

## 40V Full-Bridge of MOSFET

### Description

Vj g"J O 6; 46" wugu'cf xcpegf "tgpej "vgej pqmqi { "vq" r tqxkf g"gzegngpv" T<sub>FUQP+</sub> "cpf "mqy "i cvg"ej cti g"0Vj g" eqo r rgo gpvct { " O QUHGVi" o c { " dg" wugf " vq" hqto " c" J /Dtkf i g. "cpf "hqt "c" j quv'qh'qyj gt "cr r rdecvkpu0'

### 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

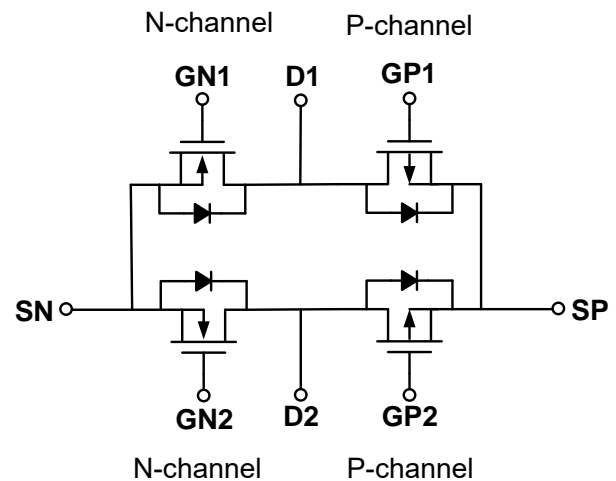
### Application

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

### Package

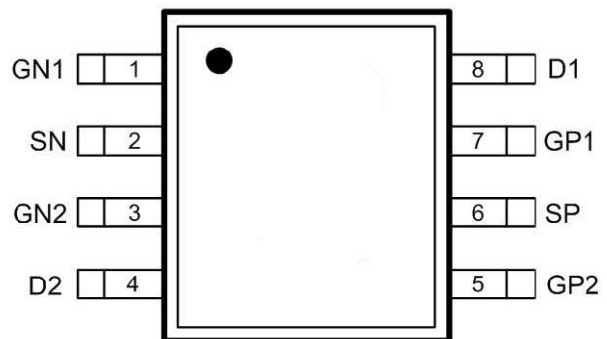
- ◆ SOP-8

### Schematic diagram



### Marking and pin assignment

#### SOP-8 (TOP VIEW)



### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
J O 6; 46UT	-55°C to +150°C	SOP-8	3000
J O 6; 46UH	-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	$V_{GS}$	$\pm 12$	$\pm 12$	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)	$T_A=25^{\circ}\text{C}$	$I_D$	10	-6	A
	$T_A=75^{\circ}\text{C}$		7	-4.2	
Pulsed Drain Current (Package Limited)	$I_{DM}$	30	-18	A	
Power Dissipation <sup>B</sup>	$T_A=25^{\circ}\text{C}$	$P_D$	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
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu\text{A}$	40	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$	-	-	1	$\mu\text{A}$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
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	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=10A$	-		22	m $\Omega$
		$V_{GS}=10V, I_D=2.8A$	-		17	
Forward transconductance	$g_{fs}$	$V_{GS}=5V, I_D=10A$	-	5	-	S
<b>Dynamic Characteristics</b>						
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	$\Omega$
<b>Switching Characteristics</b>						
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	$^{\circ}\text{C/W}$
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N-Channel: Typical Electrical And Thermal Characteristics

