

40V Full-Bridge of MOSFET

Description

The HM4924 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:**
 $V_{DS} = 40V, I_D = 10A$
 $R_{DS(ON)} = 22m\Omega$ (typical) @ $V_{GS} = 4.5V$
 $R_{DS(ON)} = 17m\Omega$ (typical) @ $V_{GS} = 10V$
- ◆ **P-Channel:**
 $V_{DS} = -40V, I_D = -6A$
 $R_{DS(ON)} = 65m\Omega$ (typical) @ $V_{GS} = -4.5V$
 $R_{DS(ON)} = 45m\Omega$ (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

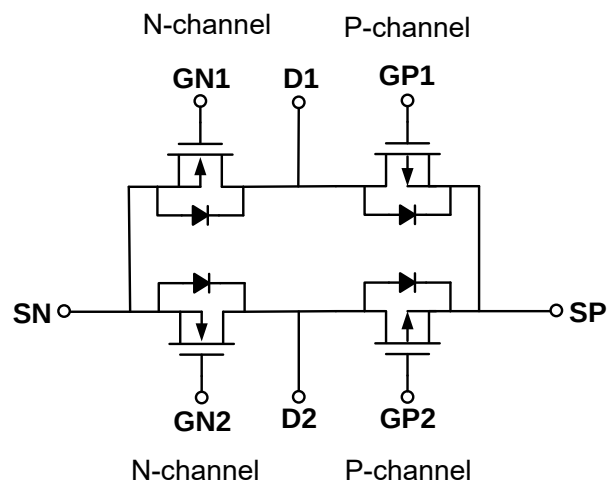
Application

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

Package

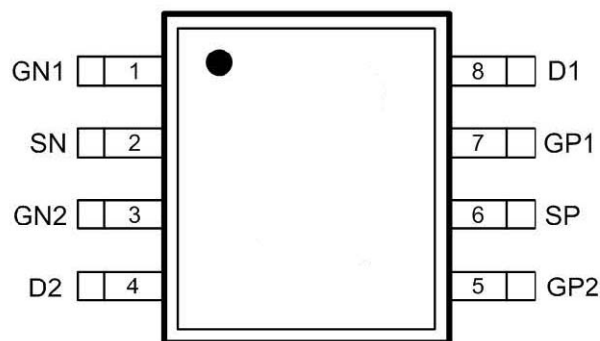
- ◆ SOP-8

Schematic diagram



Marking and pin assignment

SOP-8 (TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HM4924SR	-55°C to +150°C	SOP-8	3000
HM4924SF	-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}	40	-40	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	10	-6	A
	T _A =75°C		7	-4.2	
Pulsed Drain Current (Package Limited)		I _{DM}	30	-18	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}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	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	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=10A$	-		22	m Ω
		$V_{GS}=10V, I_D=2.8A$	-		17	
Forward transconductance	g_{fs}	$V_{GS}=5V, I_D=10A$	-	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	$V_{DS}=10V$ $I_D=10A$ $V_{GS}=4.5V$	-	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

