40V Full-Bridge of MOSFET

Description

The HM4924B 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
  $R_{DS(ON)}$=22mΩ (typical) @ V_{GS}=4.5V
  $R_{DS(ON)}$=17mΩ (typical) @ V_{GS}=10V
  P-Channel:
  V_{DS} =-40V,ID =-6A
  $R_{DS(ON)}$=65mΩ (typical) @ V_{GS}=-4.5V
  $R_{DS(ON)}$=45mΩ (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

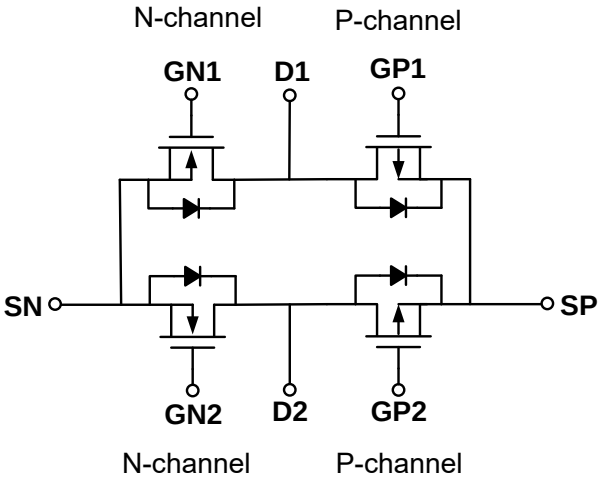
Application

- Complementary MOSFET for DC FAN, Motor
- Wireless Charging

Package

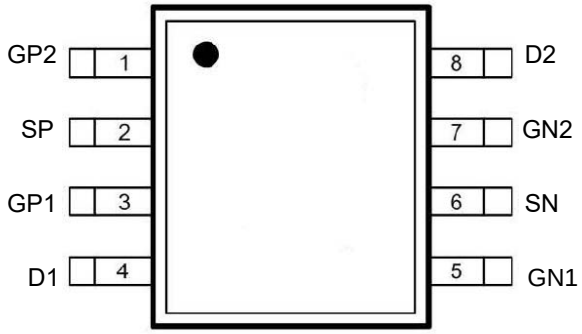
- SOP-8

Schematic diagram



Marking and pin assignment

SOP-8
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HM4924BSR	-55°C to +150°C	SOP-8	3000
HM4924SF	-55°C to +150°C	SOP-8	4000

Absolute Maximum Ratings (TA=25℃ 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	℃
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		℃

N-Channel Electrical Characteristics (T_J=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	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}=±12V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	1.0		2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=10A	-		22	mΩ
		V_{GS}=10V, I_D=2.8A	-		17	
Forward transconductance	gfs	V_{GS}=5V, I_D=10A	-	5	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	V_{DS}=10V ,V_{GS}=0V f=1.0MHz	-	240	-	pF
Output capacitance	C_{OSS}		-	45	-	
Reverse transfer capacitance	C_{RSS}		-	23	-	
Gate resistance	Rg	V_{GS}=0V, V_{DS}=0V, f=1.0MHz	-	3.3	4.9	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	V_{DD}=10V R_L=3.3 ohm V_{GEN}=4.5V R_{GEN}=6ohm	-	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=10A 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	℃/W

