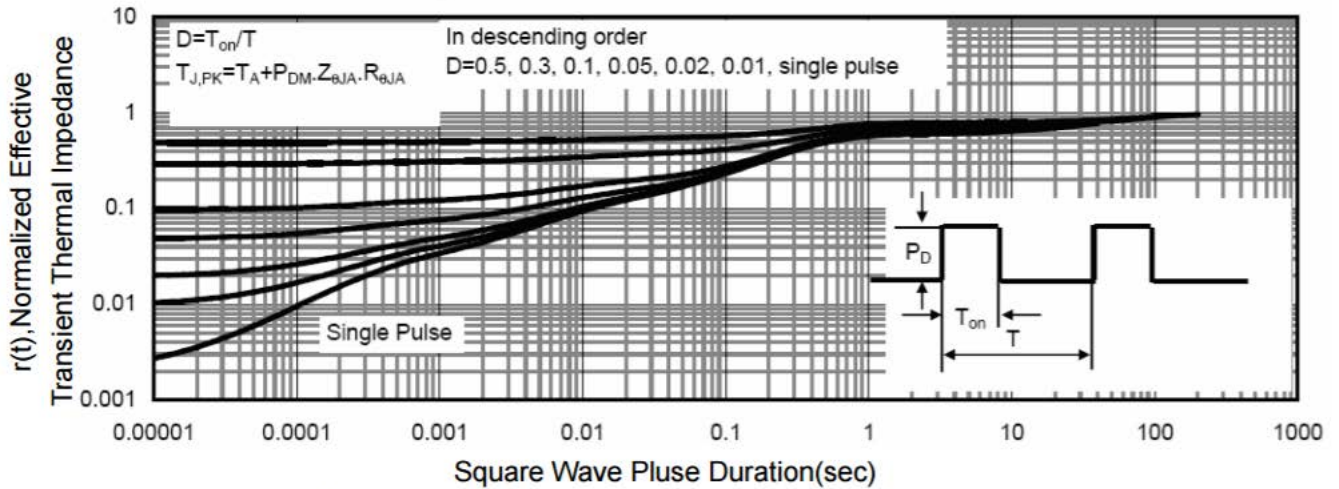
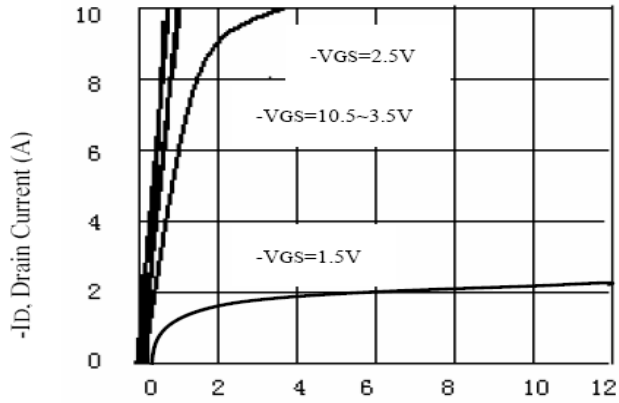


Figure 14 Normalized Maximum Transient Thermal Impedance

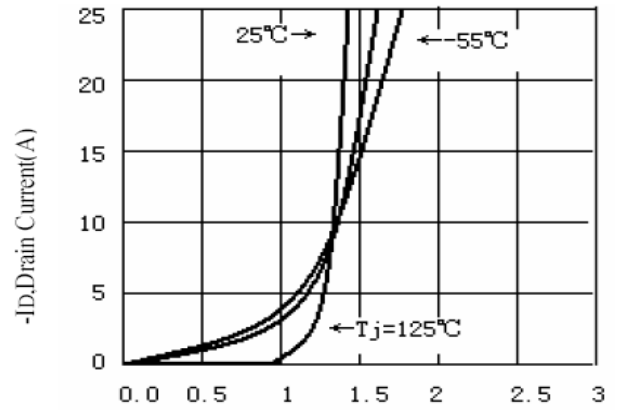
P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.5		-2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-2.8A$	-		11	m Ω
		$V_{GS}=-1.5V, I_D=-2.8A$	-		1.5	
Forward transconductance	gfs	$V_{GS}=-5V, I_D=-5A$	-	5	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-10V, V_{GS}=0V$ $f=1.0MHz$	-	561	-	pF
Output capacitance	C_{OSS}		-	61	-	
Reverse transfer capacitance	C_{RSS}		-	52	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-10V$ $I_D=-2.8A$ $V_{GEN}=-4.5V$ $R_L=10ohm$ $R_{GEN}=-60ohm$	-	12.5	-	ns
Rise time	t_r		-	6.6	-	
Turn-off delay time	$t_{D(OFF)}$		-	113	-	
Fall time	t_f		-	46.6	-	
Total gate charge	Qg	$V_{DS}=-10V, I_D=-8A$ $V_{GS}=-4.5V$	-	6.1	-	nC
Gate-source charge	Qgs		-	1.7	-	
Gate-drain charge	Qgd		-	1.2	-	