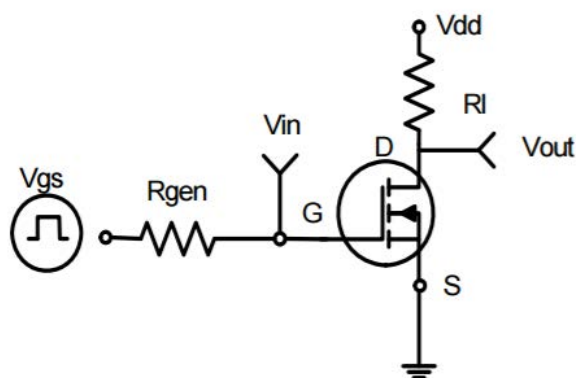


Figure 1: Switching Test Circuit

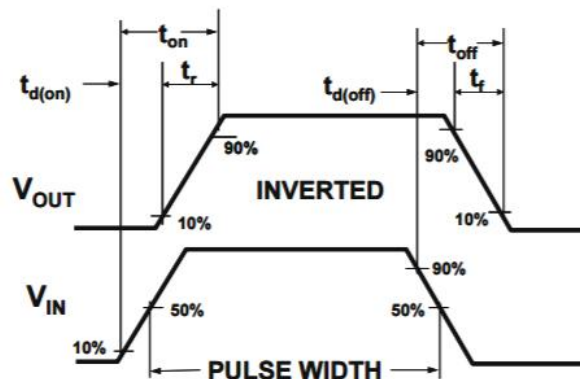


Figure 2: Switching Waveforms

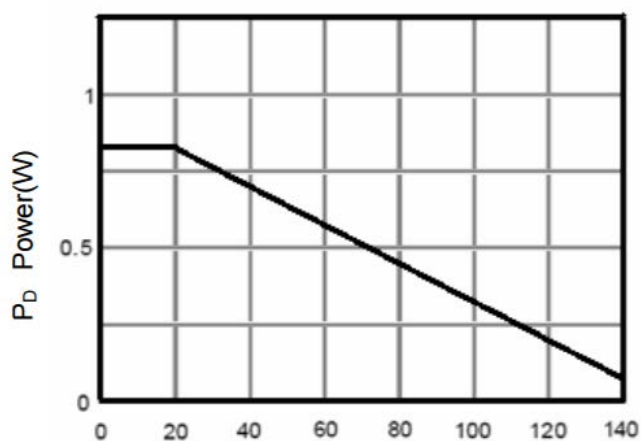


Figure 3 Power Dissipation

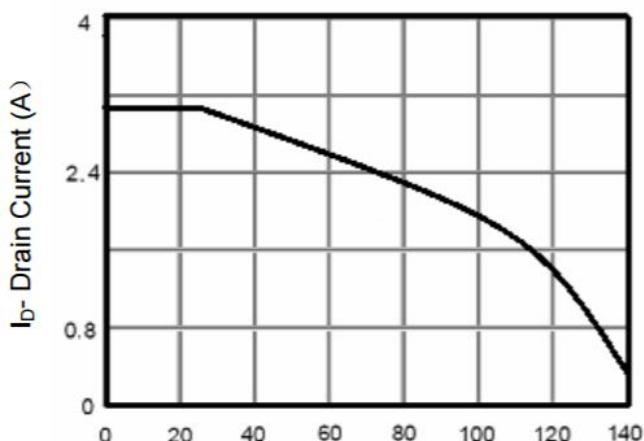


Figure 4 Drain Current

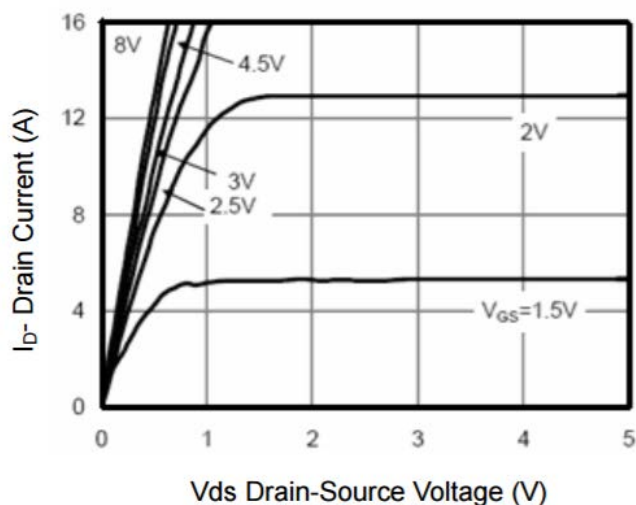


Figure 5 Output Characteristics