N-Channel: Typical Electrical And Thermal Characteristics

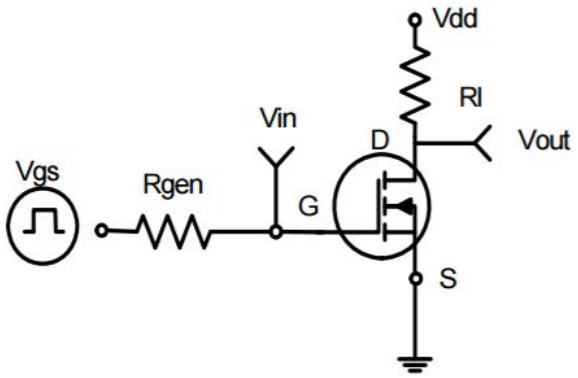


Figure 1:Switching Test Circuit

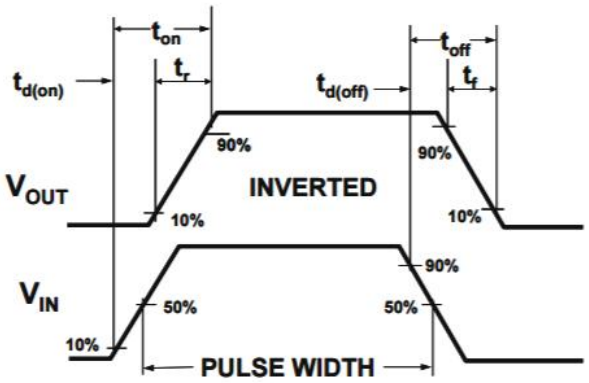


Figure 2:Switching Waveforms

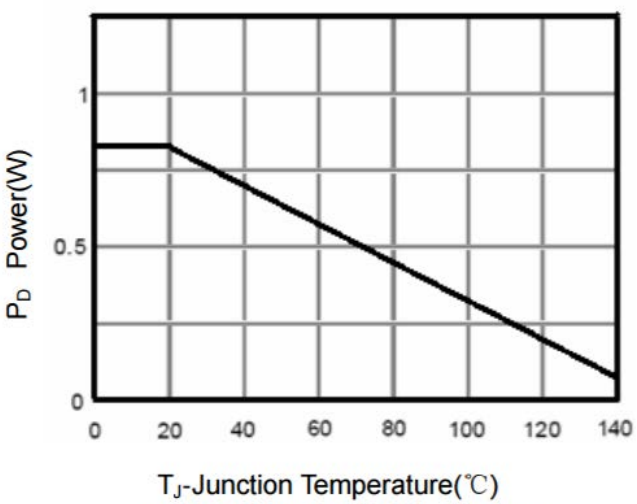


Figure 3 Power Dissipation

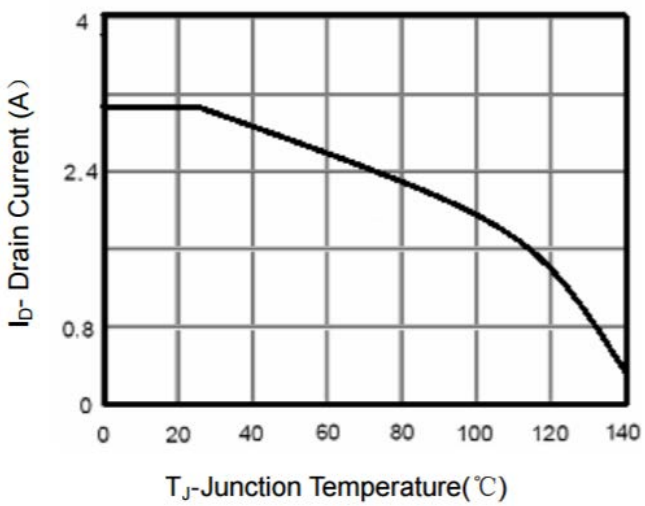


Figure 4 Drain Current

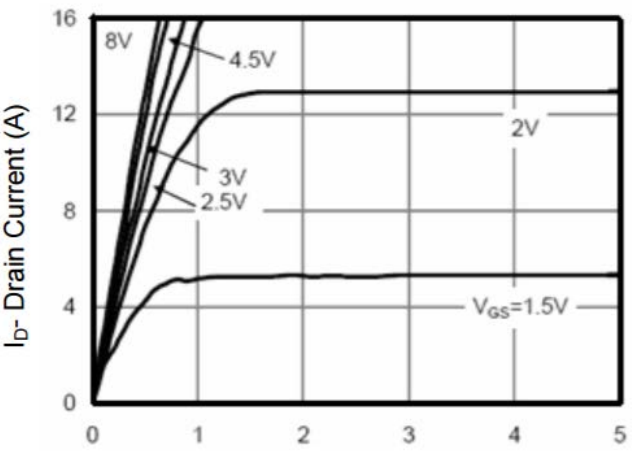