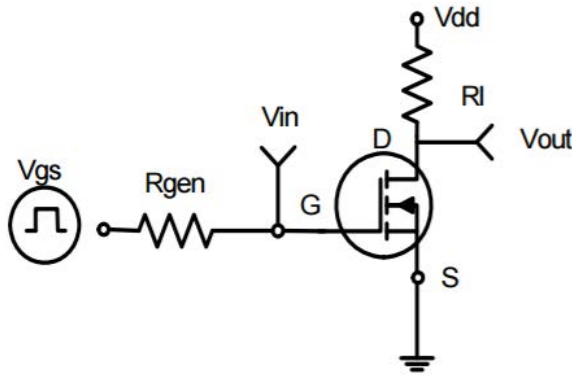


Figure 1: Switching Test Circuit

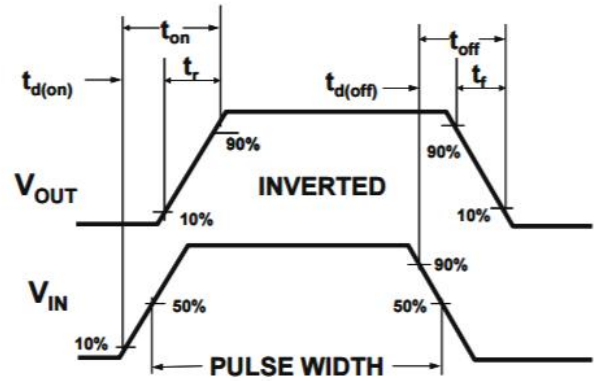


Figure 2: Switching Waveforms

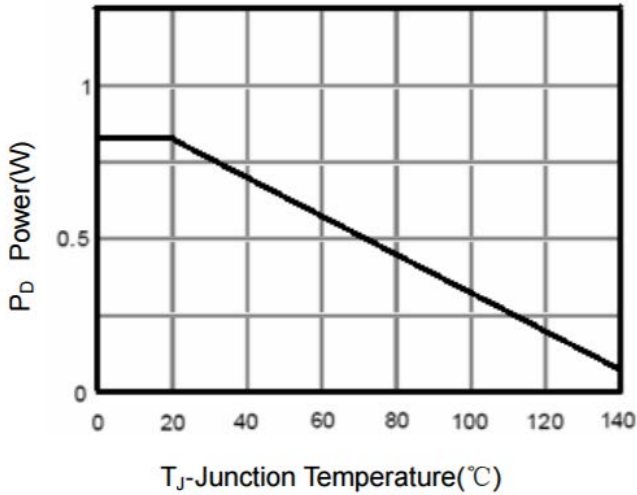


Figure 3 Power Dissipation

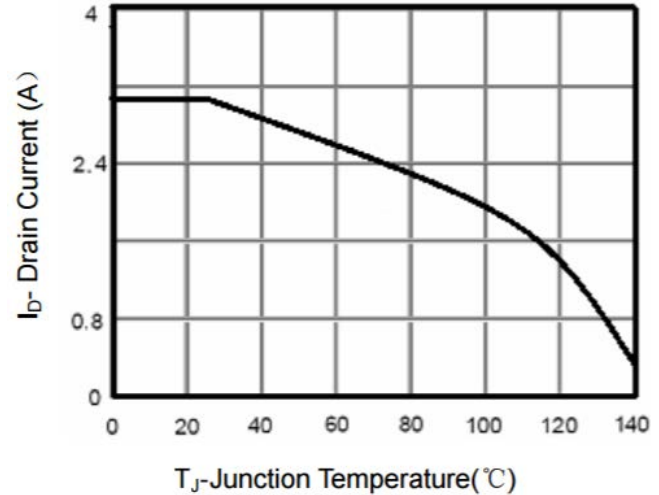


Figure 4 Drain Current

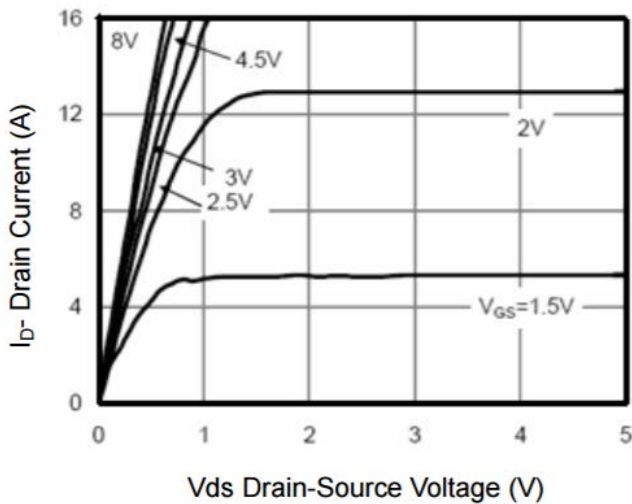


Figure 5 Output Characteristics

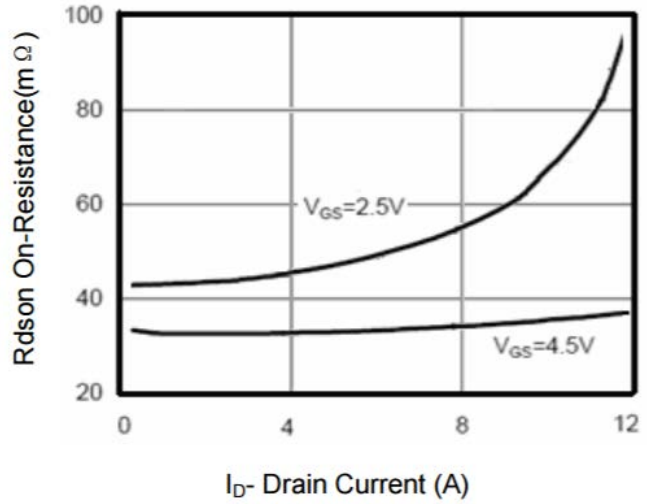


Figure 6 Drain-Source On-Resistance

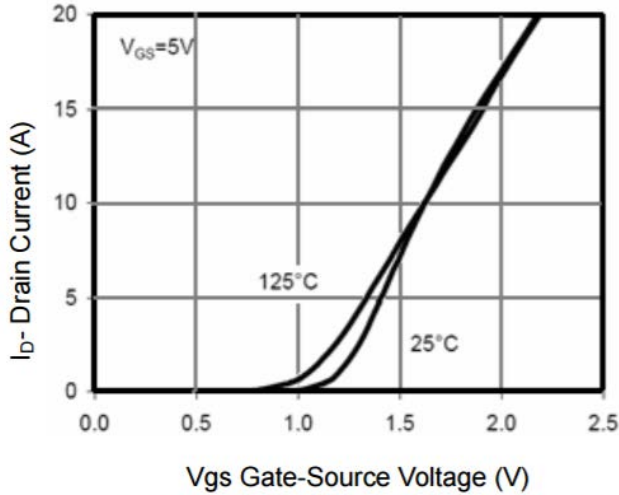