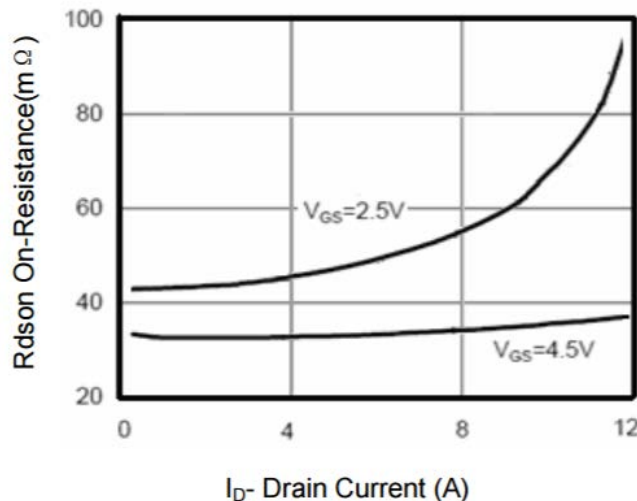


Figure 6 Drain-Source On-Resistance

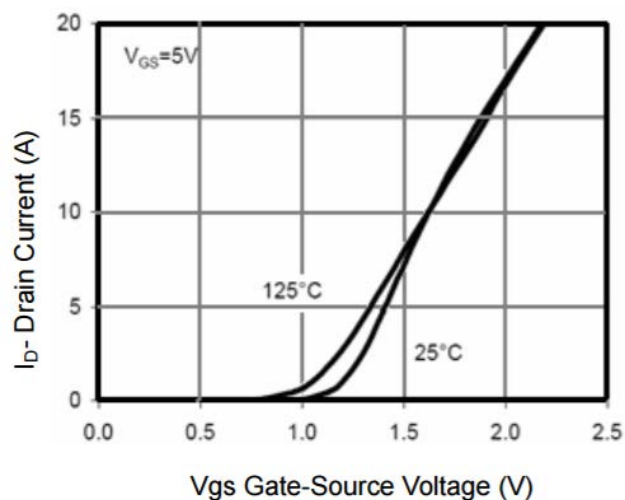


Figure 7 Transfer Characteristics

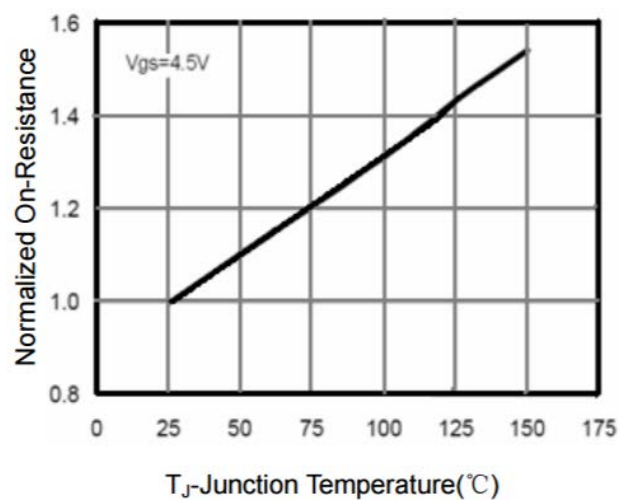


Figure 8 Drain-Source On-Resistance

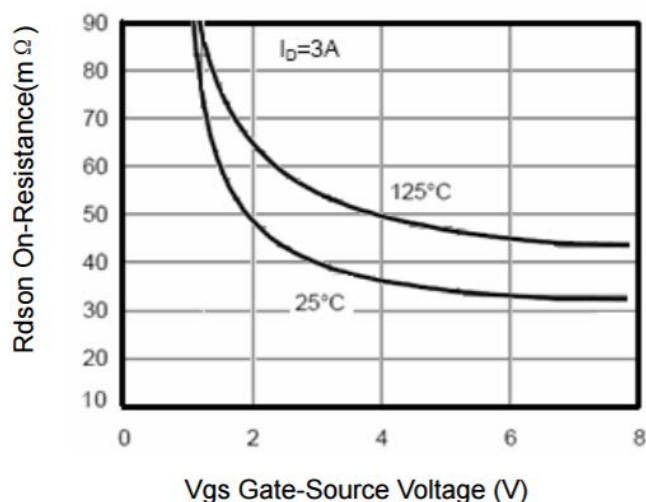


Figure 9 $R_{DS(on)}$ vs V_{GS}

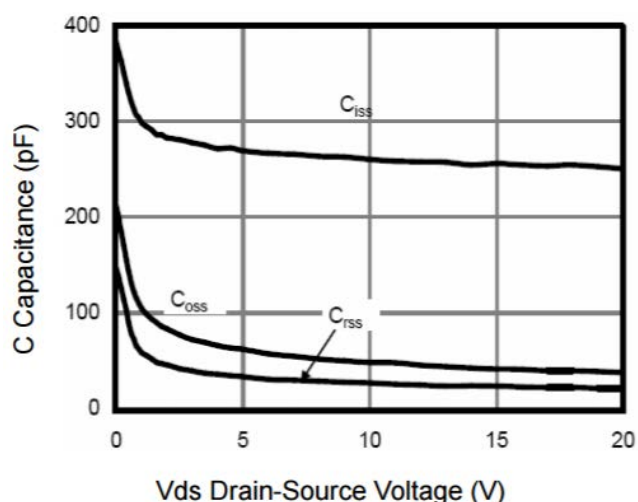


