

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

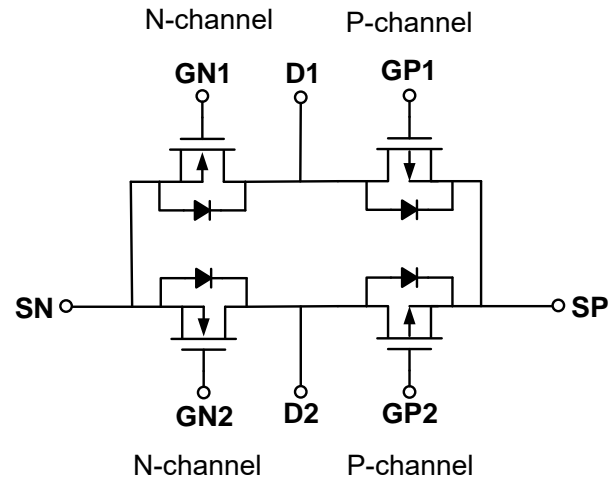
Application

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

Package

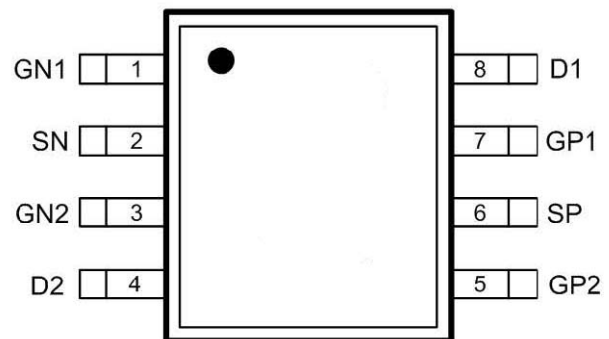
- ◆ SOP-8

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	°C
Drain Current-Continuous (Silicon Limited)	T _A =25°C	I _D	12	-8	A
	T _A =75°C		8.4	-5.6	
Pulsed Drain Current (Package Limited)		I _{DM}	36	-24	A
Power Dissipation ^B	T _A =25°C	P _D	2	2	W
	T _A =75°C		1.3	1.3	
Junction and Storage Temperature Range		T _J , T _{STG}	-55—150		°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}	$V_{GS}=0V, I_D=250\mu A$	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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		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	g_{fs}	$V_{GS}=5V, I_D=12A$	-	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	t_r		-	3.1	-	
Turn-off delay time	$t_{D(off)}$		-	21	-	
Fall time	t_f		-	2.6	-	
Total gate charge	Q_g	$V_{DS}=10V$ $I_D=12A$ $V_{GS}=4.5V$	-	2.7	-	nC
Gate-source charge	Q_{gs}		-	0.4	-	
Gate-drain charge	Q_{gd}		-	0.5	-	

Thermal Characteristics

Thermal Resistance junction-to ambient	$R_{th JA}$	100	°C/W
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N-Channel: Typical Electrical And Thermal Characteristics