Figure 5 Output Characteristics

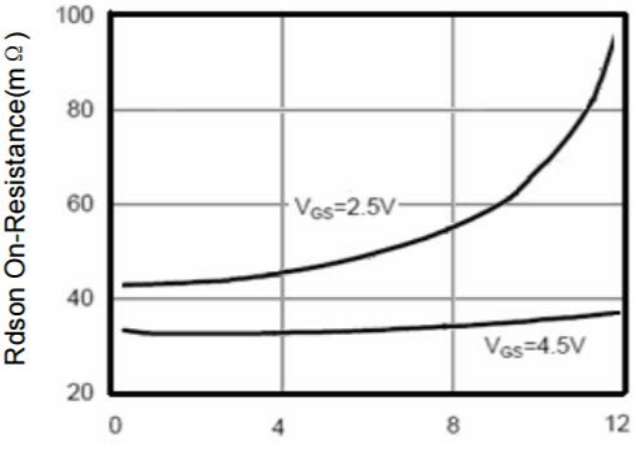


Figure 6 Drain-Source On-Resistance

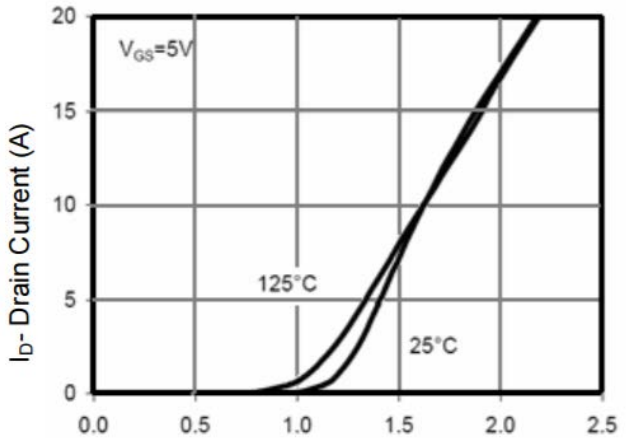


Figure 7 Transfer Characteristics

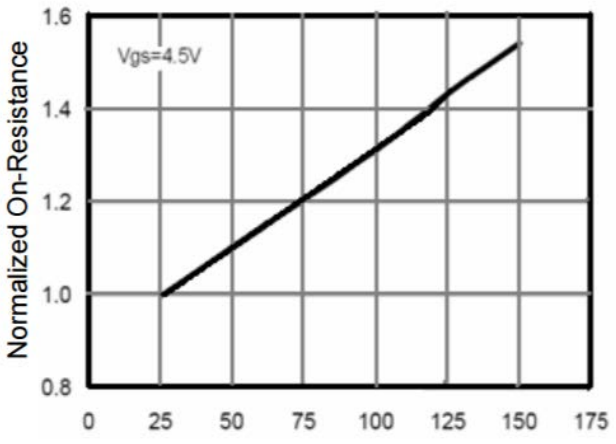


Figure 8 Drain-Source On-Resistance

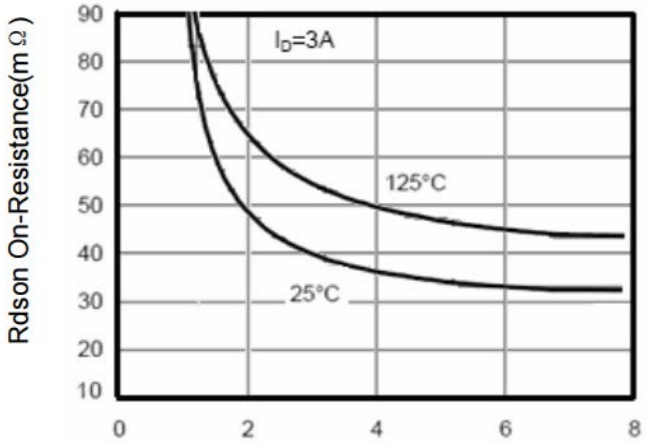


Figure 9 Rdson vs Vgs