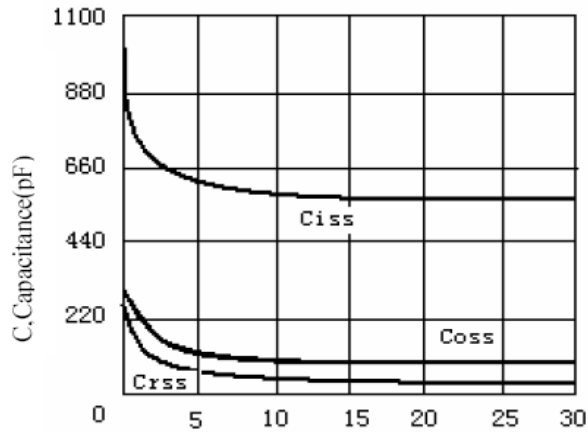
P-Channel: Typical Electrical And Thermal Characteristics



- Vds, Drain-to-Source Voltage (V)
Figure 1. Output Characteristics



-Vgs, Gate-to-source Voltage (V)
Figure 2. Transfer Characteristics



- VGS, Drain-to Source Voltage
Figure3. Capacitance

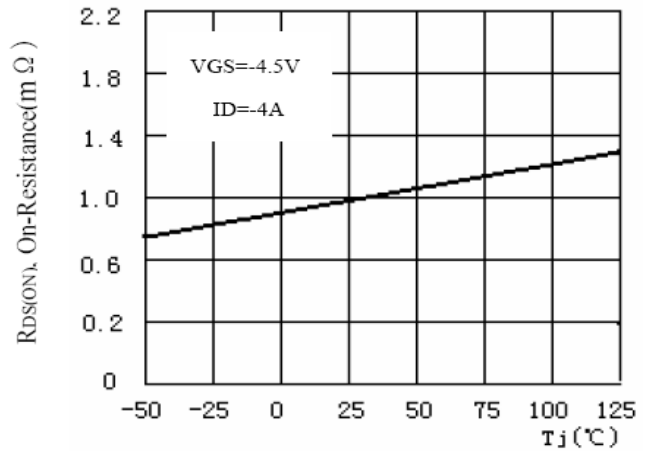
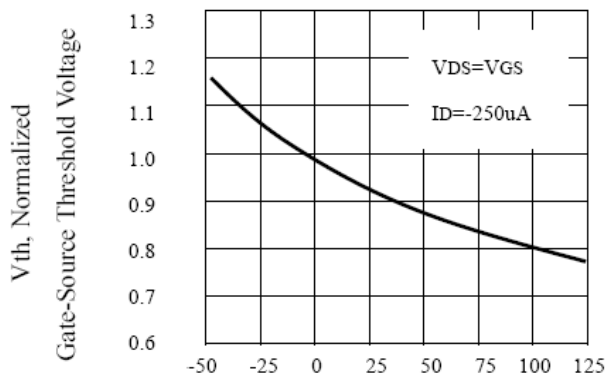
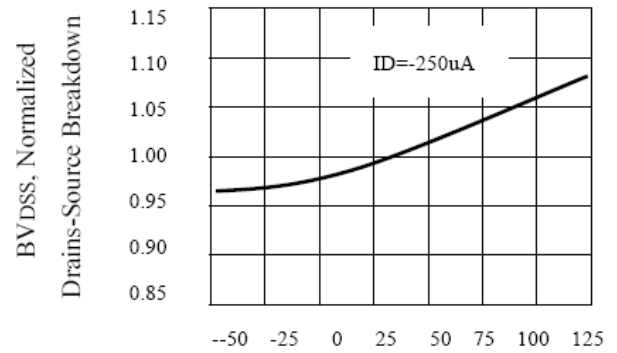