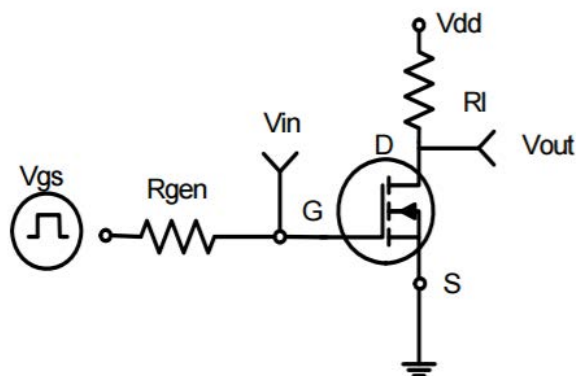


Figure 1: Switching Test Circuit

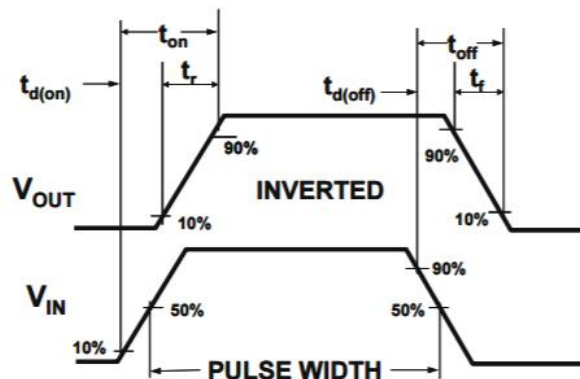
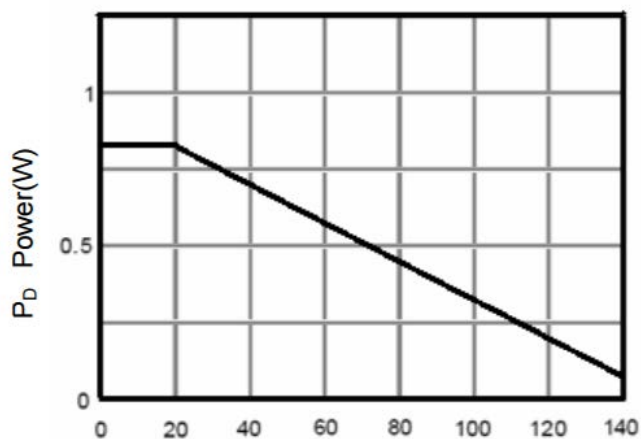
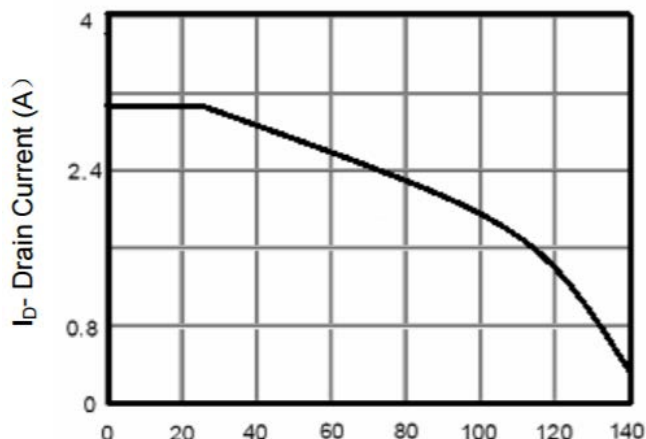


Figure 2: Switching Waveforms



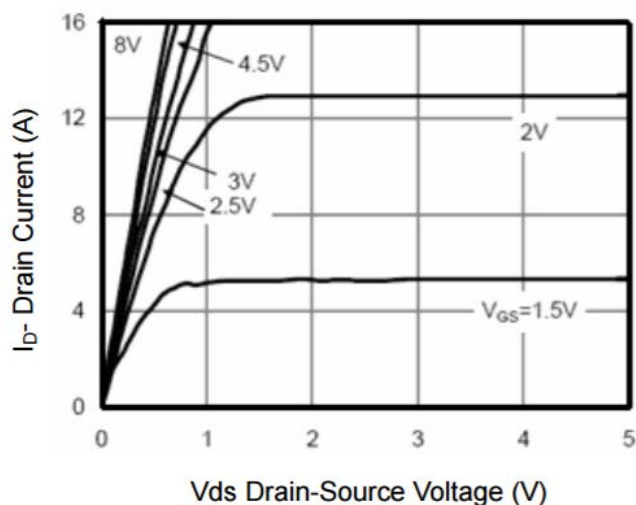
T_J-Junction Temperature(°C)

Figure 3 Power Dissipation



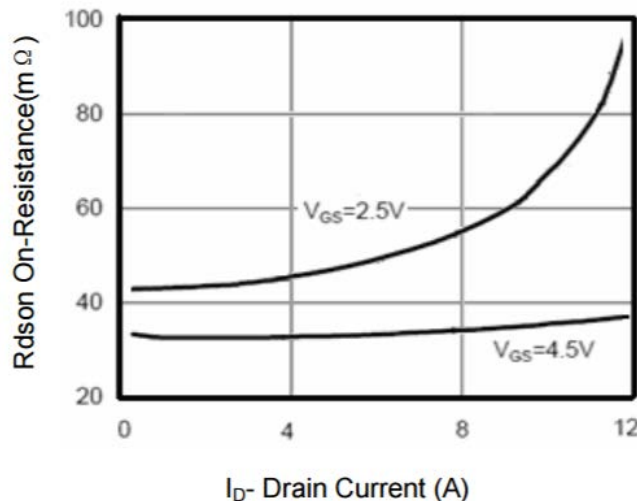
T_J-Junction Temperature(°C)

Figure 4 Drain Current



V_{ds} Drain-Source Voltage (V)

Figure 5 Output Characteristics



I_D- Drain Current (A)