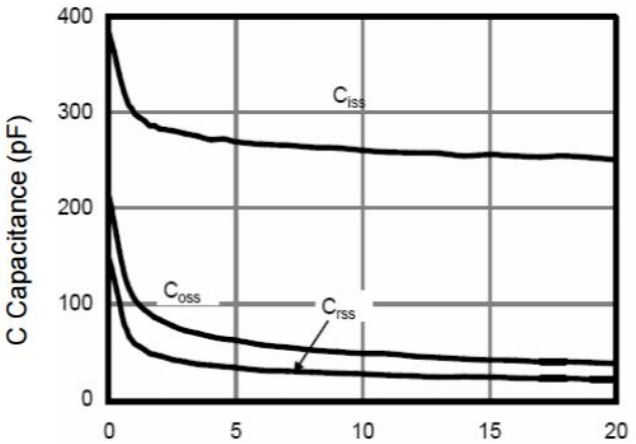


Figure 10 Capacitance vs Vds

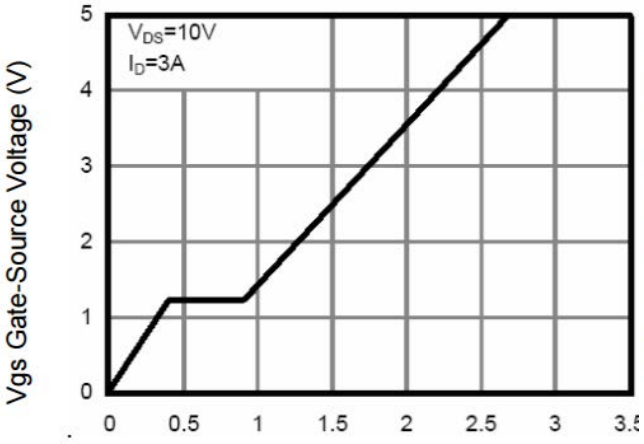


Figure 11 Gate Charge

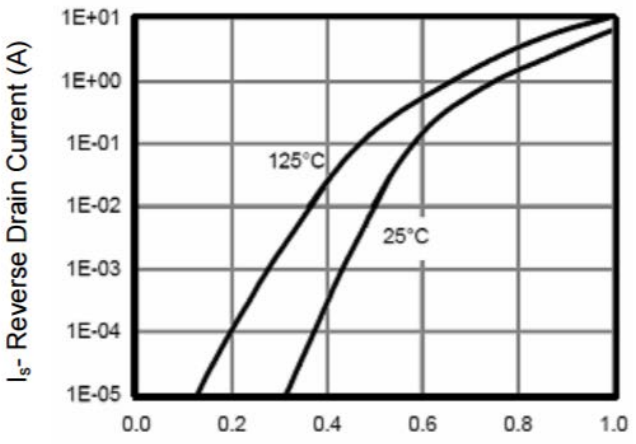


Figure 12 Source- Drain Diode Forward

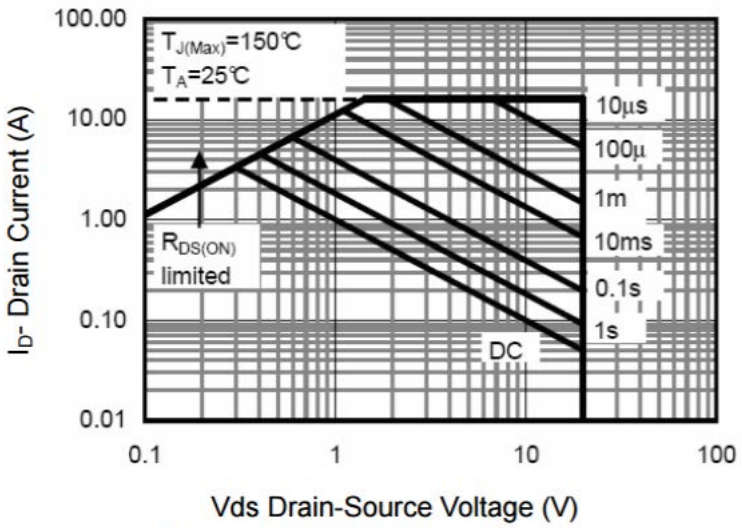


Figure 13 Safe Operation Area

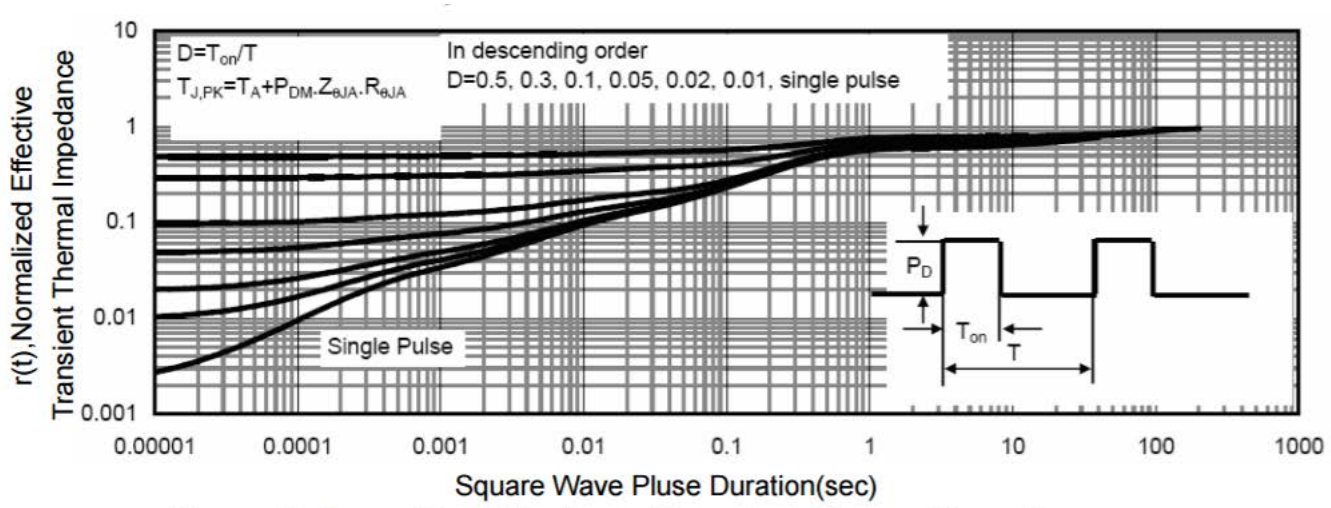
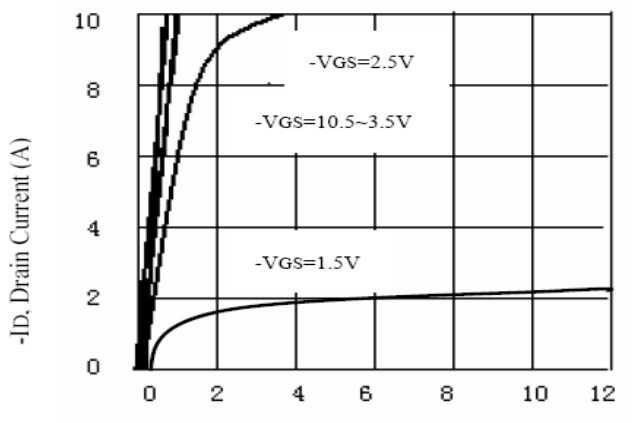


