

HM4920 Full-Bridge of MOSFET

Description

The HM4920 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:**
 $V_{DS} = 100V, I_D = 4A$
 $R_{DS(ON)} = 160m\Omega$ (typical) @ $V_{GS} = 4.5V$
 $R_{DS(ON)} = 150m\Omega$ (typical) @ $V_{GS} = 10V$
- ◆ **P-Channel:**
 $V_{DS} = -100V, I_D = -3A$
 $R_{DS(ON)} = 330m\Omega$ (typical) @ $V_{GS} = -4.5V$
 $R_{DS(ON)} = 300m\Omega$ (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

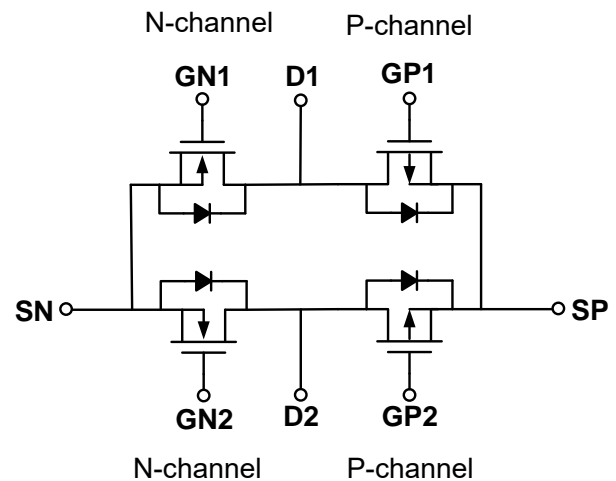
Application

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

Package

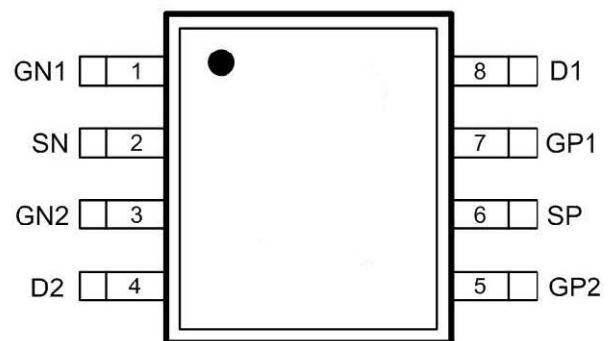
- ◆ SOP-8

Schematic diagram



Marking and pin assignment

SOP-8 (TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HM4920SR	-55°C to +150°C	SOP-8	3000
HM4920SF	-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}	100	-100	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)	$T_A=25^{\circ}\text{C}$	I_D	4	A
	$T_A=75^{\circ}\text{C}$		2.8	
Pulsed Drain Current (Package Limited)	I_{DM}	12	-12	A
Power Dissipation ^B	$T_A=25^{\circ}\text{C}$	P_D	2	W
	$T_A=75^{\circ}\text{C}$		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}	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	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	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=4A$	-		160	m Ω
		$V_{GS}=10V, I_D=2.8A$	-		150	
Forward transconductance	g_{fs}	$V_{GS}=5V, I_D=4A$	-	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	$V_{DS}=10V$ $I_D=4A$ $V_{GS}=4.5V$	-	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
--	-------------	-----	------