Figure 7 Transfer Characteristics

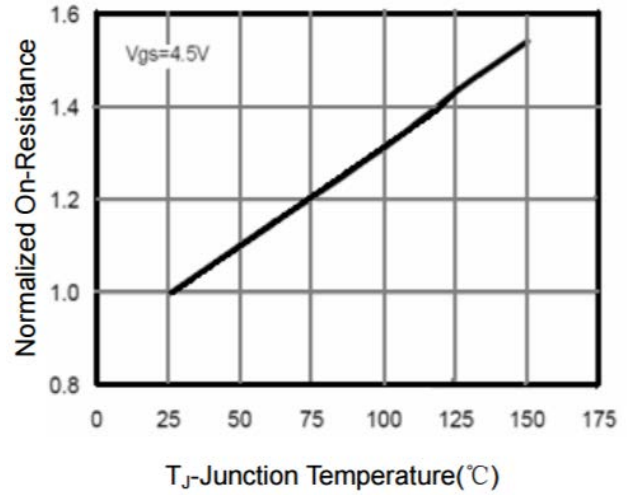


Figure 8 Drain-Source On-Resistance

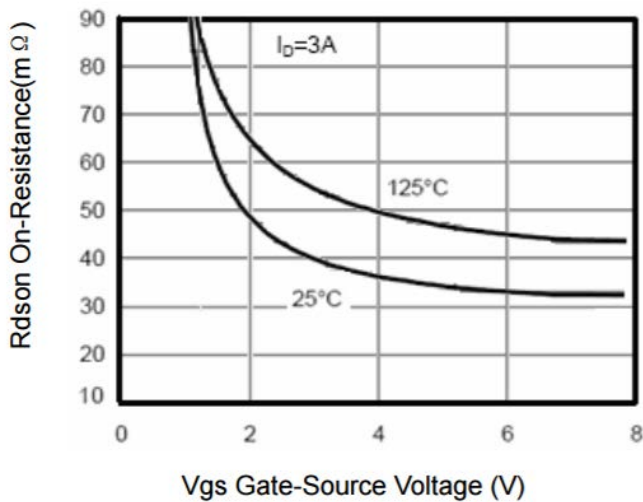


Figure 9 Rdson vs Vgs

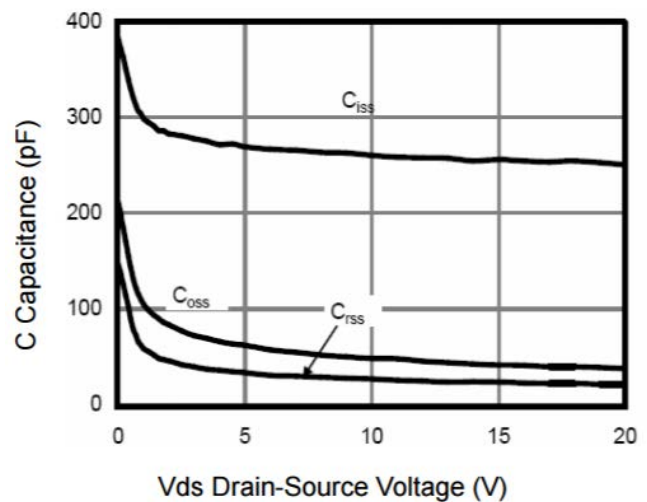


Figure 10 Capacitance vs Vds

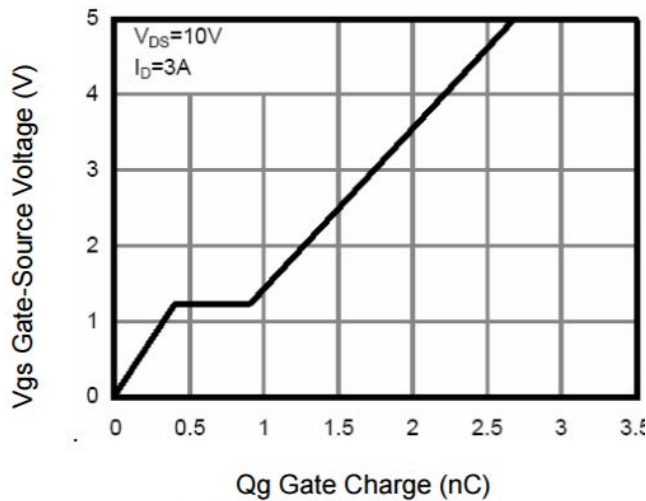


Figure 11 Gate Charge

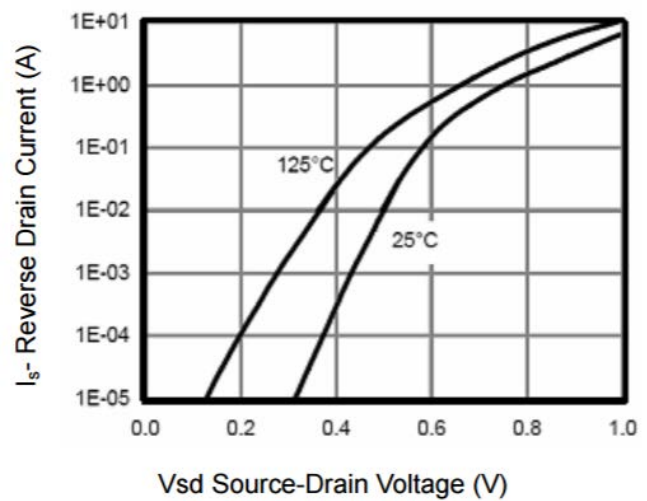


Figure 12 Source- Drain Diode Forward

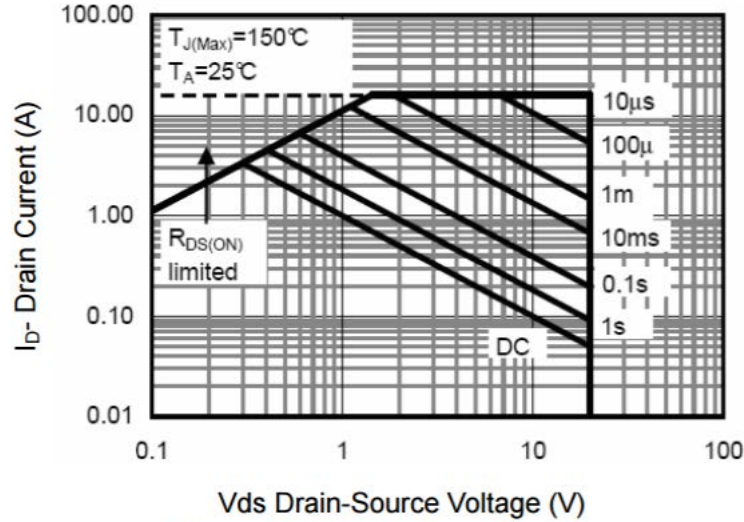


Figure 13 Safe Operation Area

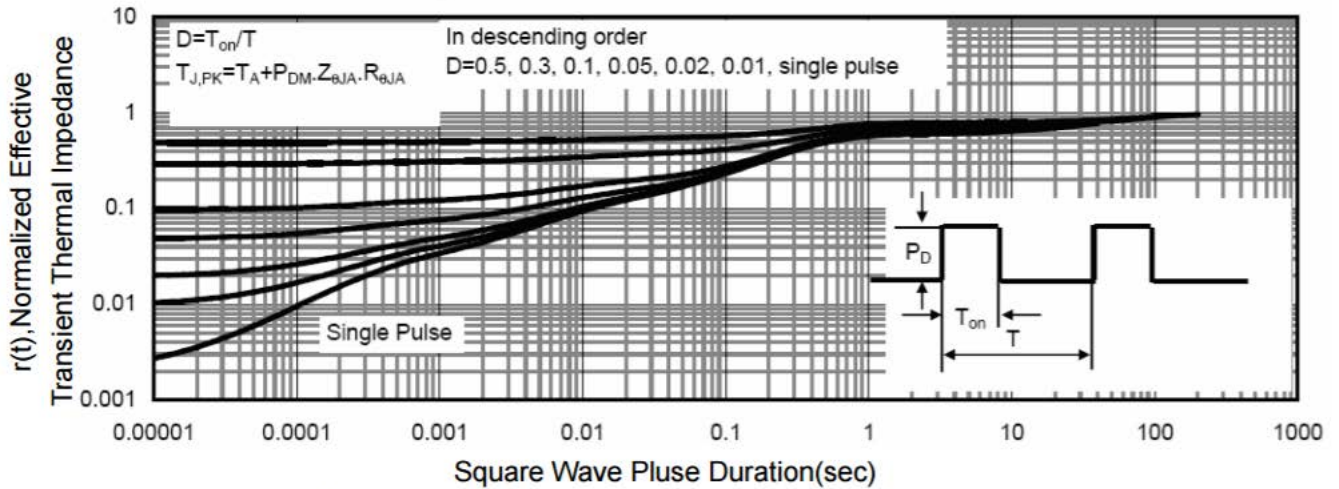