Figure 14 Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

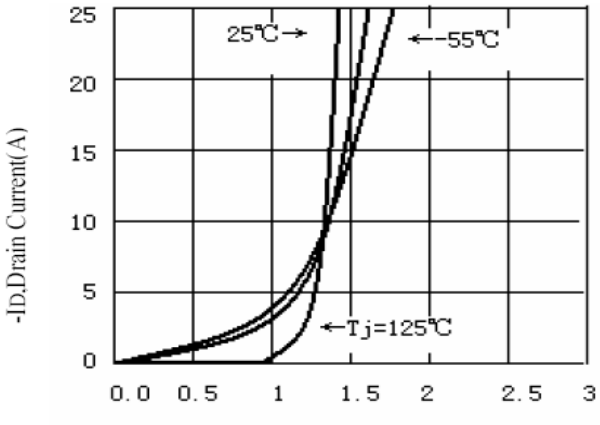
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=-250μA	-40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=-40V, V_{GS}=0V	-	-	-1	μA
Gate-body leakage	I_{GSS}	V_{DS}=0V, V_{GS}=±12V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.3		-2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=-4.5V, I_D=-2.8A	-		65	mΩ
		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	tr		-	6.6	-	
Turn-off delay time	$t_{D(OFF)}$		-	113	-	
Fall time	tf		-	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



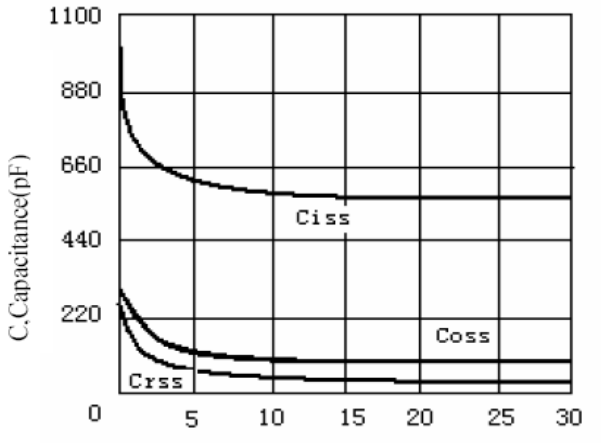
- VDS, Drain-to-Source Voltage (V)

Figure 1. Output Characteristics



-VGS, Gate-to-source Voltage (V)