N-Channel: Typical Electrical And Thermal Characteristics

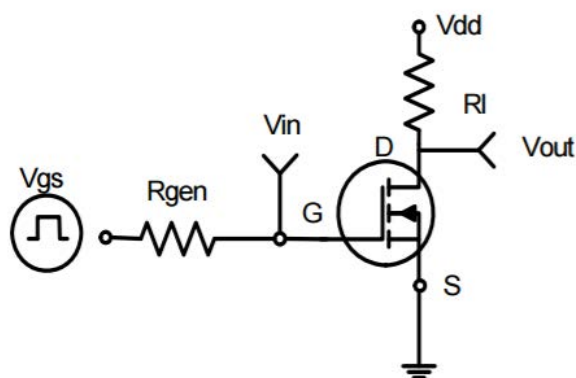


Figure 1: Switching Test Circuit

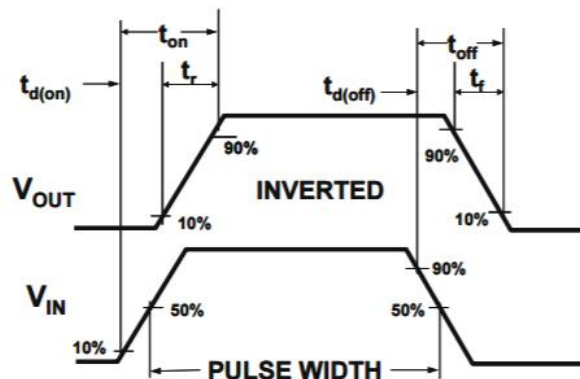
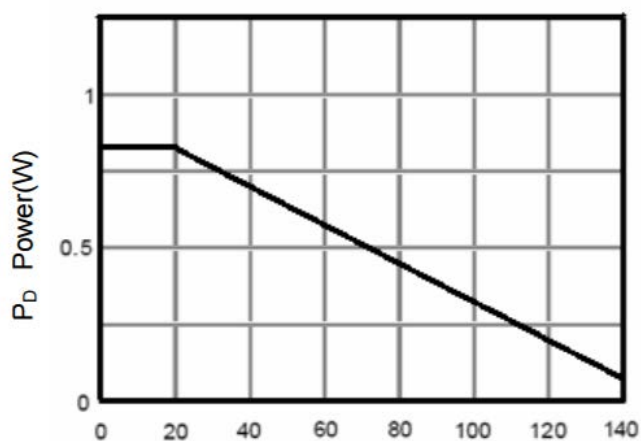
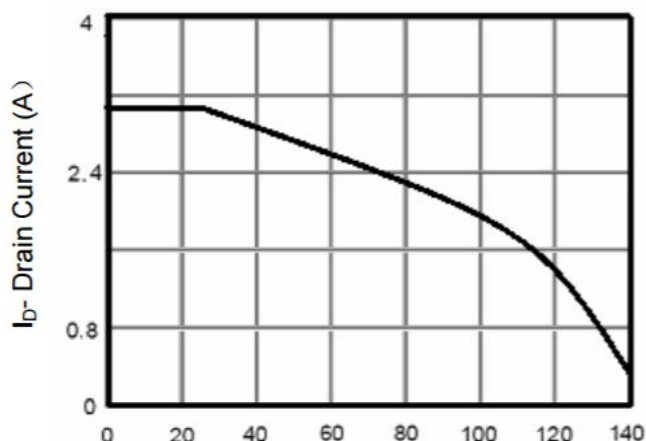


Figure 2: Switching Waveforms



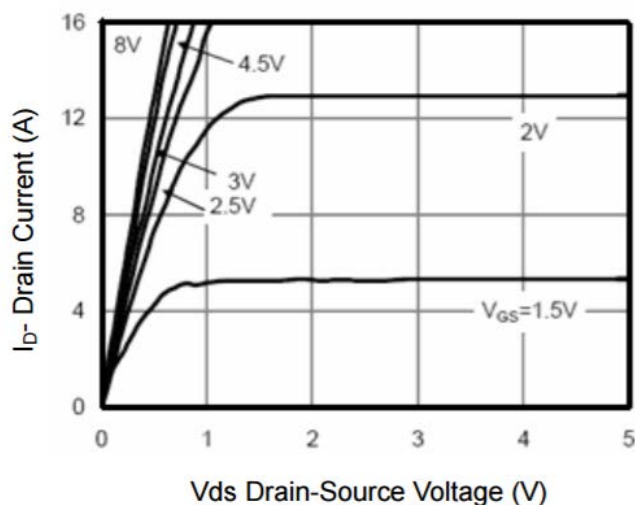
T_J-Junction Temperature(°C)

Figure 3 Power Dissipation



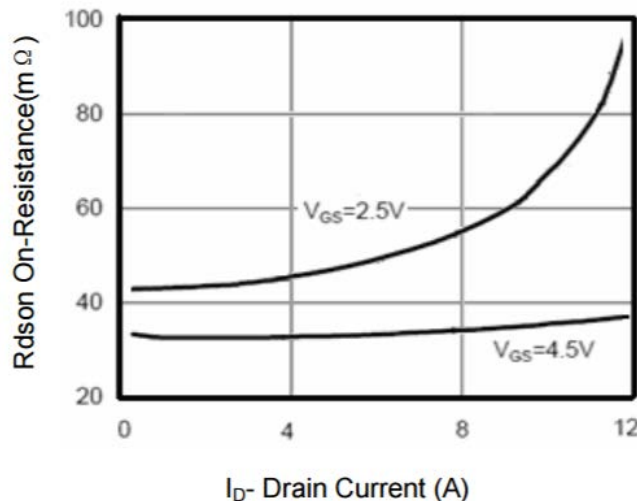
T_J-Junction Temperature(°C)