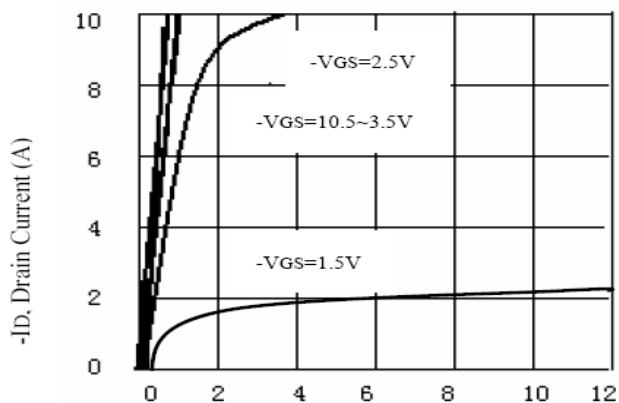


Figure 14 Normalized Maximum Transient Thermal Impedance

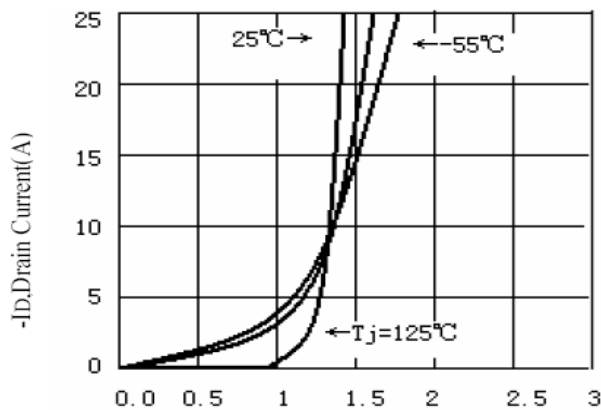
**P-Channel Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
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	$\mu A$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
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 $\Omega$
		$V_{GS}=-10V, I_D=-2.8A$	-		45	
