20V N And P-Channel Enhancement Mode MOSFET

Description

The PECN6604MR uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge . The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

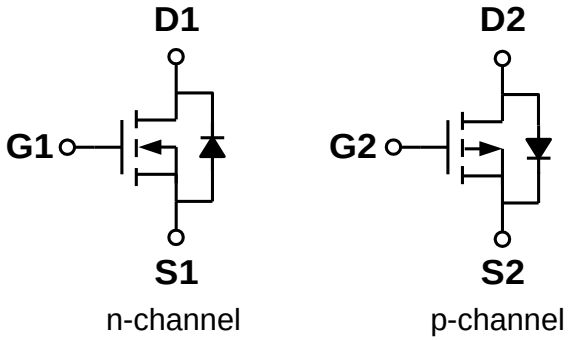
General Features

- **N-channel:**
  V_{DS} =20V,ID =4A
  $R_{DS(ON)}$=38mΩ (typical) @ VGS=4.5V
  $R_{DS(ON)}$=45mΩ (typical) @ VGS=2.5V
  P-Channel:
  V_{DS} =-20V,ID =-3A
  $R_{DS(ON)}$=64mΩ (typical) @ VGS=-4.5V
  $R_{DS(ON)}$=82mΩ (typical) @ VGS=-2.5V
- 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

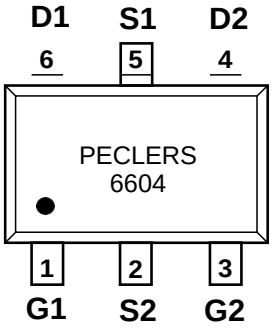
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

Schematic diagram



Marking and pin assignment

SOT-23-6L
(TOP VIEW)



Package

- SOT-23-6L

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
PECN6604MR	-55°C to +150°C	SOT-23-6L	3000

Absolute Maximum Ratings (TA=25℃ unless otherwise noted)

Parameter	Symbol	Limit		Unit
		N	P	
Drain-source voltage	V_{DS}	20	-20	V
Gate-source voltage	V_{GS}	±12	±12	V
Maximum power dissipation	P_D	1.1		W
Operating junction Temperature range	T_j	-55—150	-55—150	℃

Drain Current-Continuous (Silicon Limited)	T_A=25°C	I_D	4	-3.2	A
	T_A=75°C		3	-2.6	
Pulsed Drain Current (Package Limited)		I_{DM}	16	-12.8	A
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	20	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=20V, 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	0.5	0.75	1.2	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=3A	-	38	48	mΩ
		V_{GS}=2.5V, I_D=2A		45	55	
Forward transconductance	gfs	V_{GS}=5V, I_D=3A	-	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	-	
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=3A V_{GS}=4.5V	-	2.7	-	nC
Gate-source charge	Qgs		-	0.4	-	
Gate-drain charge	Qgd		-	0.5	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	V_{GS}=0V,Is=3A	-	0.76	1.16	V