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

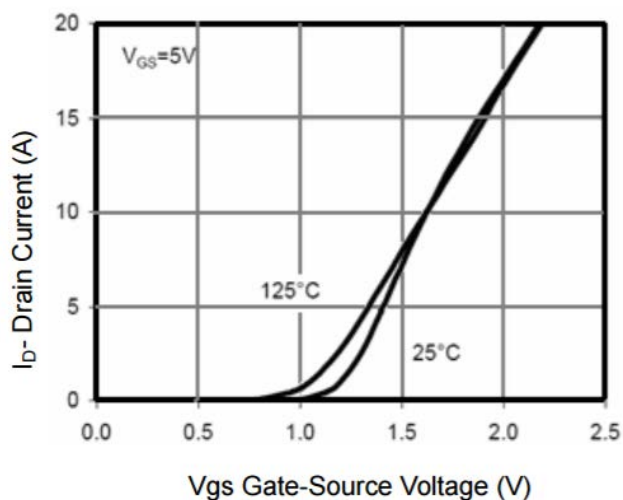


Figure 7 Transfer Characteristics

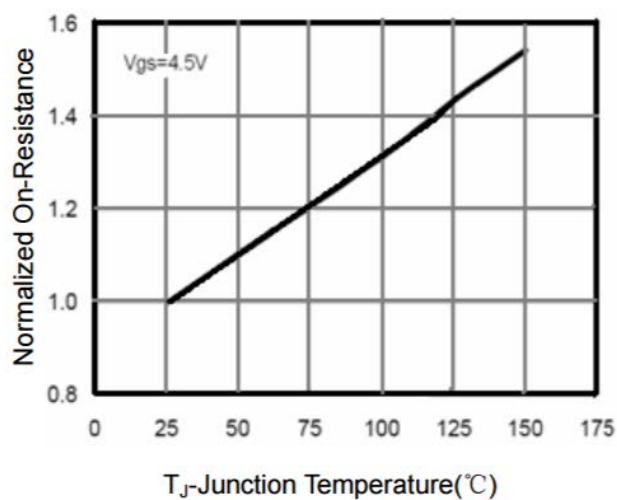


Figure 8 Drain-Source On-Resistance

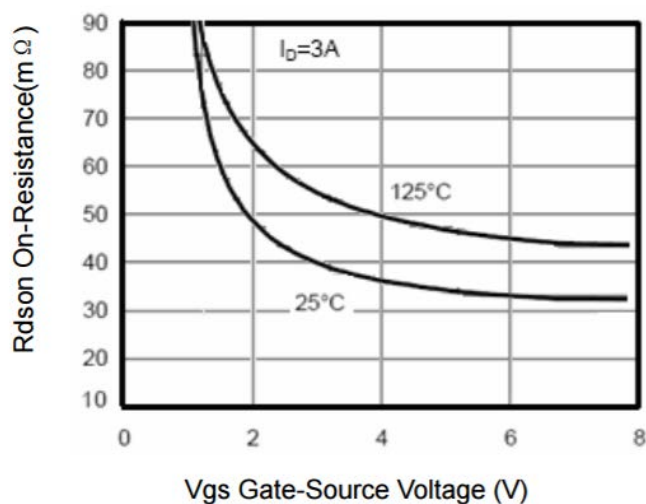


Figure 9 Rdson vs Vgs

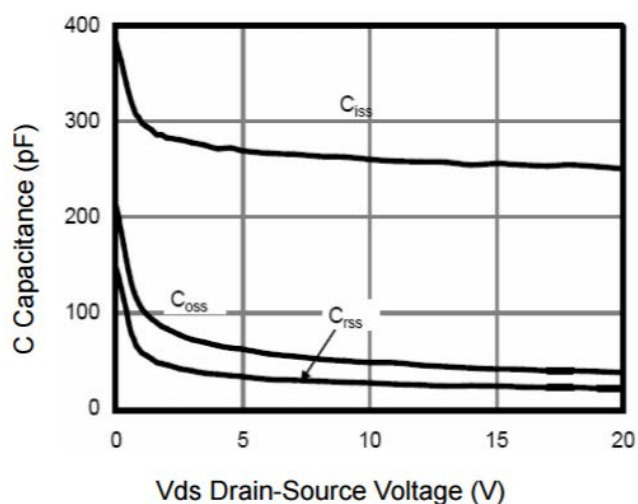


Figure 10 Capacitance vs Vds

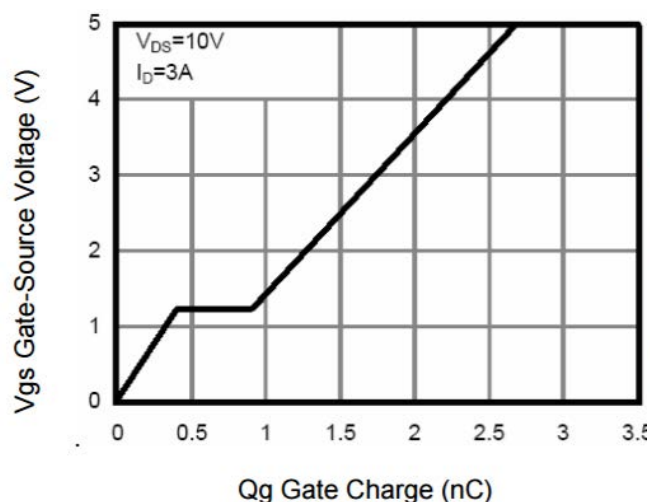


Figure 11 Gate Charge

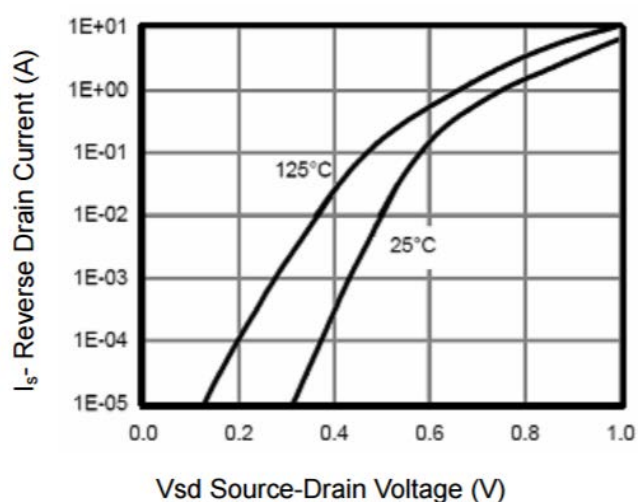