Figure 6 Drain-Source On-Resistance

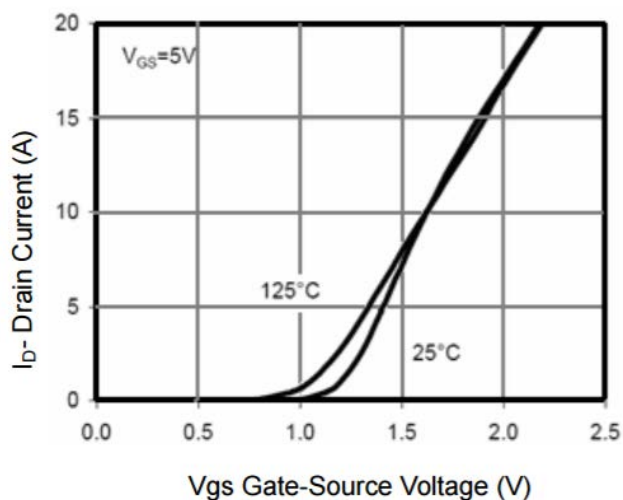


Figure 7 Transfer Characteristics

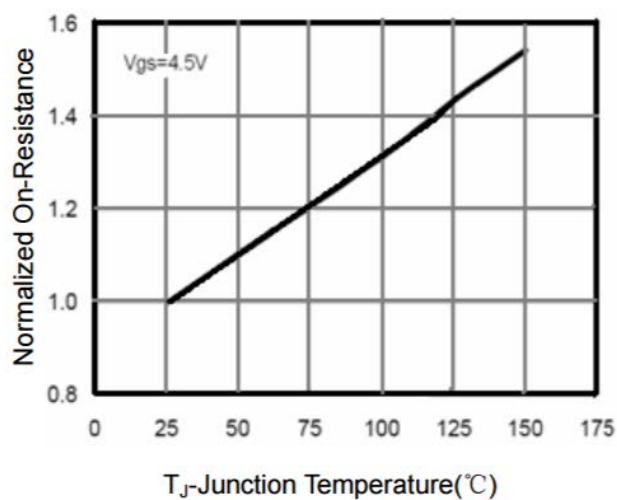


Figure 8 Drain-Source On-Resistance

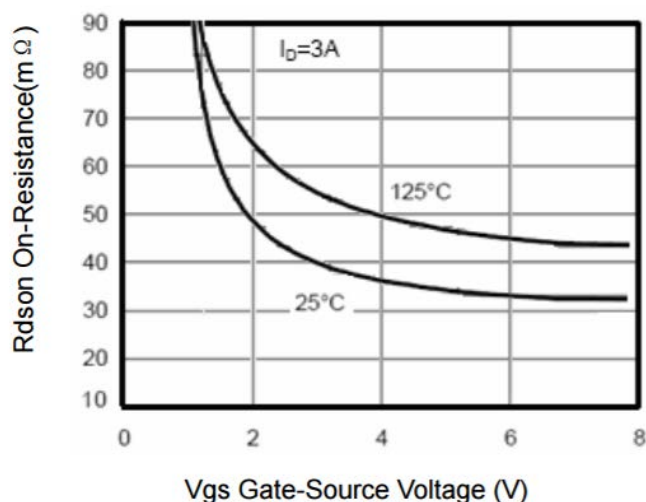


Figure 9 Rdson vs Vgs

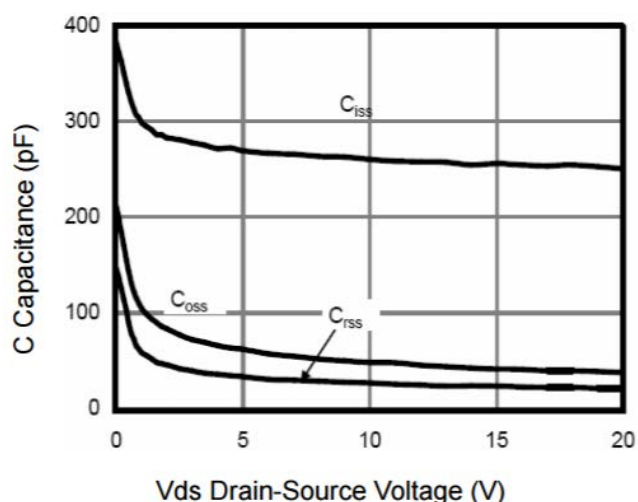


Figure 10 Capacitance vs Vds