Figure 10 Capacitance vs V_{DS}

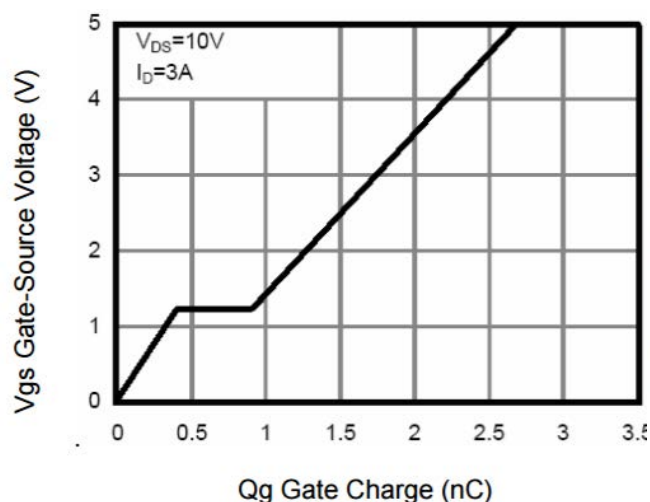


Figure 11 Gate Charge

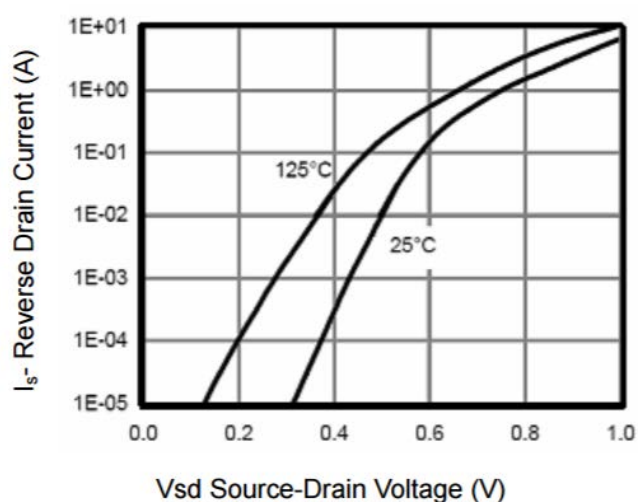


Figure 12 Source- Drain Diode Forward

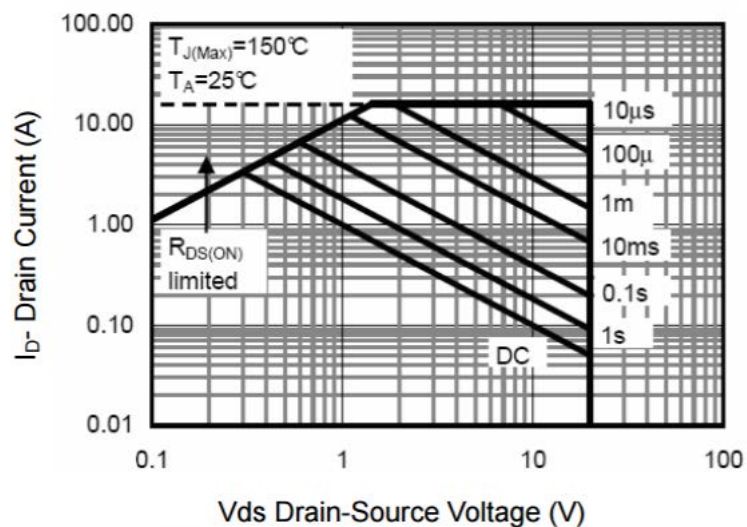


Figure 13 Safe Operation Area

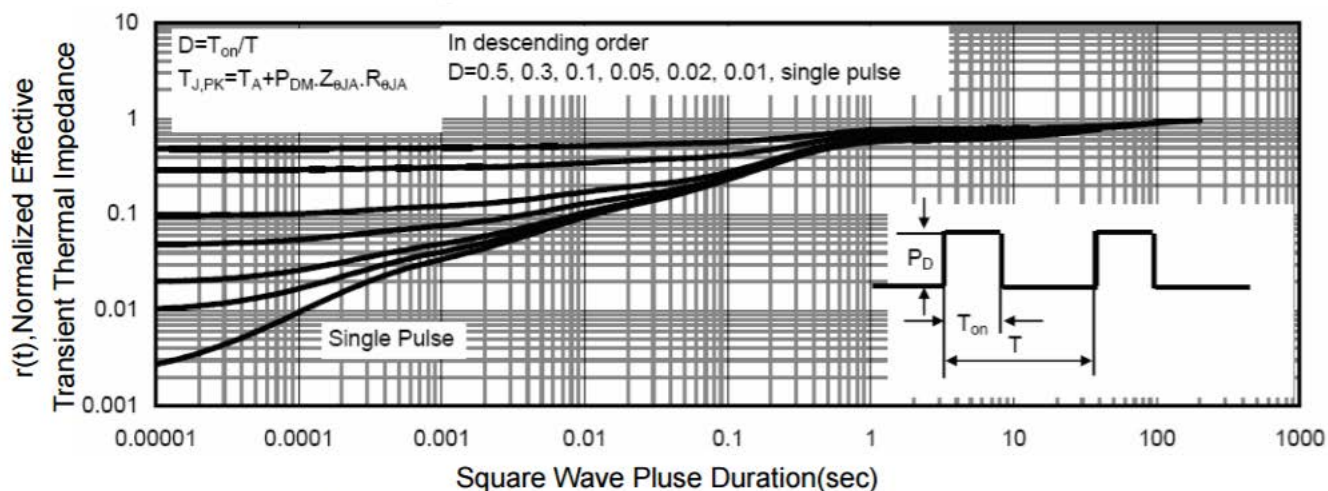
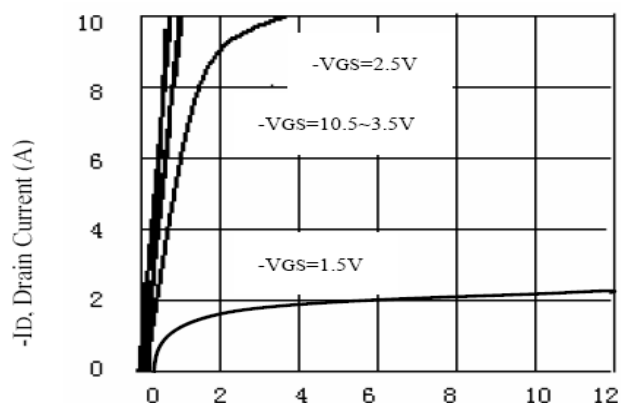