Figure 12 Source- Drain Diode Forward

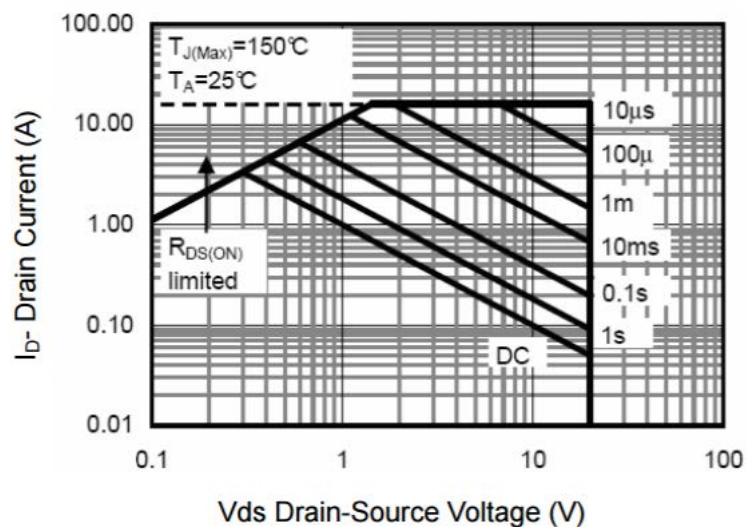


Figure 13 Safe Operation Area

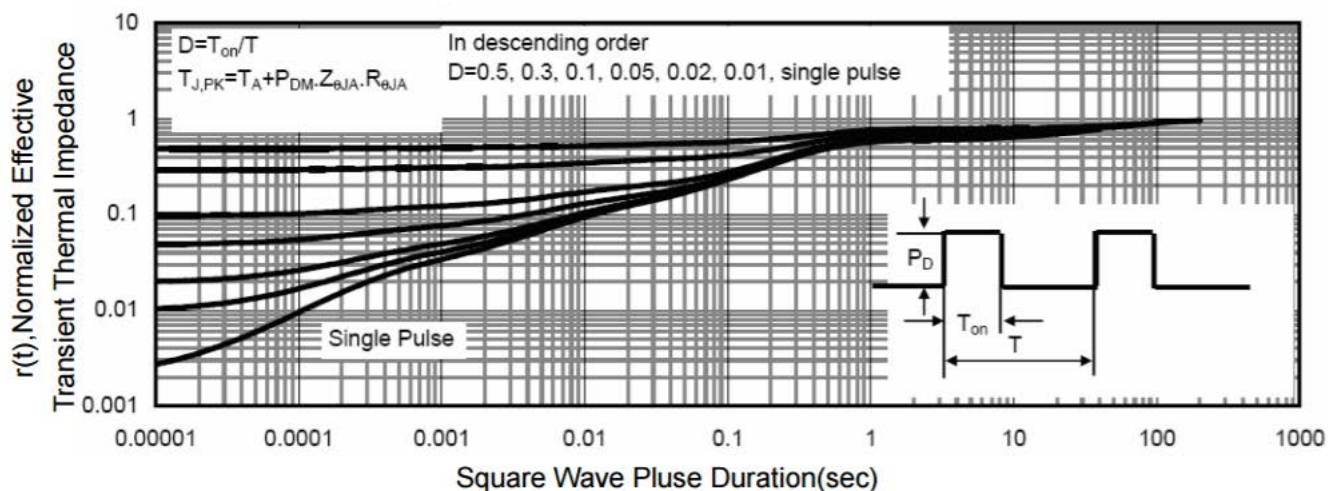
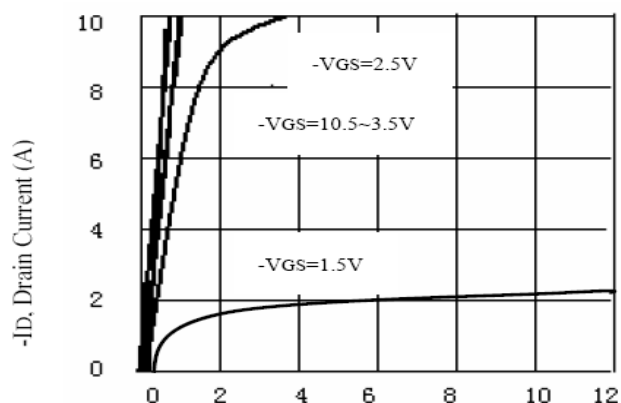


Figure 14 Normalized Maximum Transient Thermal Impedance

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

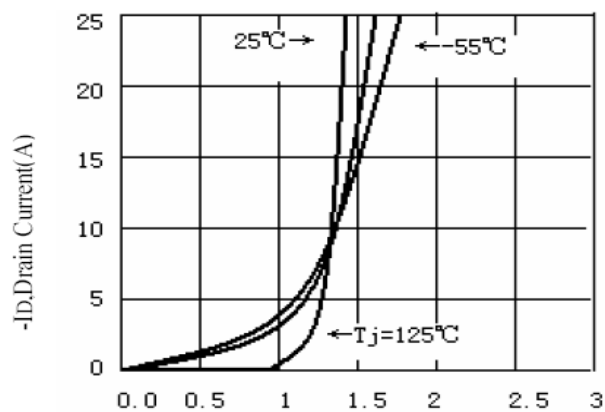
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-100	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-100V, V _{GS} =0V	-	-	-1	μA
Gate-body leakage	I _{GSS}	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.2		-2.5	V
Drain-source on-state resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.8A	-		330	mΩ
		V _{GS} =-10V, I _D =-2.8A	-		300	
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 =-3A 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



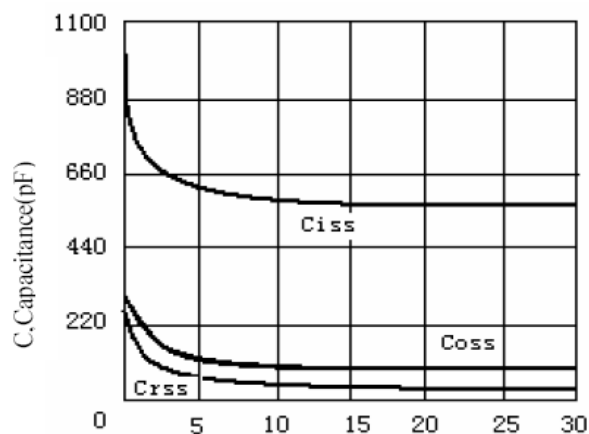
- V_{DS} , Drain-to-Source Voltage (V)