Figure 2. Transfer Characteristics



- VGS, Drain-to Source Voltage

Figure3. Capacitance

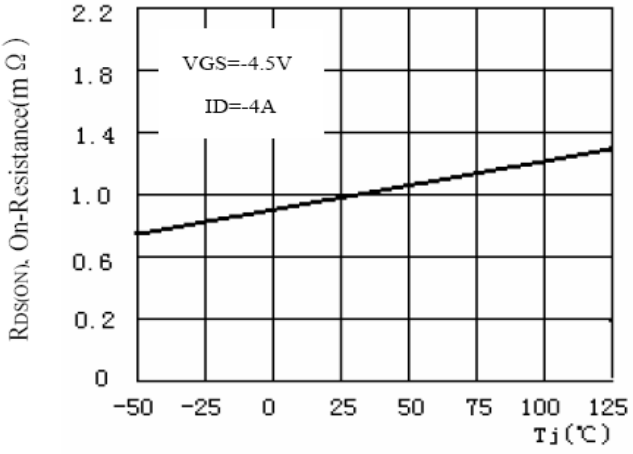
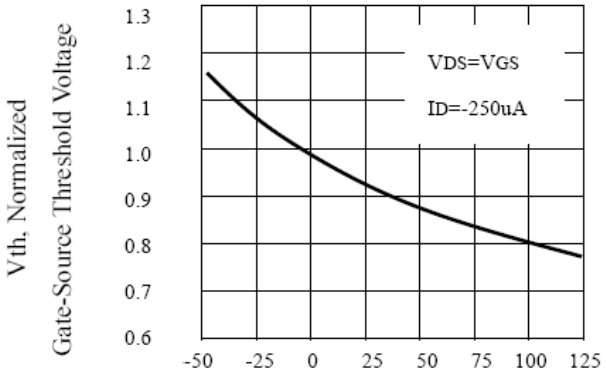
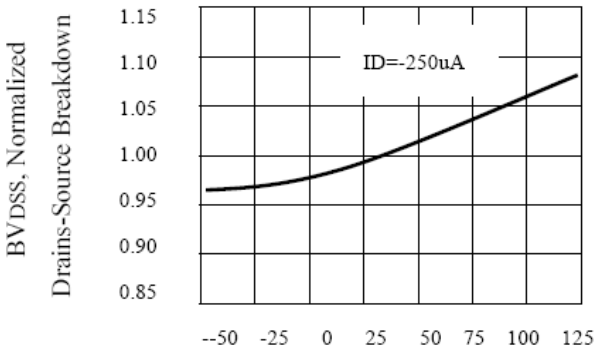


Figure4. On-Resistance Variation with Temperature



Tj,. Junction Temperature(℃)

Figure5.Gate Threshold Variation With Temperature



Tj, .Junction Temperature (℃)