Thermal Characteristics

Thermal Resistance junction-to ambient	Rth JA	100	℃/W

N-Channel: Typical Electrical And Thermal Characteristics

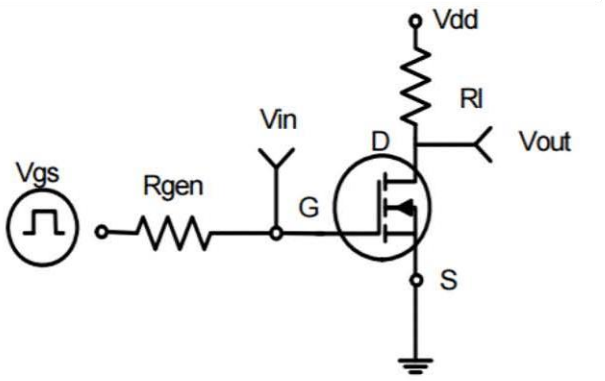


Figure 1:Switching Test Circuit

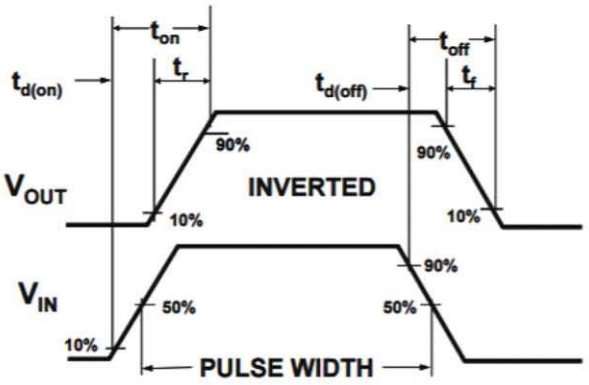


Figure 2:Switching Waveforms

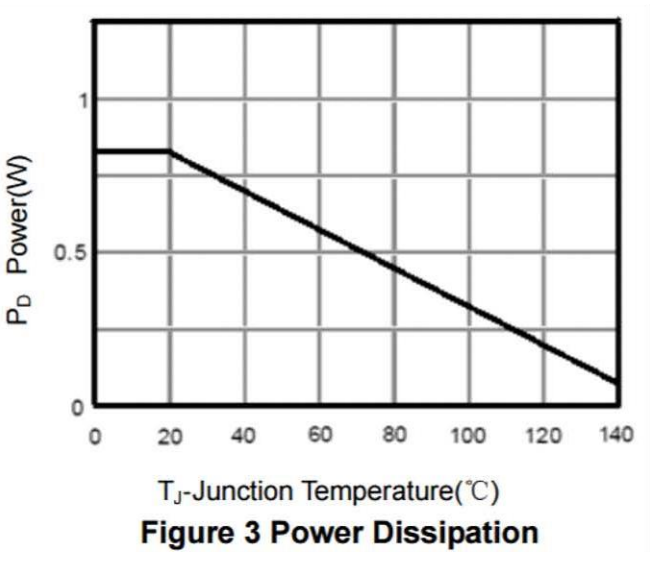


Figure 3 Power Dissipation