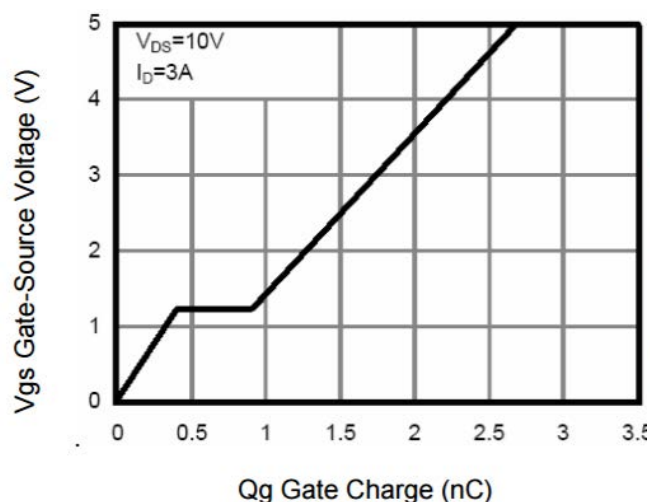


Figure 11 Gate Charge

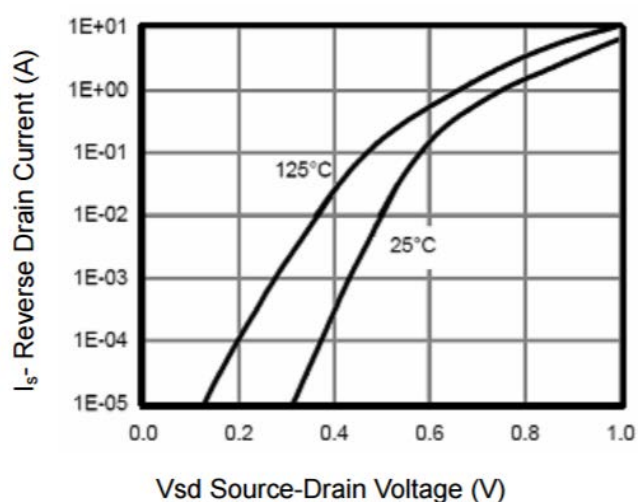


Figure 12 Source- Drain Diode Forward

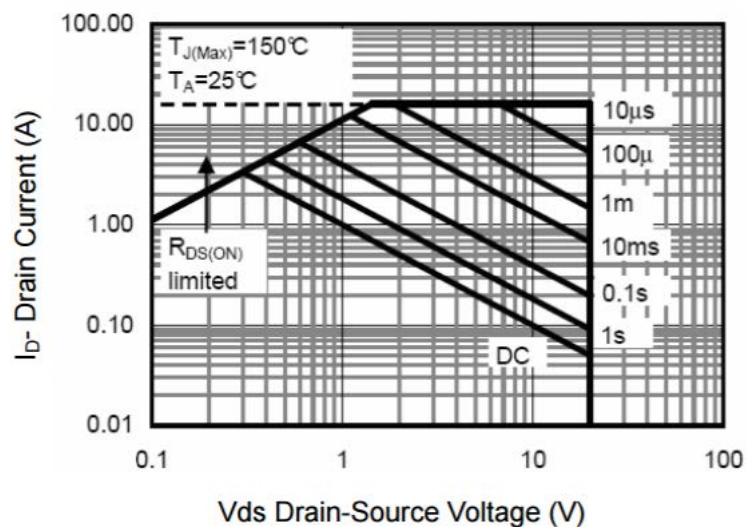


Figure 13 Safe Operation Area

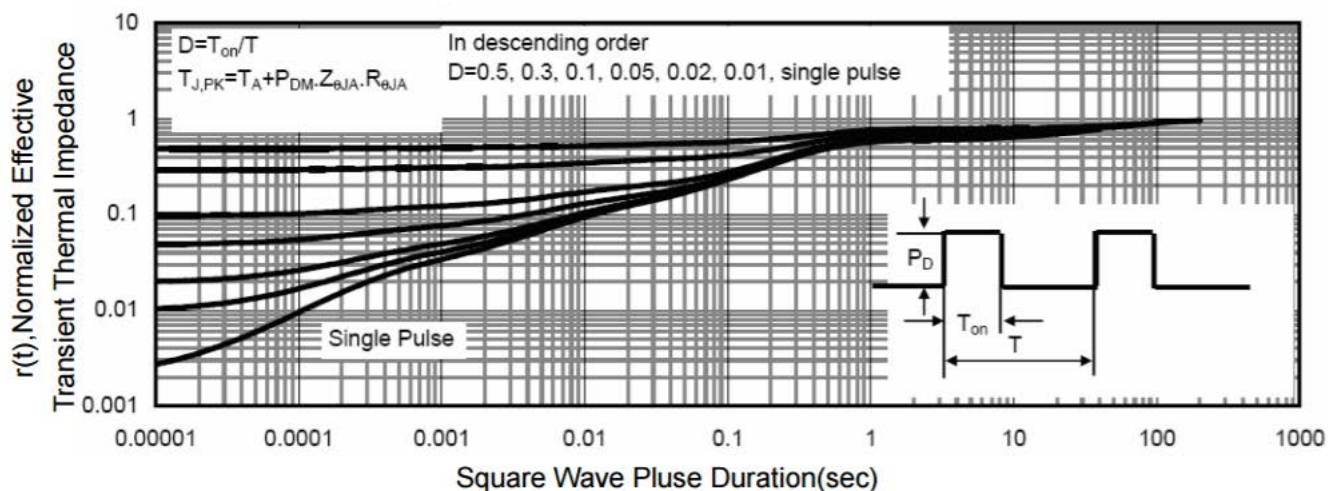
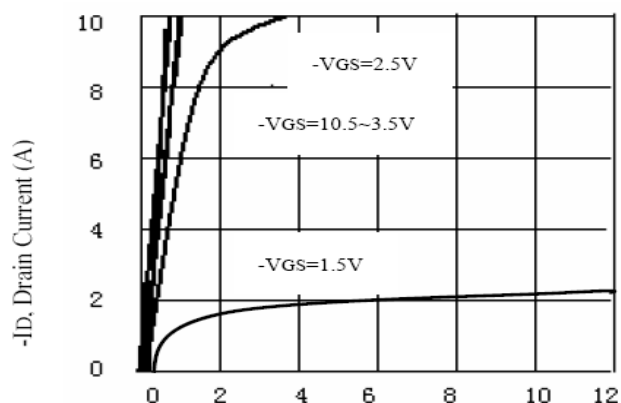