Forward transconductance	gfs	$V_{GS}=-5V, I_D=-5A$	-	5	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ISS}$	$V_{DS}=-10V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	561	-	pF
Output capacitance	$C_{OSS}$		-	61	-	
Reverse transfer capacitance	$C_{RSS}$		-	52	-	
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-10V$ $I_D=-2.8A$ $V_{GEN}=-4.5V$ $R_L=10\text{ohm}$ $R_{GEN}=-60\text{ohm}$	-	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	-	

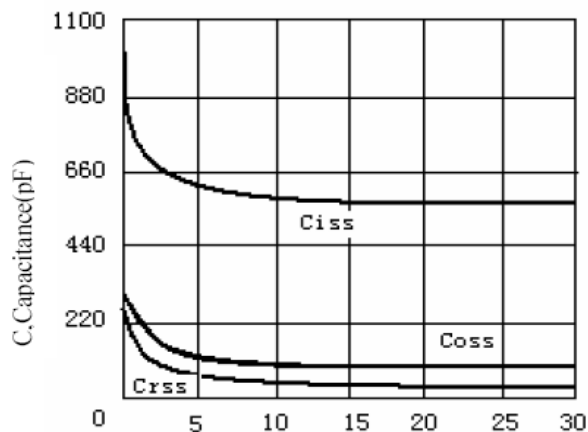
### P-Channel: Typical Electrical And Thermal Characteristics