Figure 1. Output Characteristics



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

Figure 2. Transfer Characteristics



- V_{GS} , Drain-to Source Voltage

Figure3. Capacitance

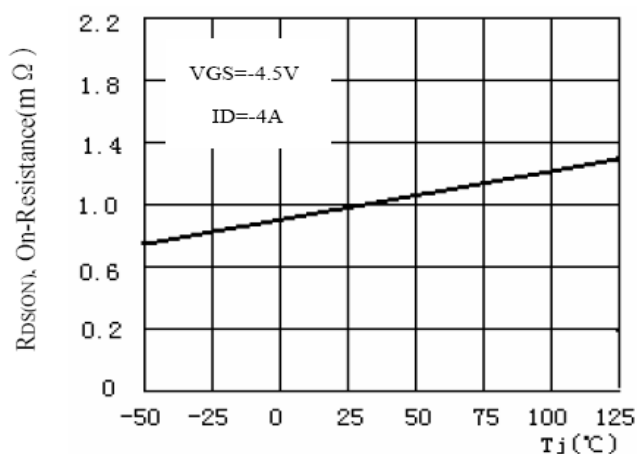


Figure4. On-Resistance Variation with Temperature

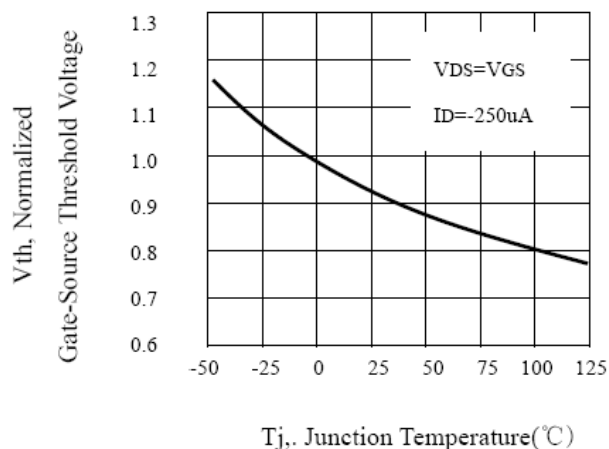


Figure5. Gate Threshold Variation With Temperature

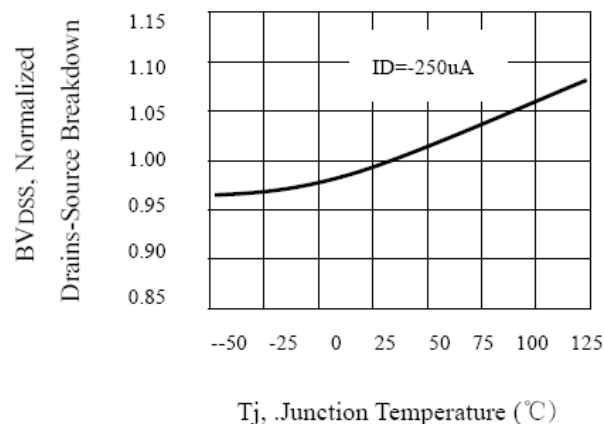
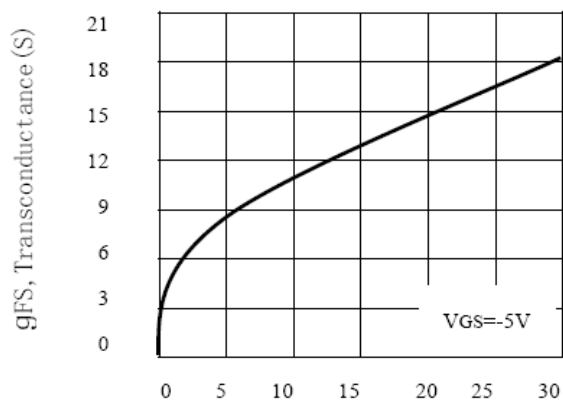
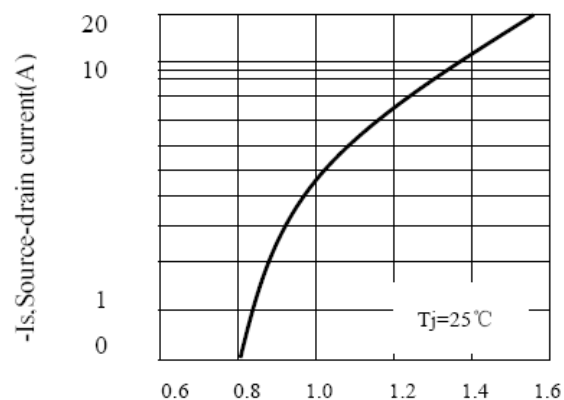


Figure6. Breakdown Voltage Variation With Temperature



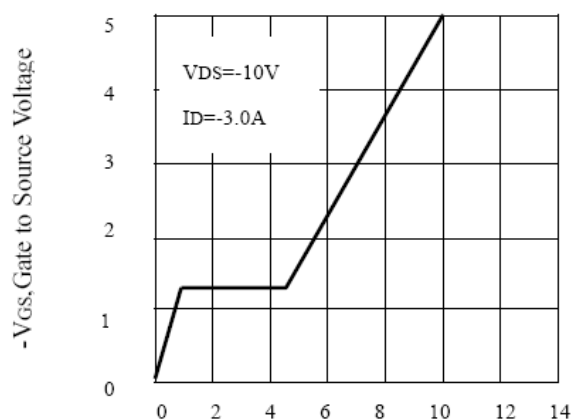
-IDS, Drain-Source Current (A)