Figure 14 Normalized Maximum Transient Thermal Impedance

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

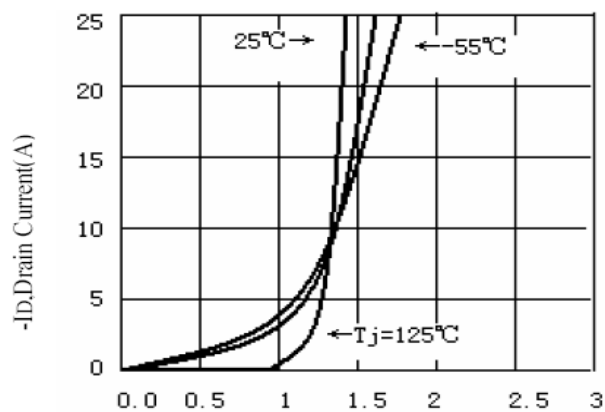
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
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
		$V_{GS}=-5V, I_D=-2.8A$	-		10	
Forward transconductance	g_{fs}	$V_{GS}=-5V, I_D=-5A$	-	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	Q_g	$V_{DS}=-10V, I_D=-8A$ $V_{GS}=-4.5V$	-	6.1	-	nC
Gate-source charge	Q_{gs}		-	1.7	-	
Gate-drain charge	Q_{gd}		-	1.2	-	

P-Channel: Typical Electrical And Thermal Characteristics



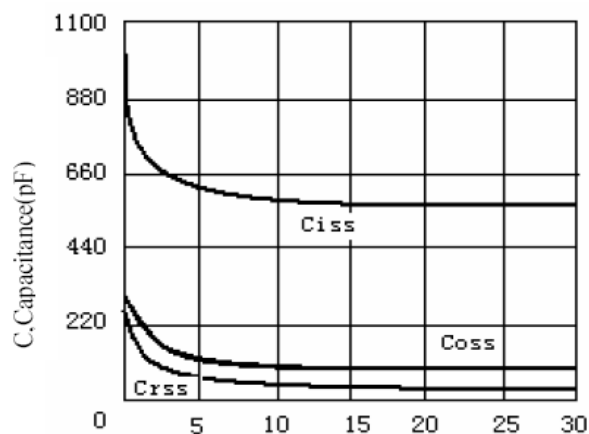
- V_{DS} , Drain-to-Source Voltage (V)

Figure 1. Output Characteristics



- V_{GS} , Gate-to-source Voltage (V)