- 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

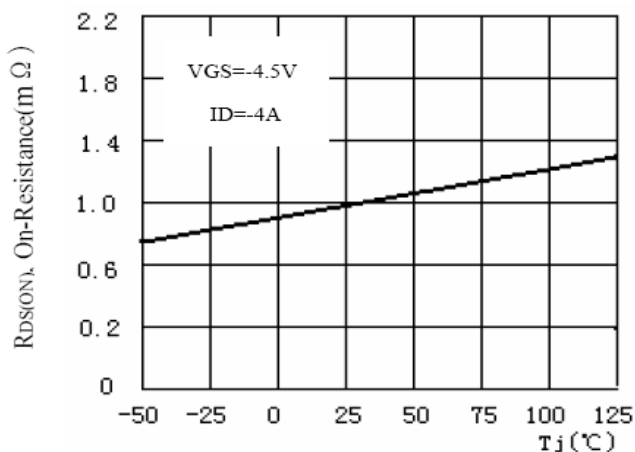
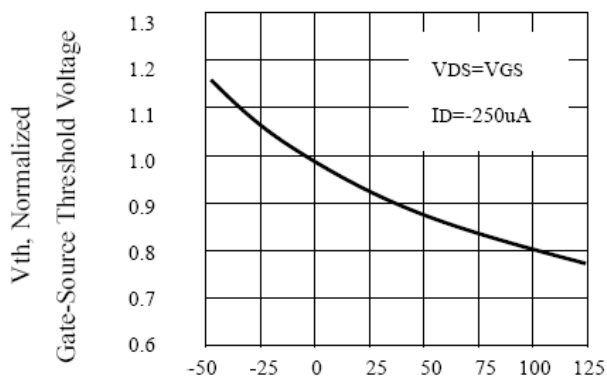
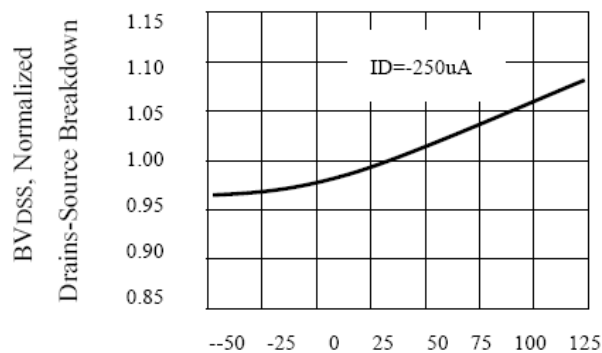