Figure6.Breakdown Voltage Variation With Temperature

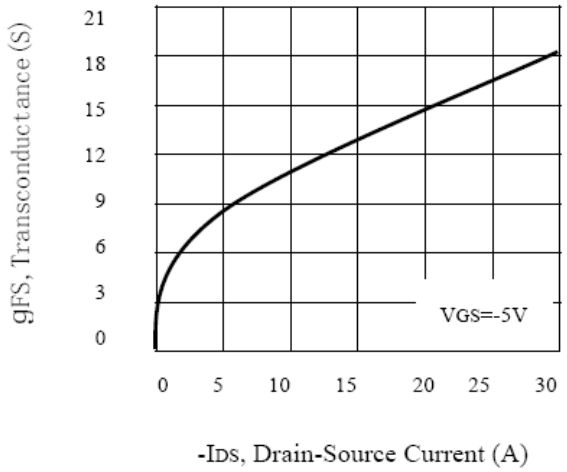


Figure7.Transconductance Variation With Drain Current

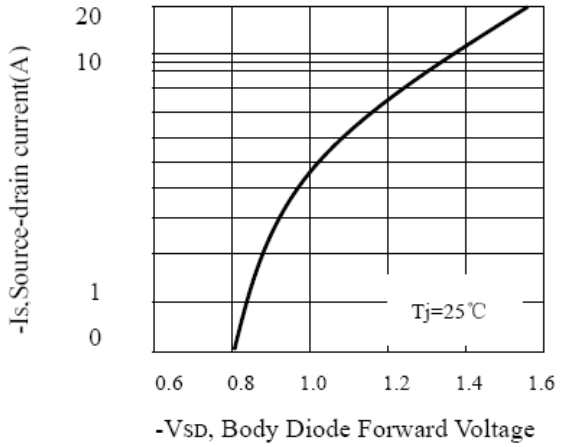


Figure8.Body Diode Forward Voltage Variation with Source Current

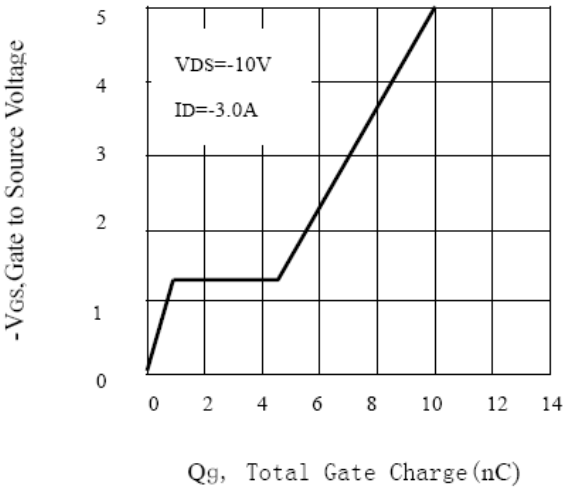


Figure9. Gate Charge

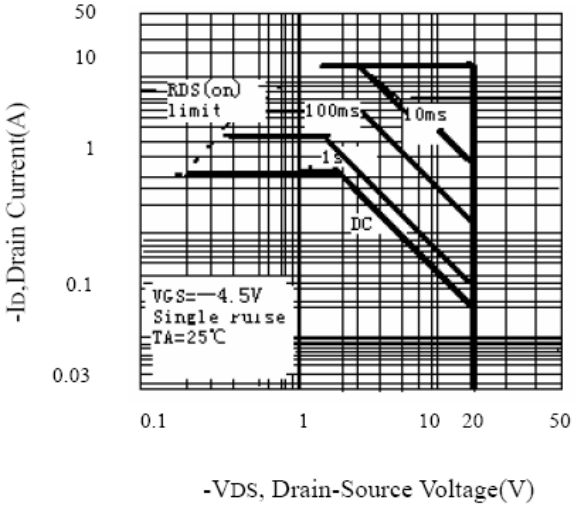
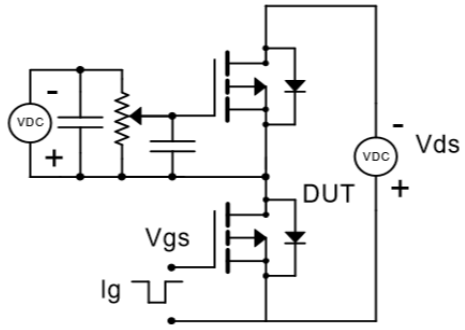
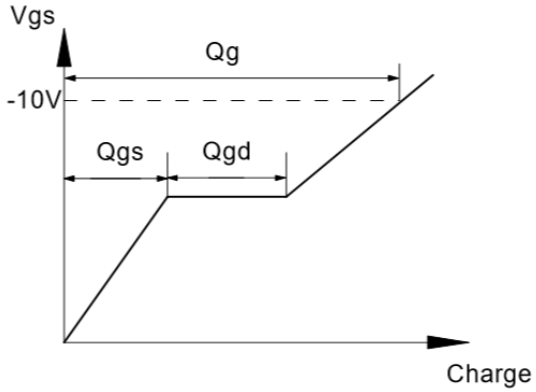


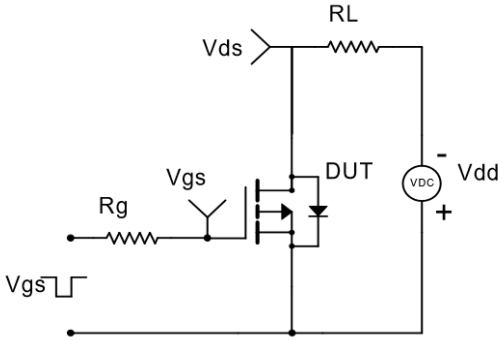
Figure10.Maximum Safe Operating Area

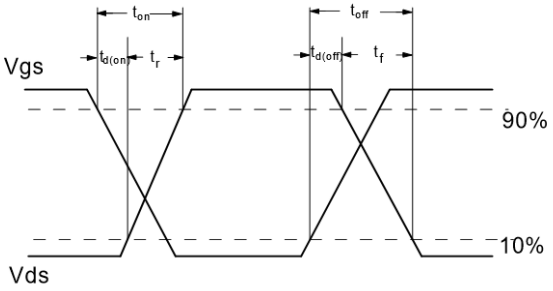
Gate Charge Test Circuit & Waveform



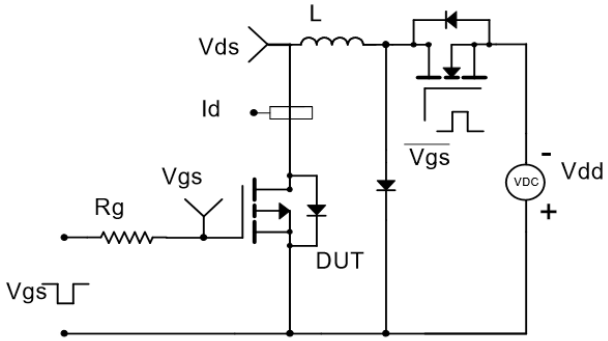


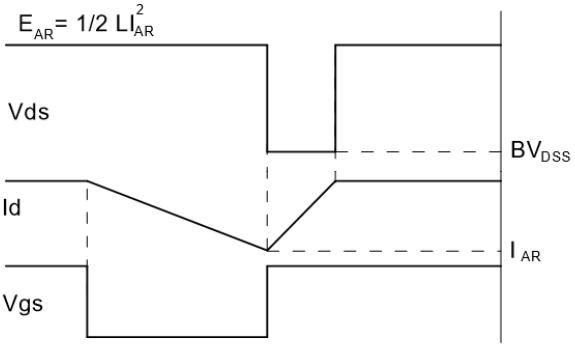
Resistive Switching Test Circuit & Waveforms