Figure 2. Transfer Characteristics



- V_{GS} , Drain-to Source Voltage

Figure3. Capacitance

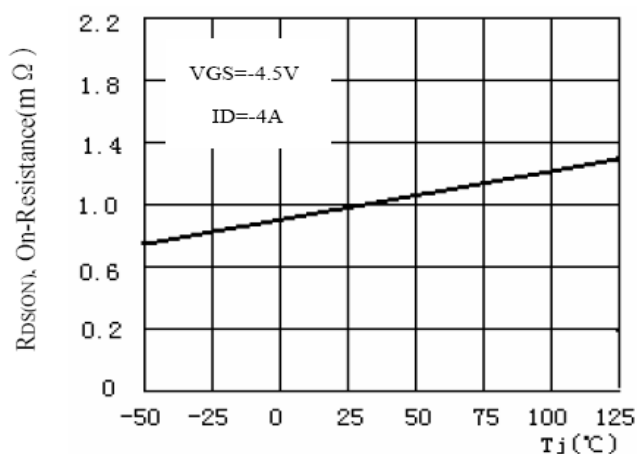


Figure4. On-Resistance Variation with Temperature

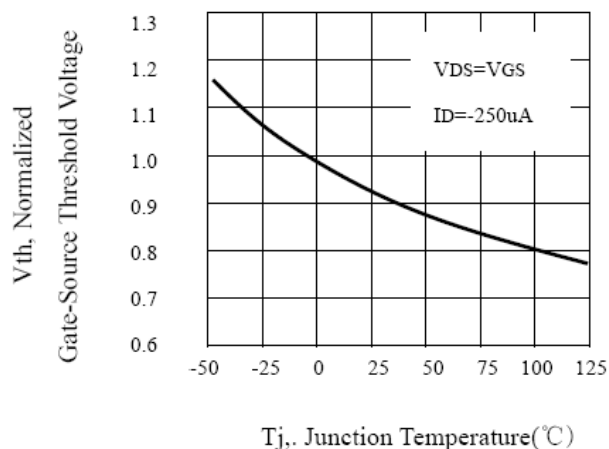


Figure5. Gate Threshold Variation With Temperature

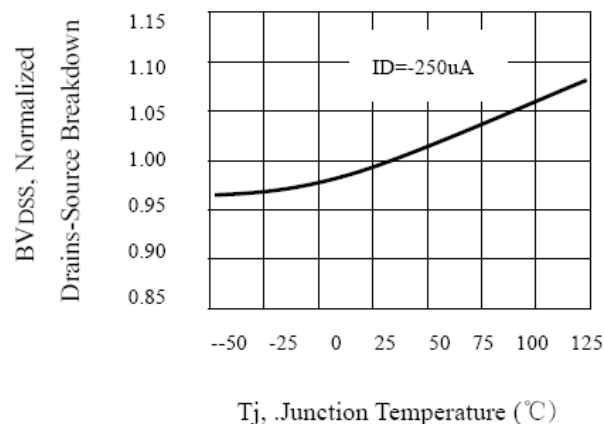
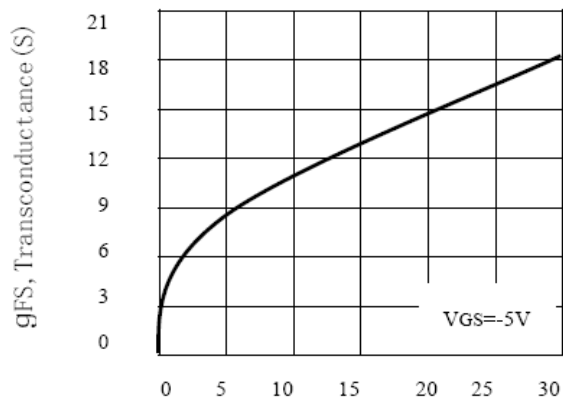
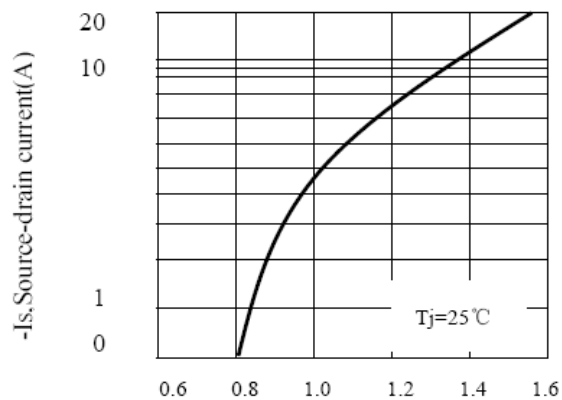


Figure6. Breakdown Voltage Variation With Temperature



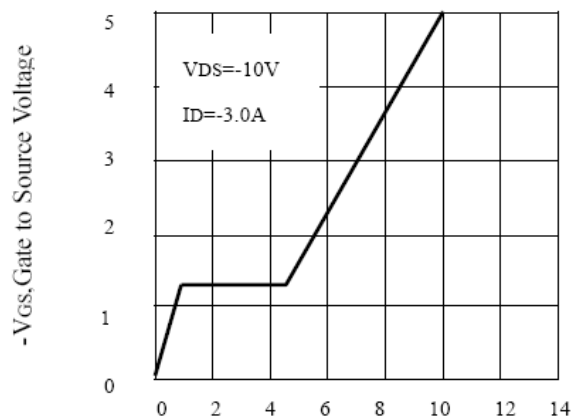
-IDS, Drain-Source Current (A)