Figure4. On-Resistance Variation with Temperature



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



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

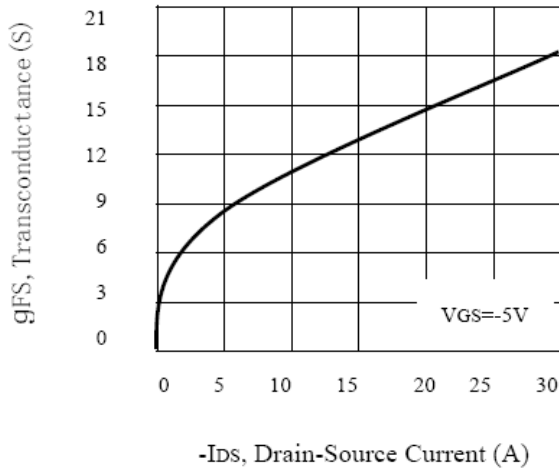


Figure 7. Transconductance Variation With Drain Current

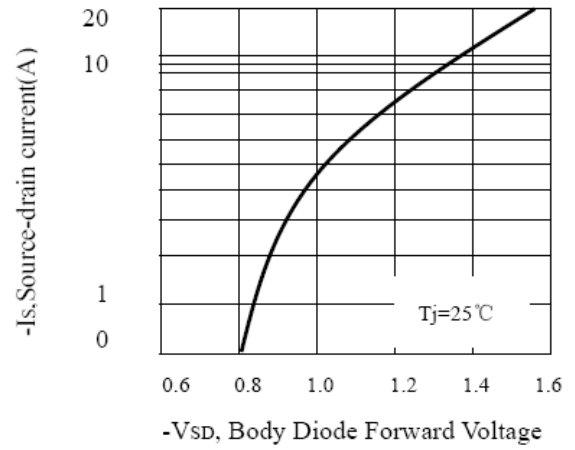


Figure 8. Body Diode Forward Voltage Variation with Source Current

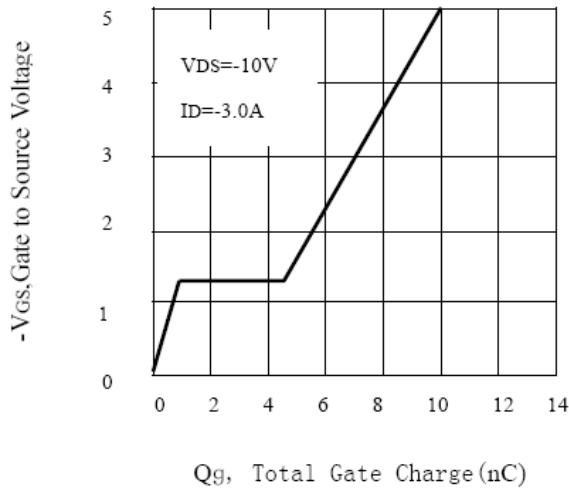


Figure 9. Gate Charge

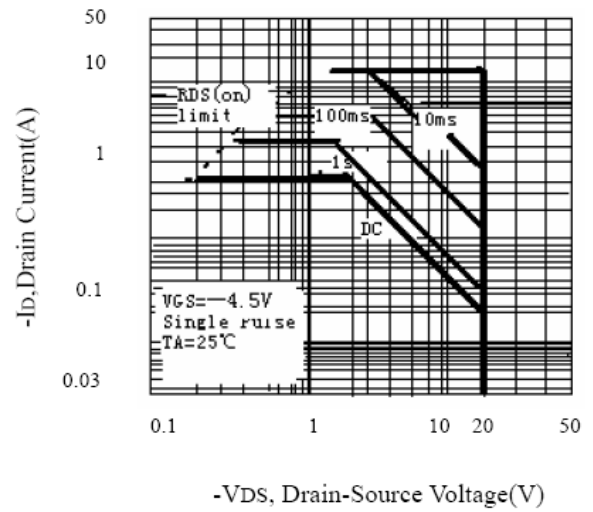
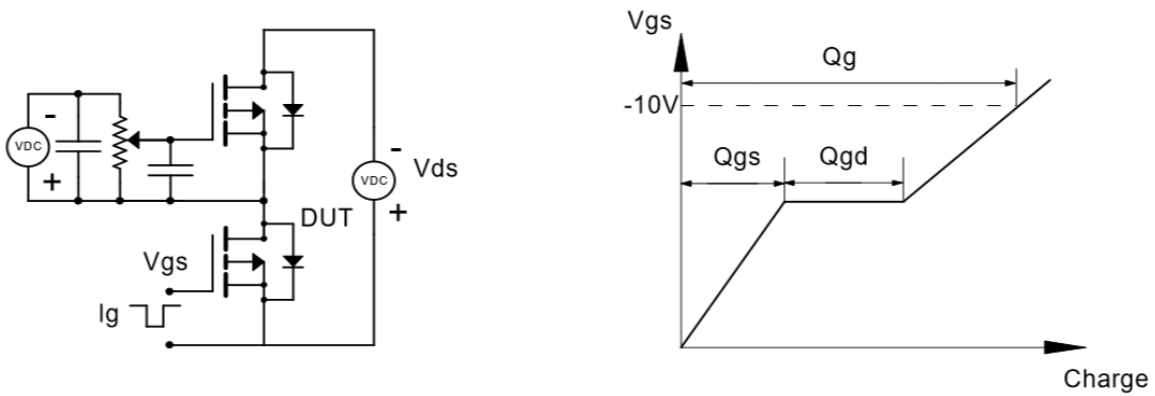