Figure7. Transconductance Variation
With Drain Current



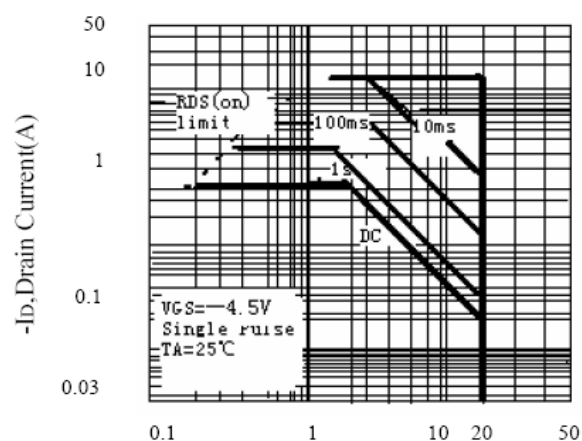
-VSD, Body Diode Forward Voltage

Figure8. Body Diode Forward Voltage
Variation with Source Current



Qg, Total Gate Charge (nC)

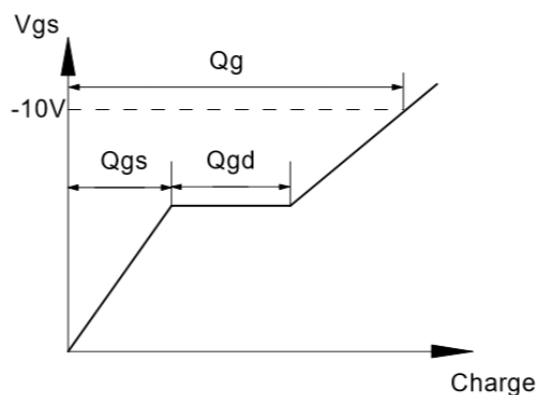
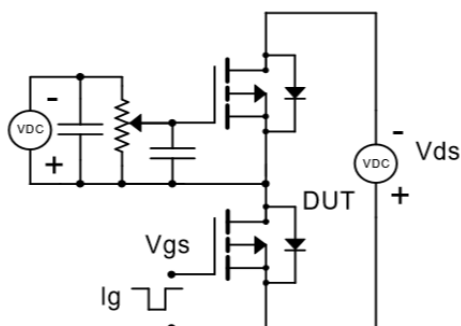
Figure9. Gate Charge



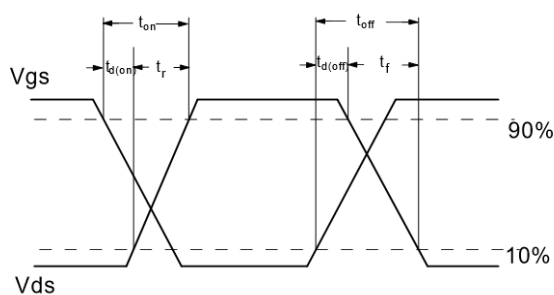
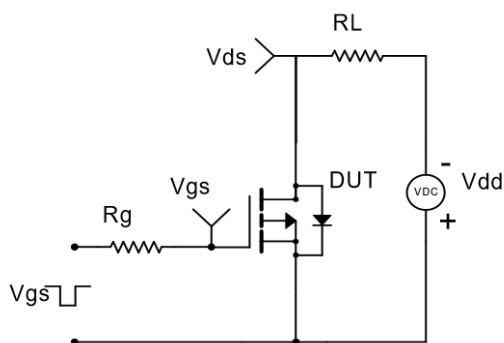
-VDS, Drain-Source Voltage(V)