Figure 14 Normalized Maximum Transient Thermal Impedance

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

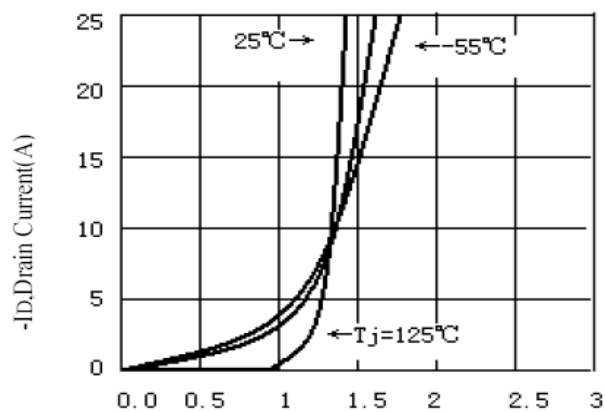
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.3		-2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-2.8A$	-		65	m Ω
		$V_{GS}=-10V, I_D=-2.8A$	-		45	
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	$V_{DS}=-10V, I_D=-6A$ $V_{GS}=-4.5V$	-	6.1	-	nC
Gate-source charge	Qgs		-	1.7	-	
Gate-drain charge	Qgd		-	1.2	-	

P-Channel: Typical Electrical And Thermal Characteristics



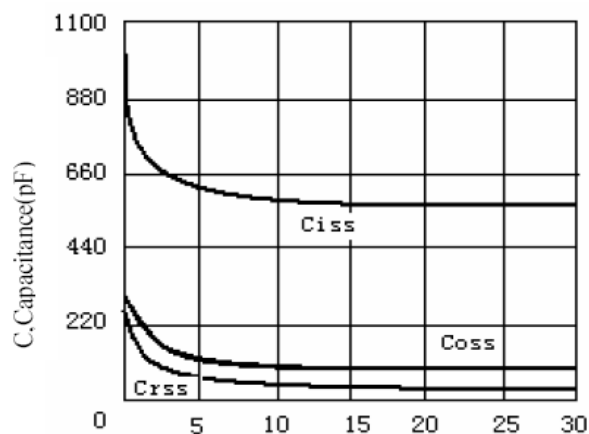
- V_{DS} , Drain-to-Source Voltage (V)