Figure7. Transconductance Variation
With Drain Current



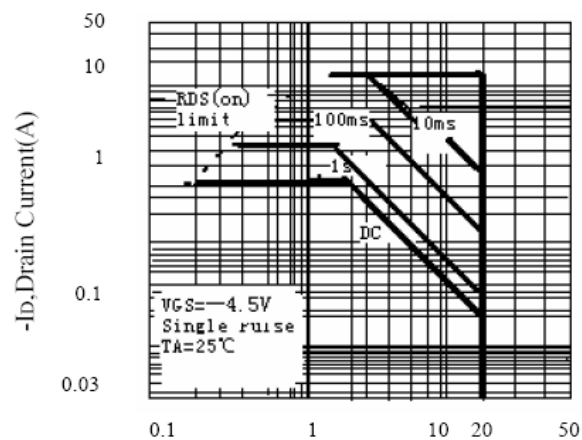
-VSD, Body Diode Forward Voltage

Figure8. Body Diode Forward Voltage
Variation with Source Current



Qg, Total Gate Charge (nC)

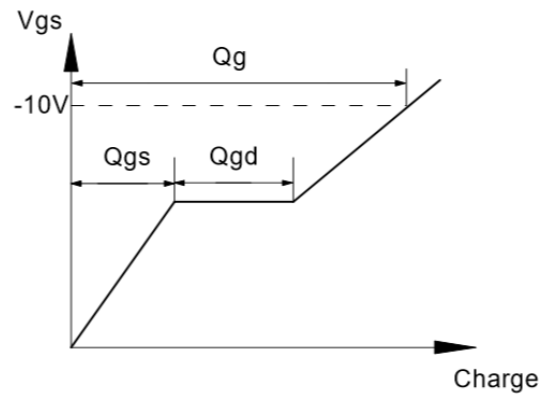
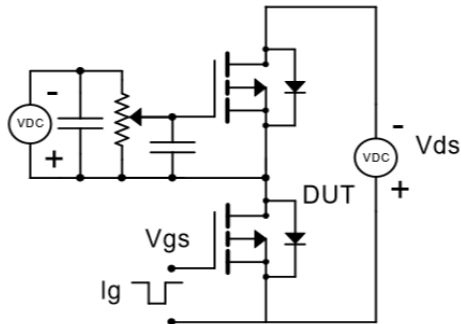
Figure9. Gate Charge



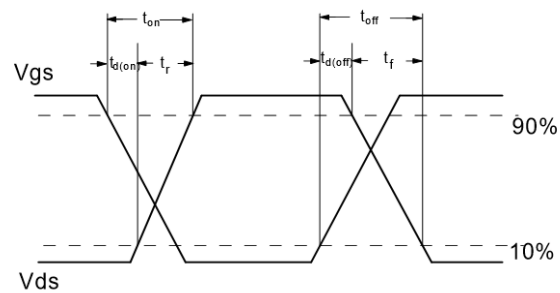
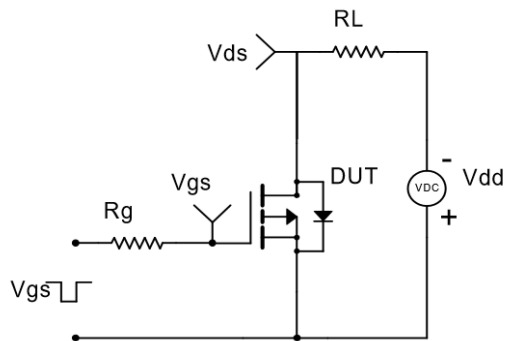
-VDS, Drain-Source Voltage(V)

Figure10. Maximum Safe Operating Area

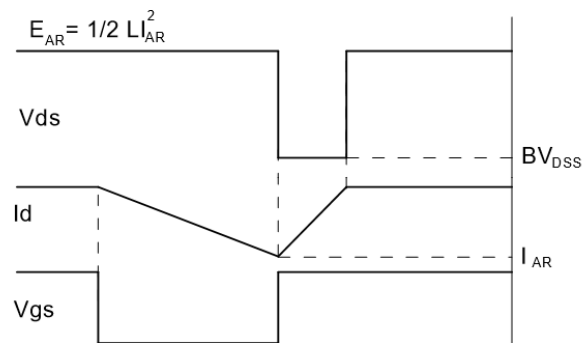
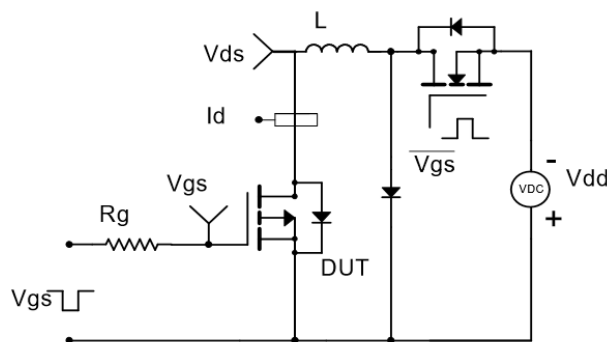
Gate Charge Test Circuit & Waveform