Figure10. Maximum Safe Operating Area

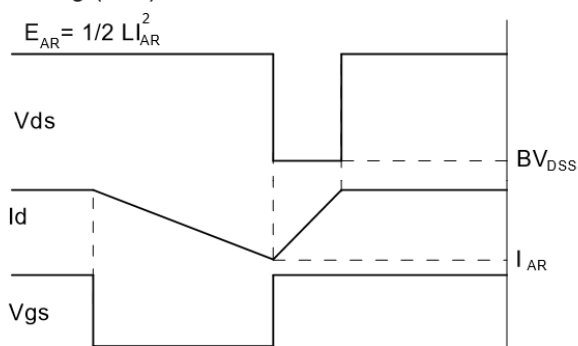
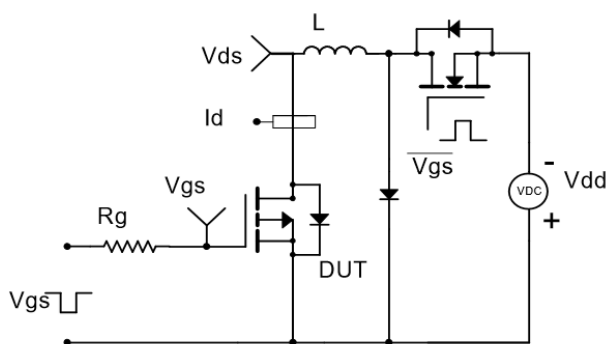
Gate Charge Test Circuit & Waveform



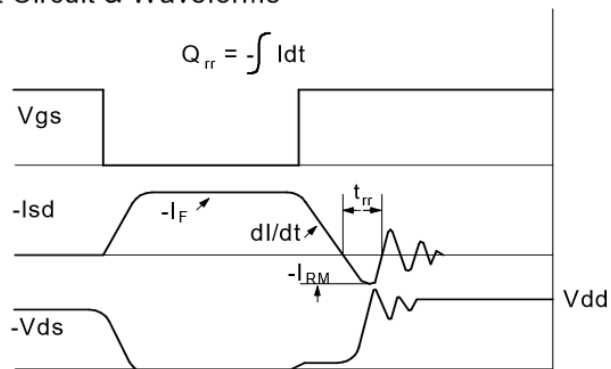
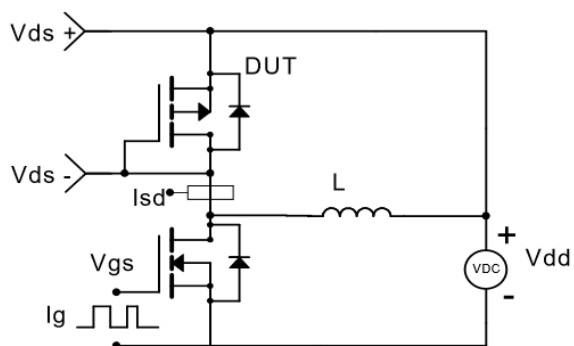
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

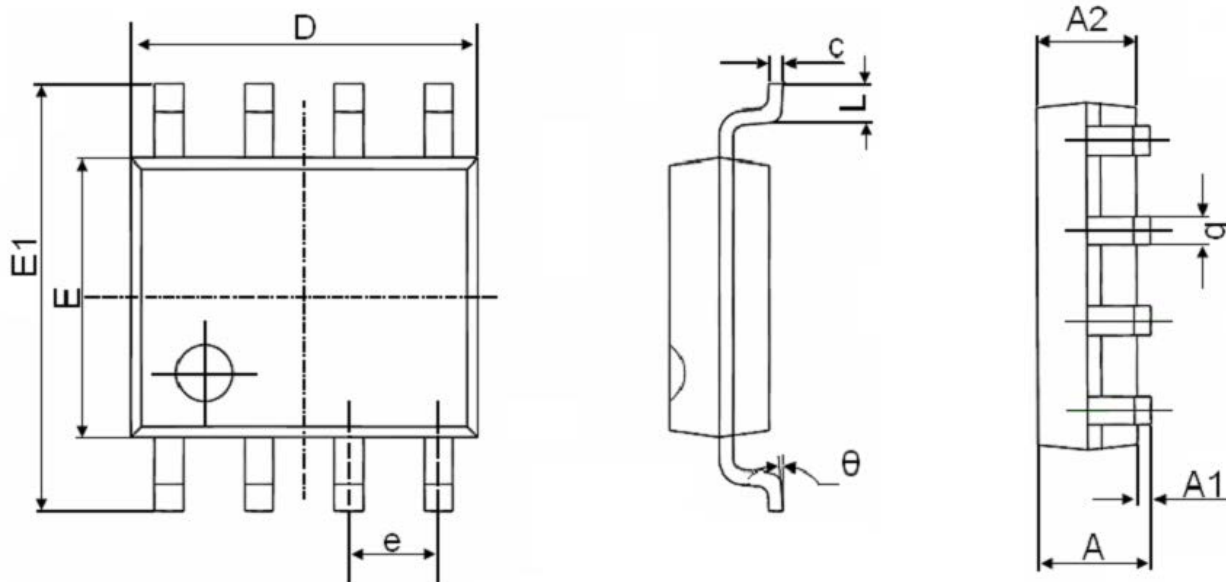


Diode Recovery Test Circuit & Waveforms



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°