Figure 1. Output Characteristics



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

Figure 2. Transfer Characteristics



- V_{GS} , Drain-to Source Voltage

Figure3. Capacitance

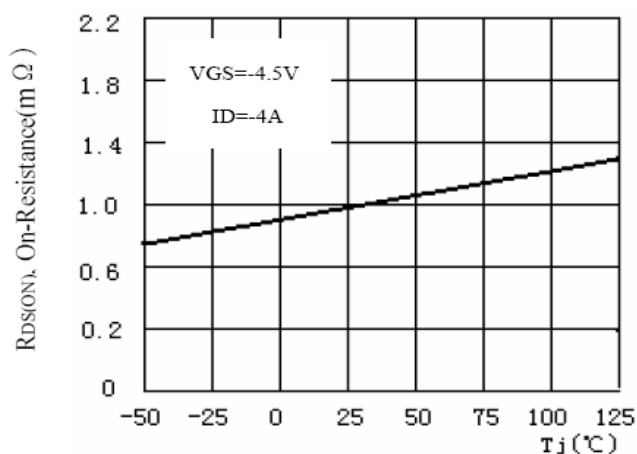


Figure4. On-Resistance Variation with Temperature

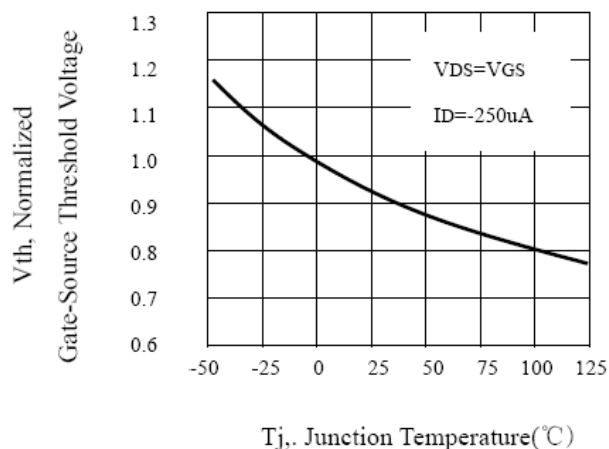


Figure5. Gate Threshold Variation With Temperature

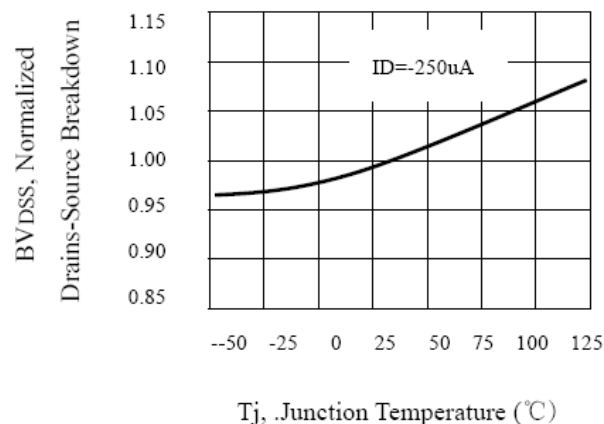


Figure6. Breakdown Voltage Variation With Temperature