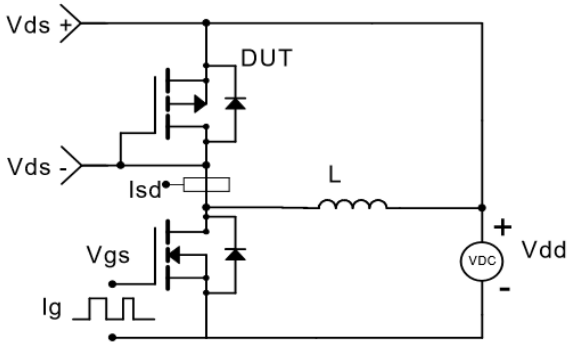


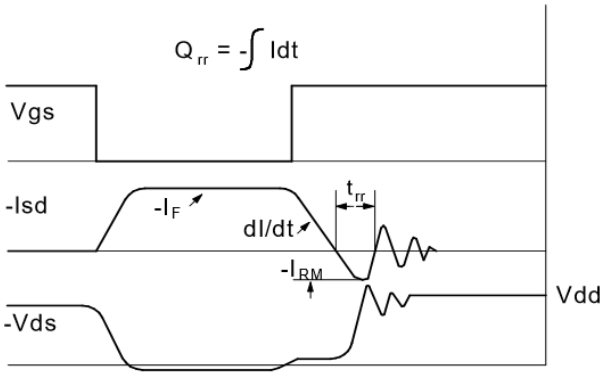
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





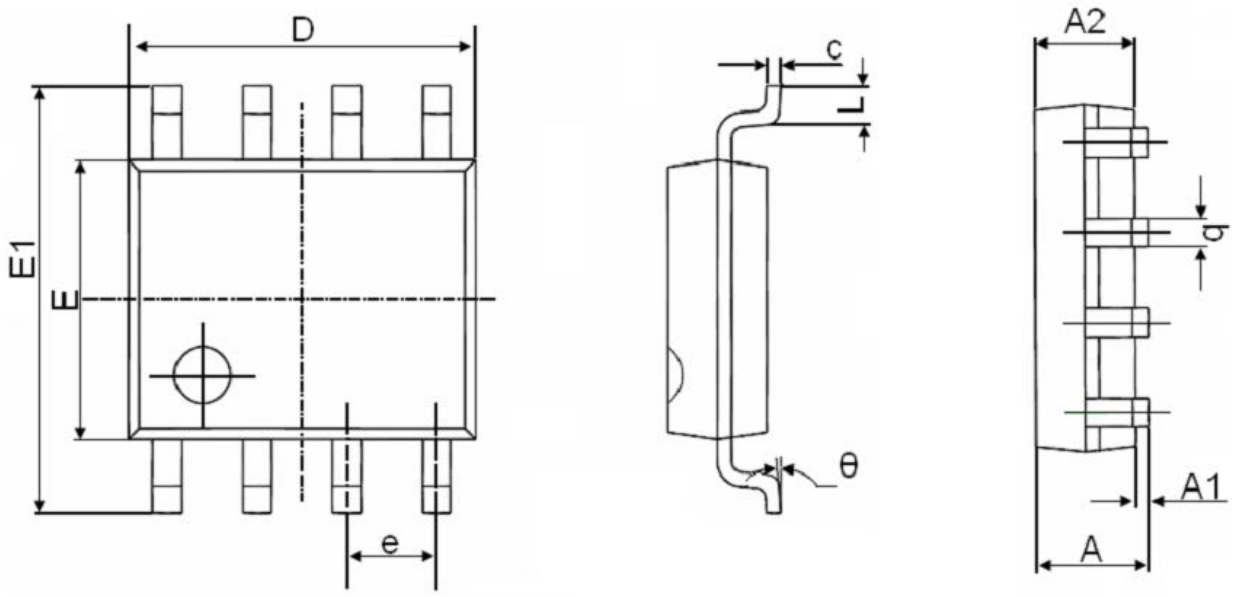
Diode Recovery Test Circuit & Waveforms





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°