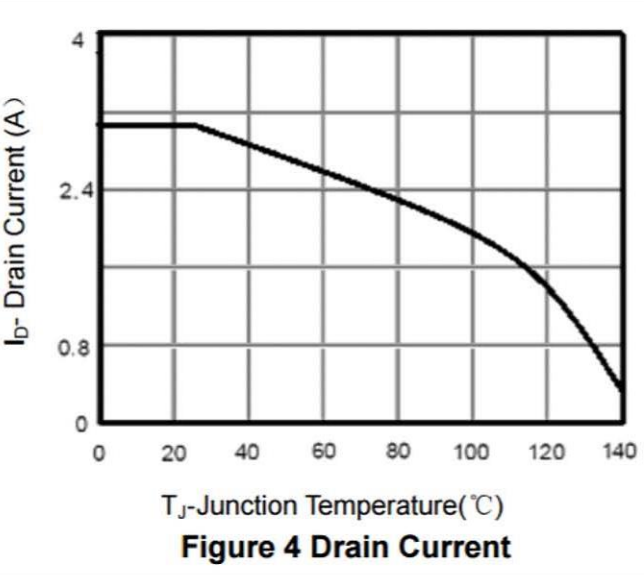


Figure 4 Drain Current

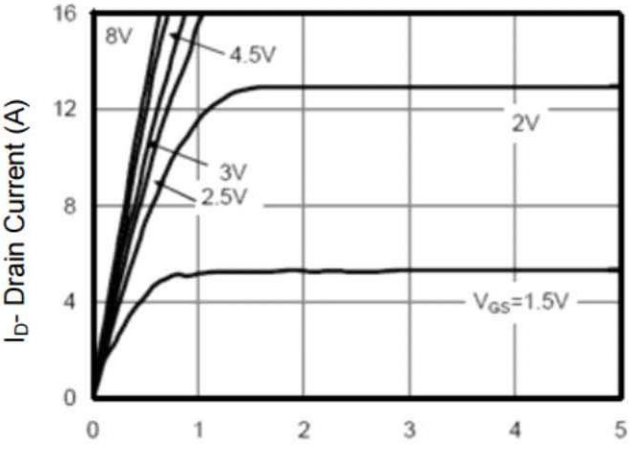


Figure 5 Output Characteristics

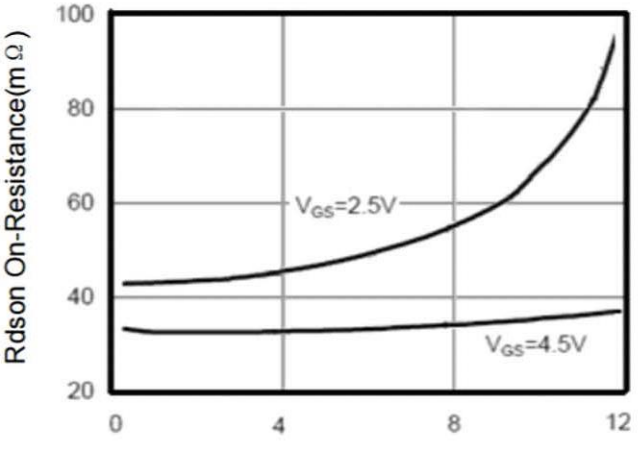


Figure 6 Drain-Source On-Resistance

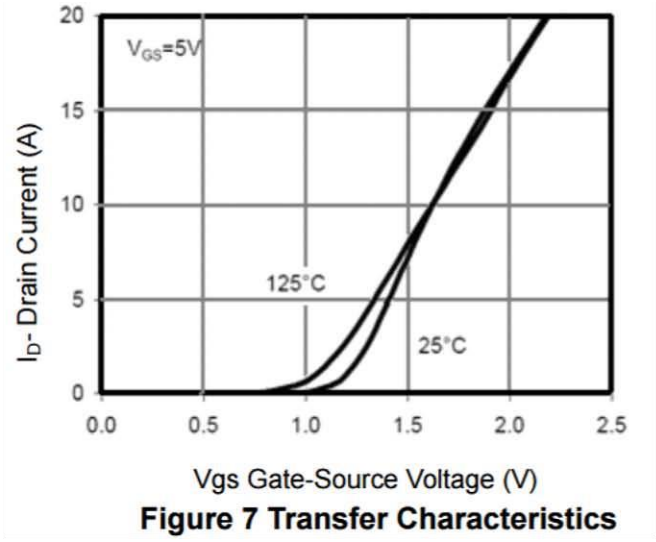


Figure 7 Transfer Characteristics

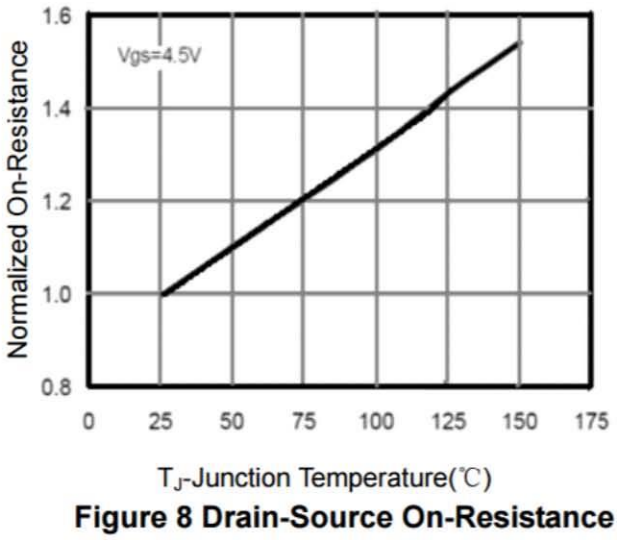


Figure 8 Drain-Source On-Resistance