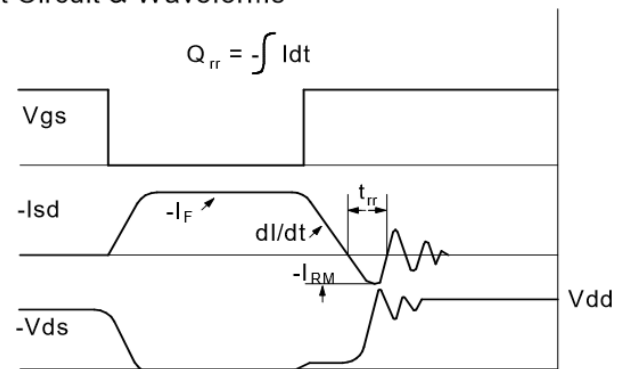
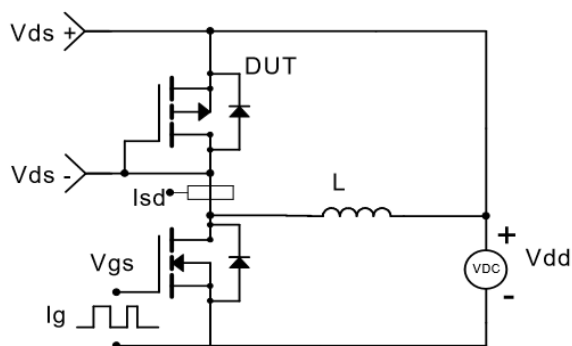
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

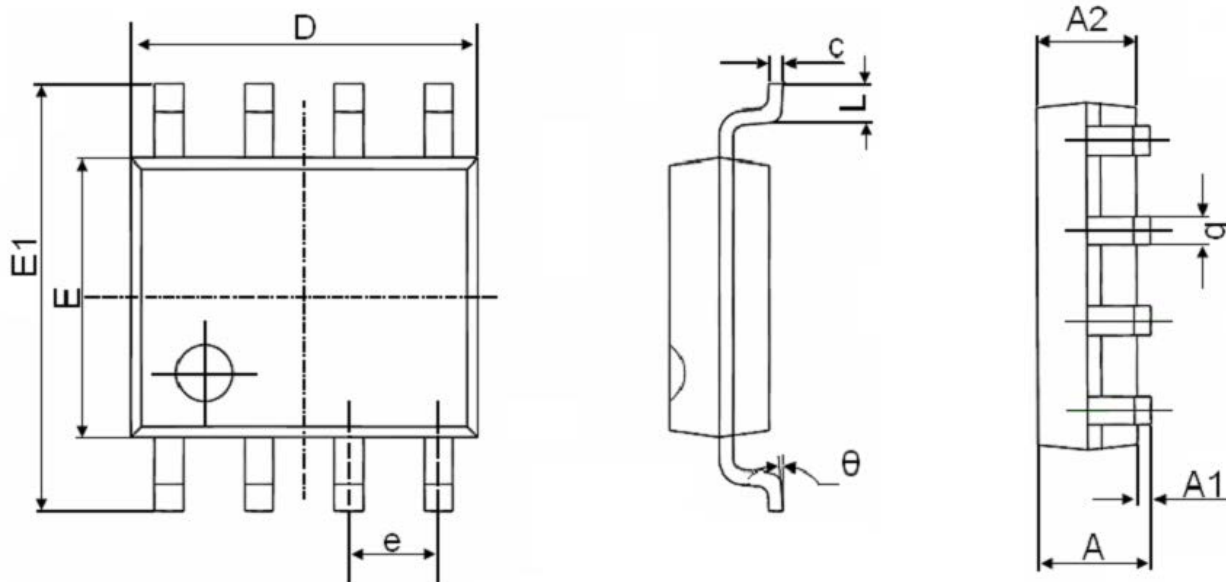


Diode Recovery Test Circuit & Waveforms



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°