Figure4. On-Resistance Variation with Temperature



Tj, Junction Temperature(°C)
Figure5. Gate Threshold Variation With Temperature



Tj, Junction Temperature (°C)
Figure6. Breakdown Voltage Variation With Temperature

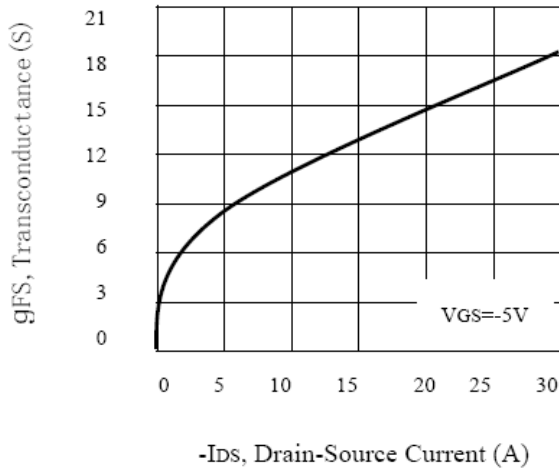


Figure 7. Transconductance Variation With Drain Current

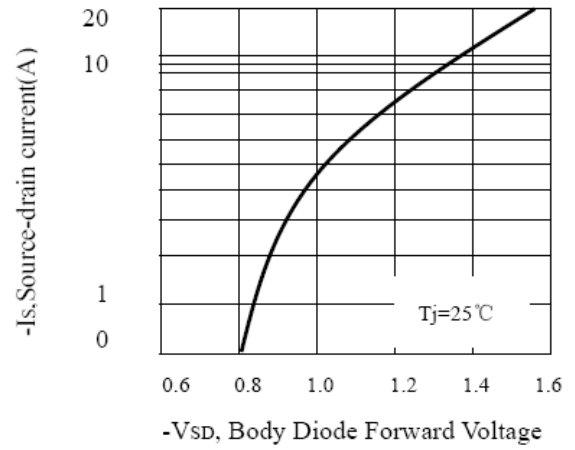


Figure 8. Body Diode Forward Voltage Variation with Source Current

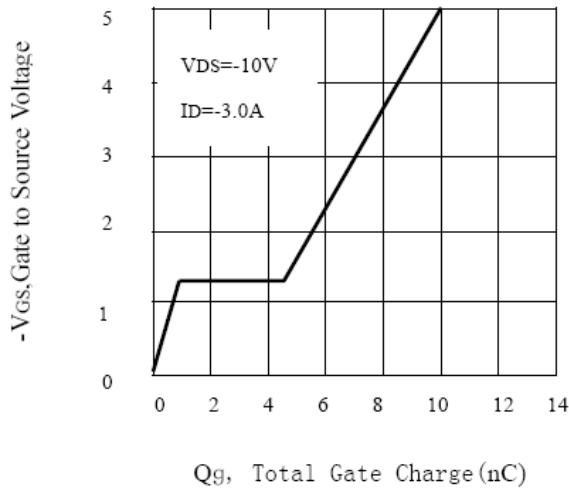


Figure 9. Gate Charge

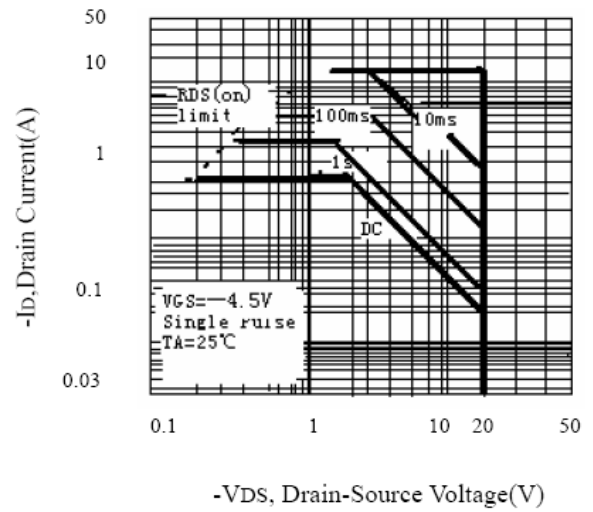
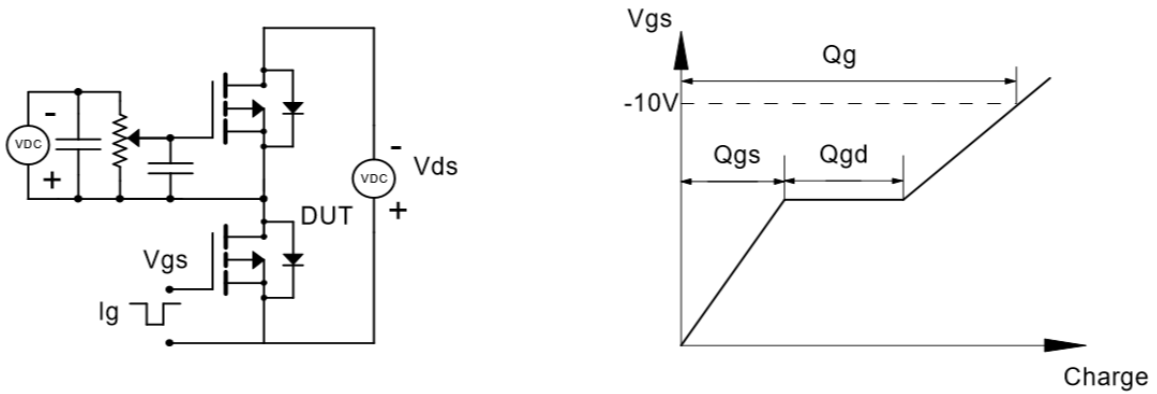
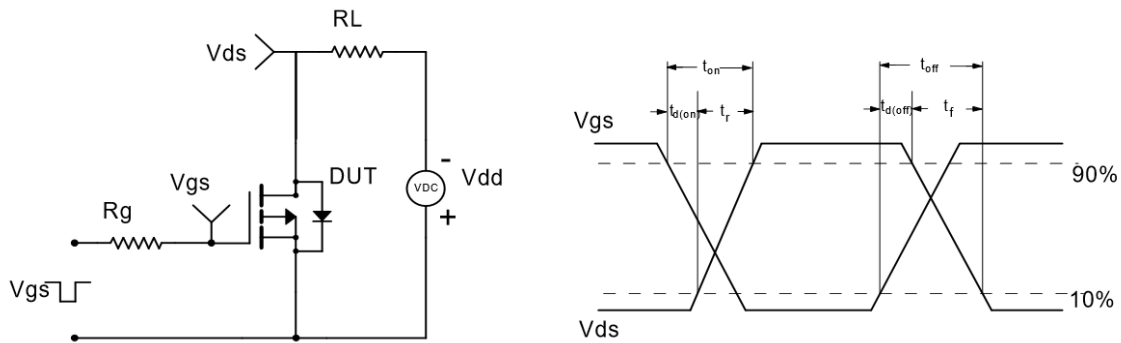