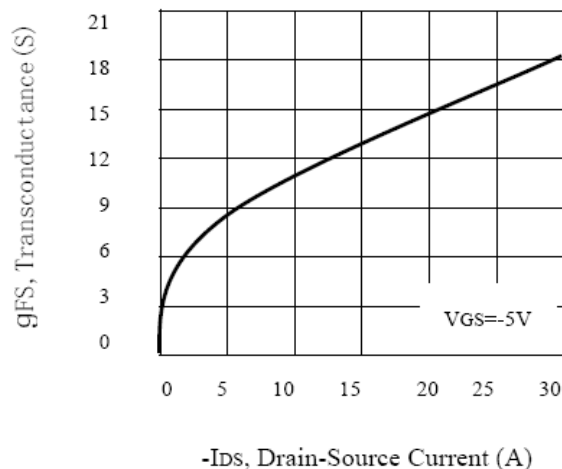


Figure7. Transconductance Variation
With Drain Current

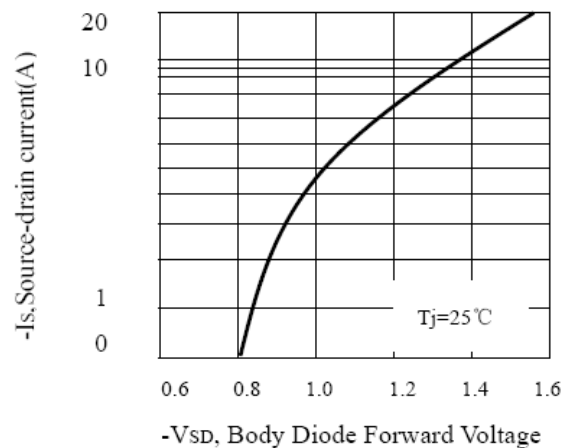


Figure8. Body Diode Forward Voltage
Variation with Source Current

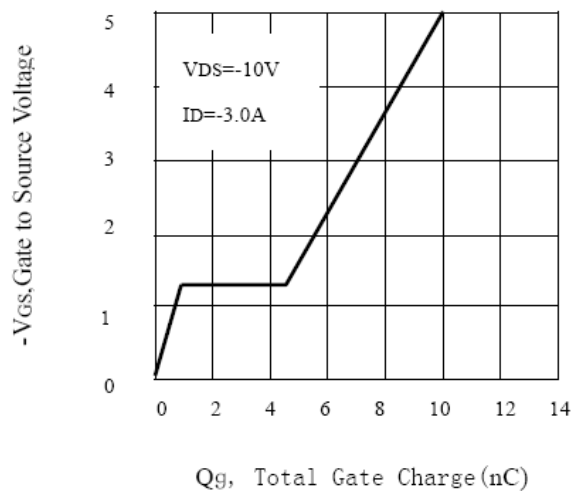


Figure9. Gate Charge

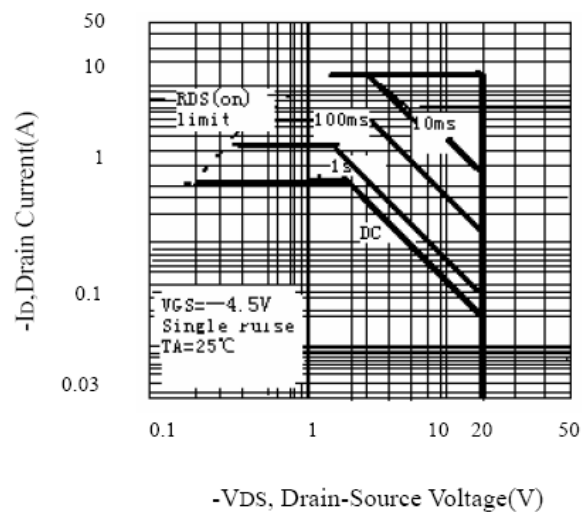
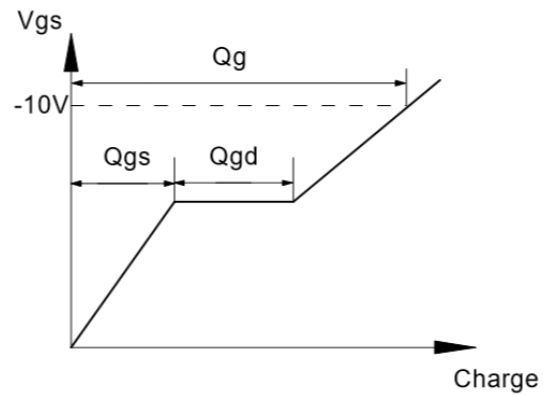
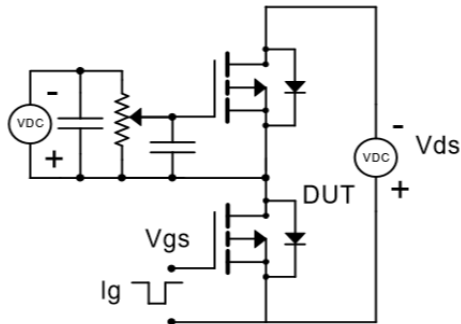
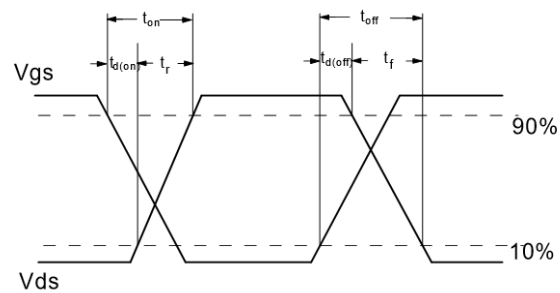
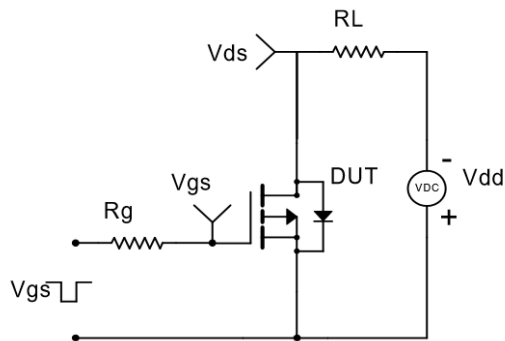