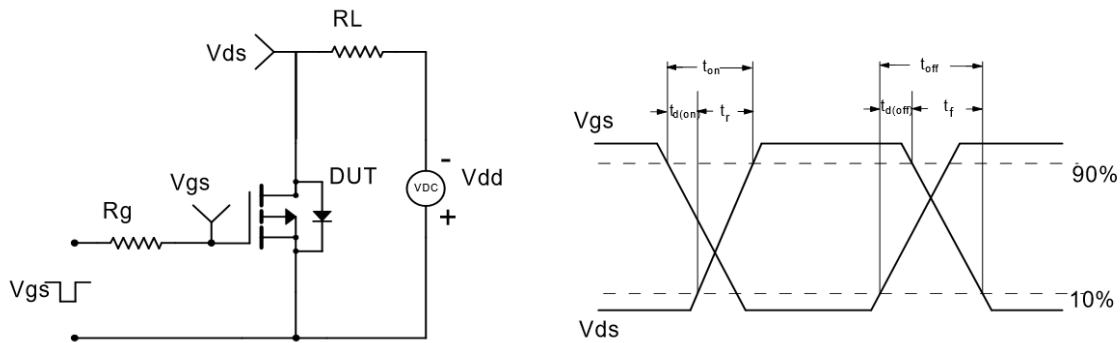
Figure 10. Maximum Safe Operating Area



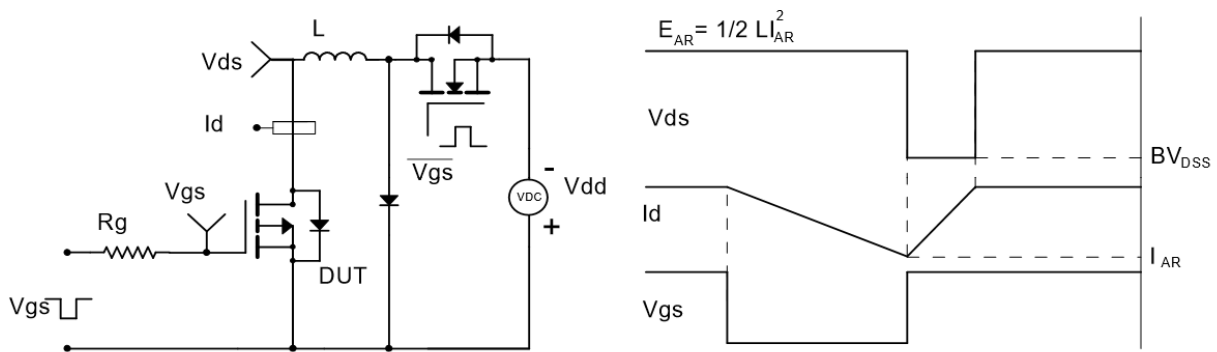
Gate Charge Test Circuit & Waveform



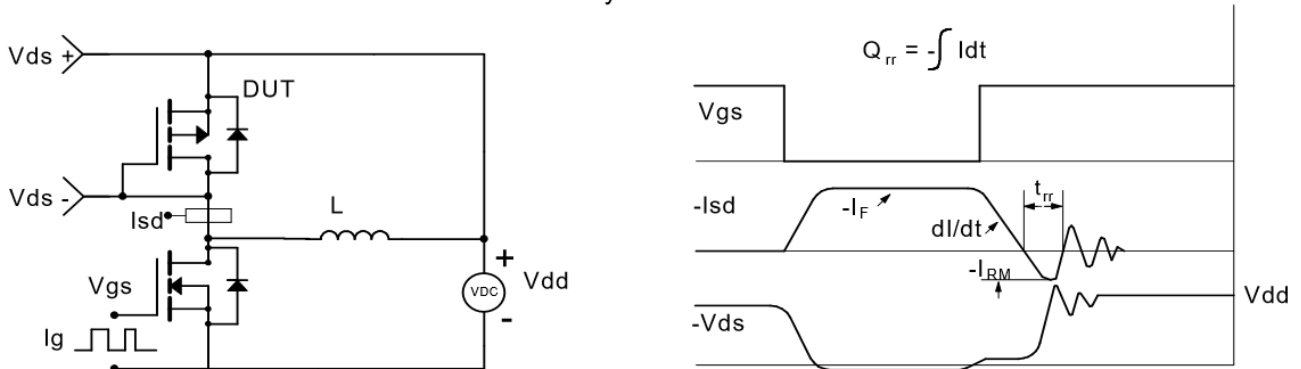
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

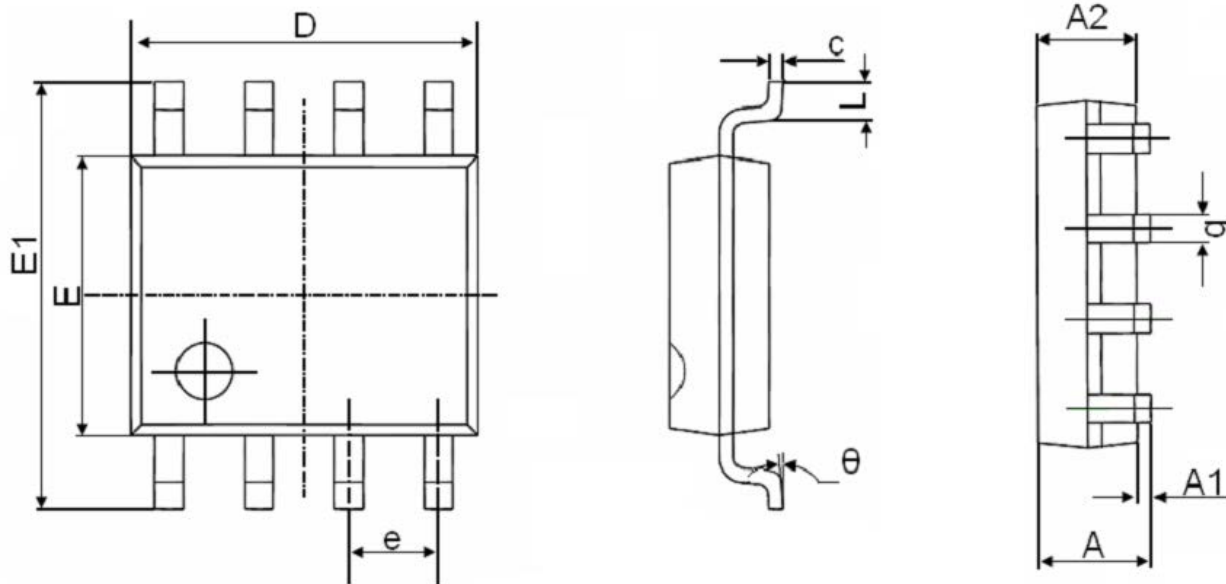


Diode Recovery Test Circuit & Waveforms



## 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°