Figure 10. Maximum Safe Operating Area

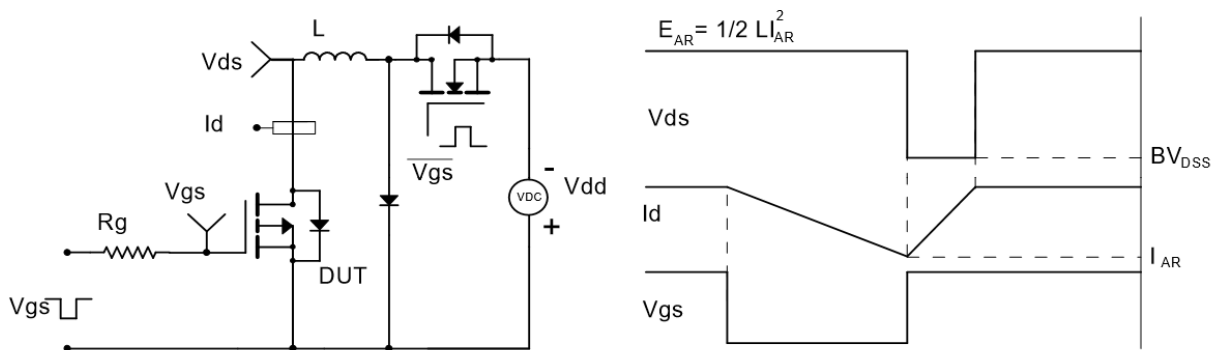
Gate Charge Test Circuit & Waveform



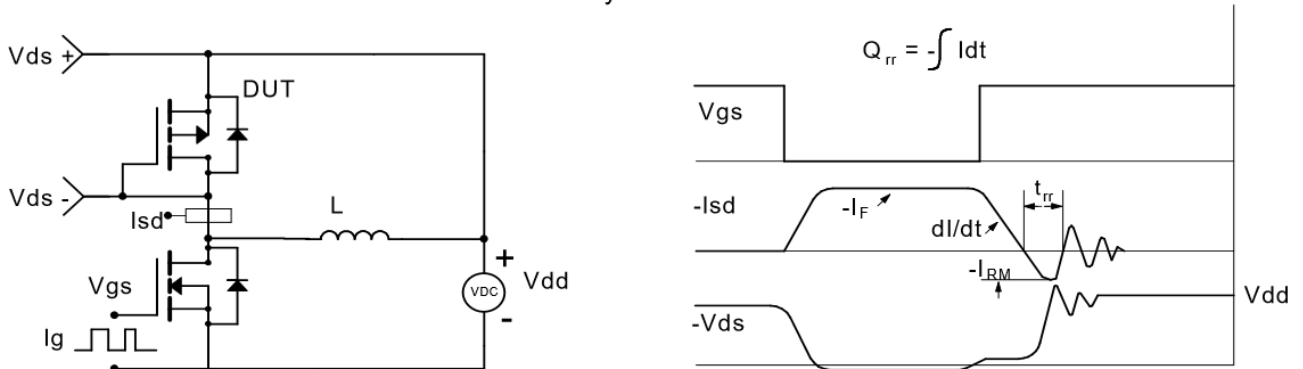
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

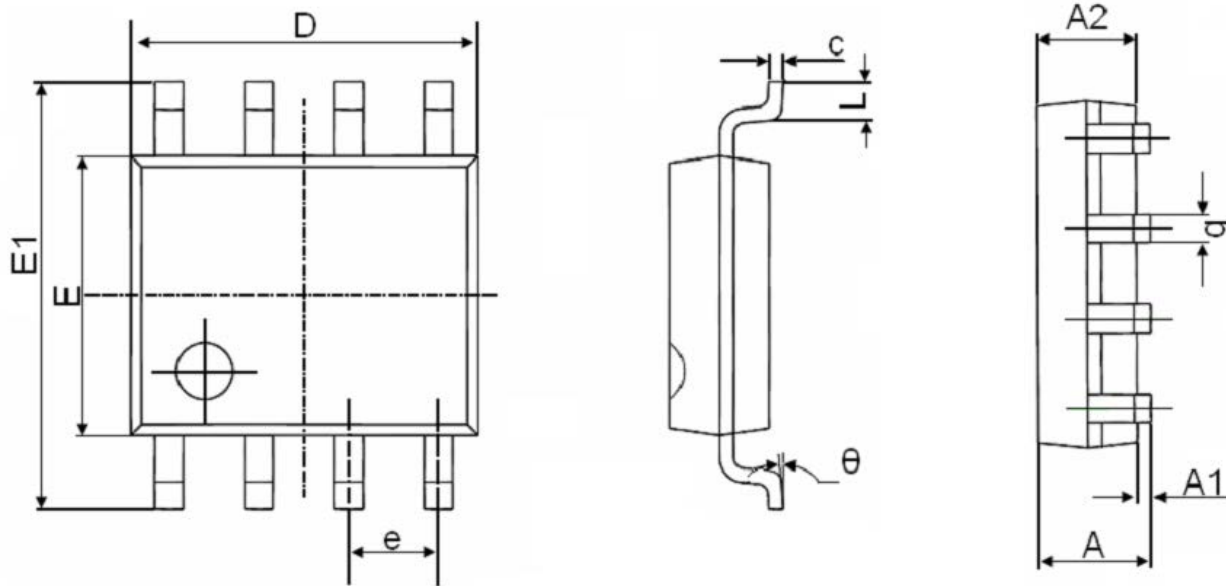


Diode Recovery Test Circuit & Waveforms



Package Information

- SOP-8



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°