Figure10. Maximum Safe Operating Area

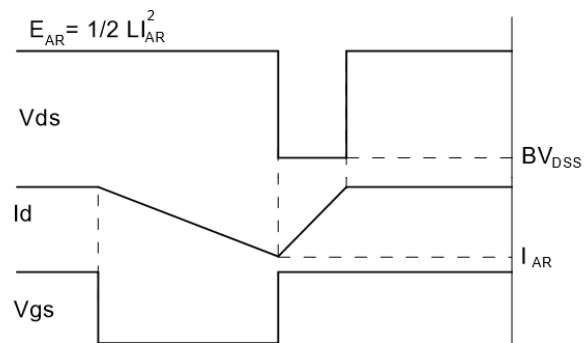
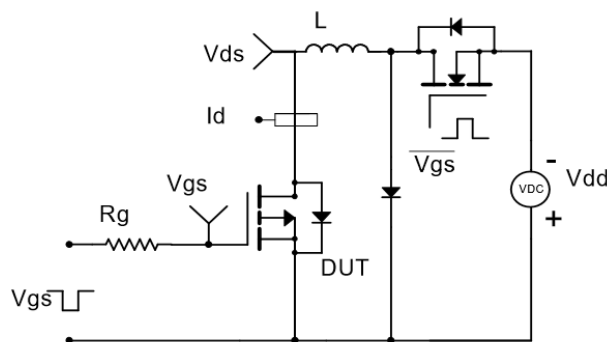
Gate Charge Test Circuit & Waveform



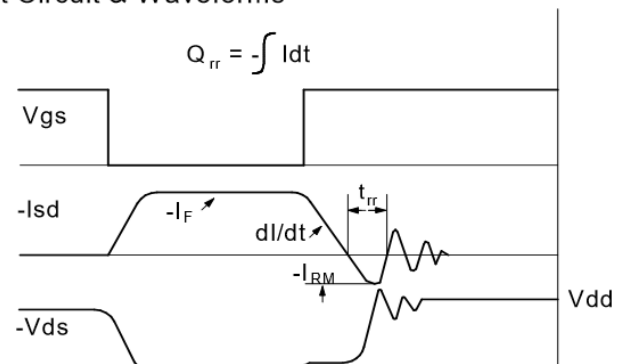
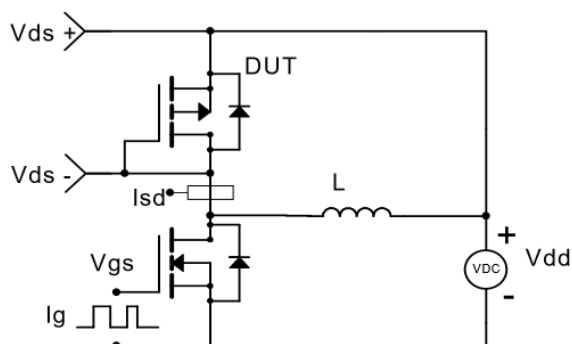
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

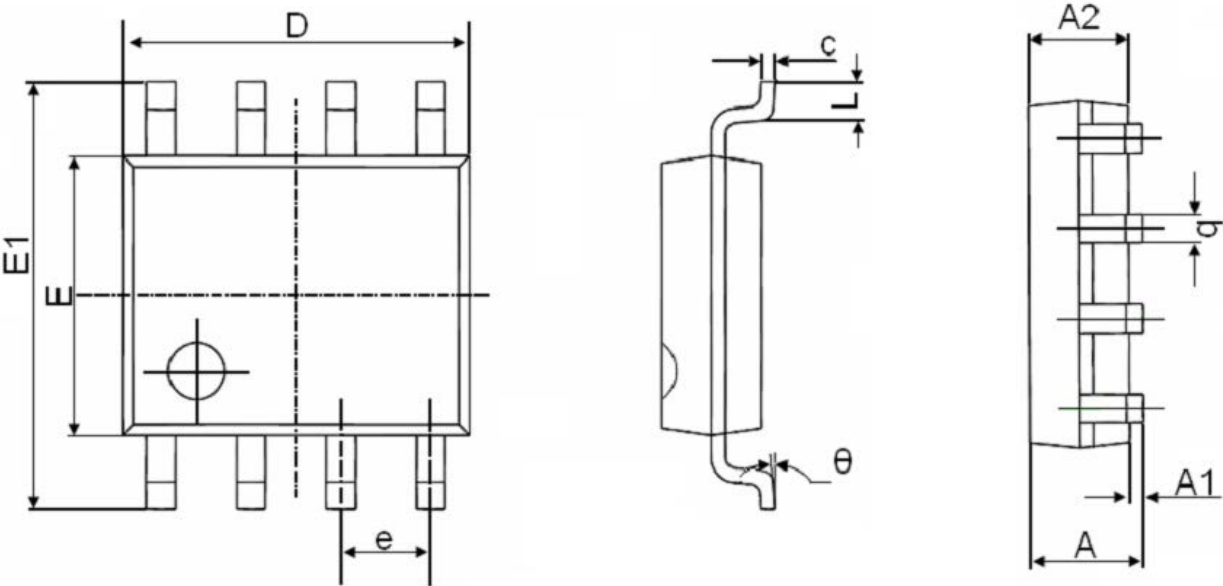


Diode Recovery Test Circuit & Waveforms



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°