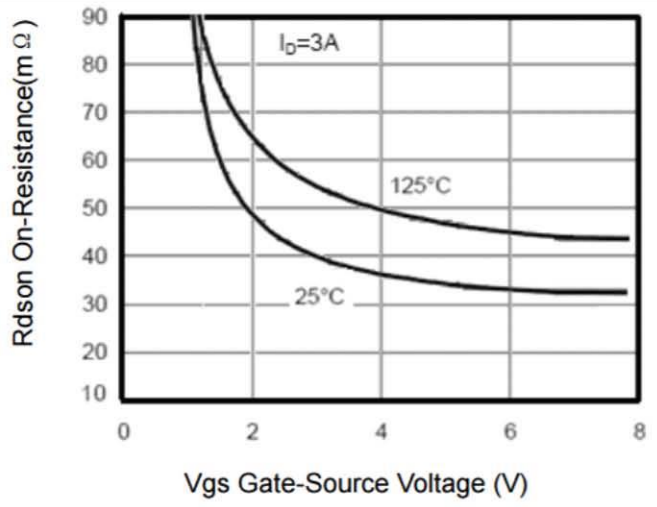


Figure 9 Rdson vs Vgs

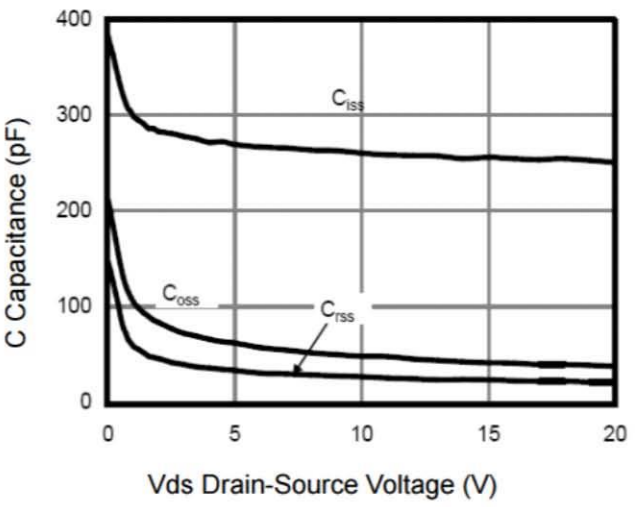


Figure 10 Capacitance vs Vds

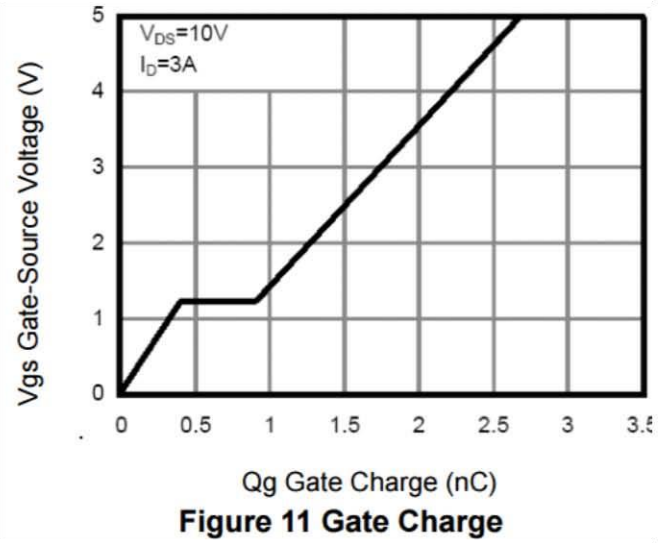


Figure 11 Gate Charge

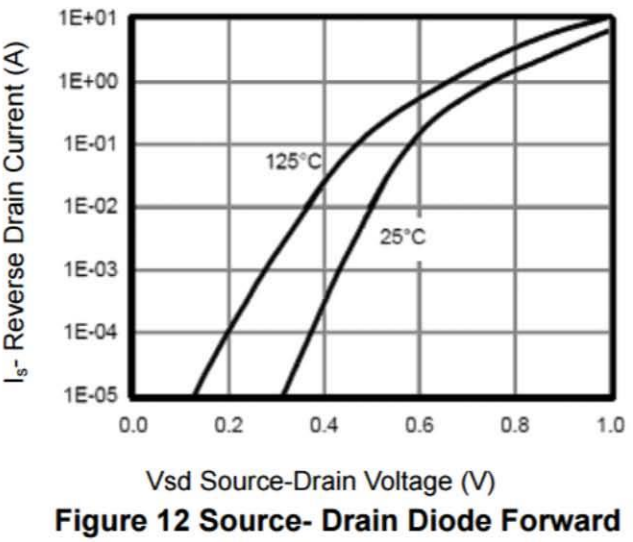


Figure 12 Source- Drain Diode Forward

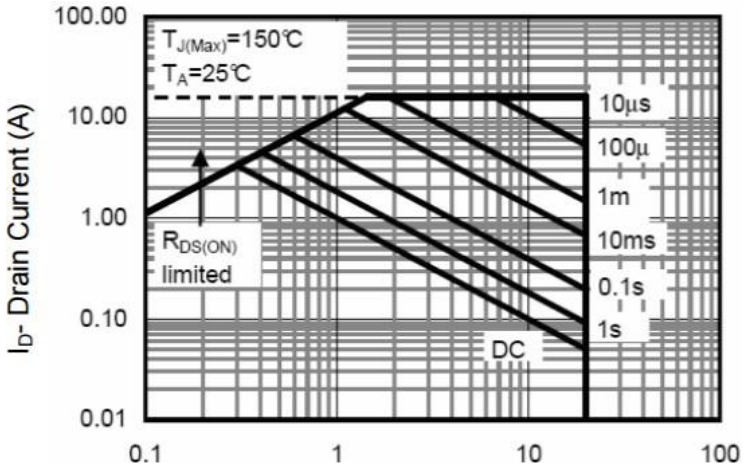


Figure 13 Safe Operation Area

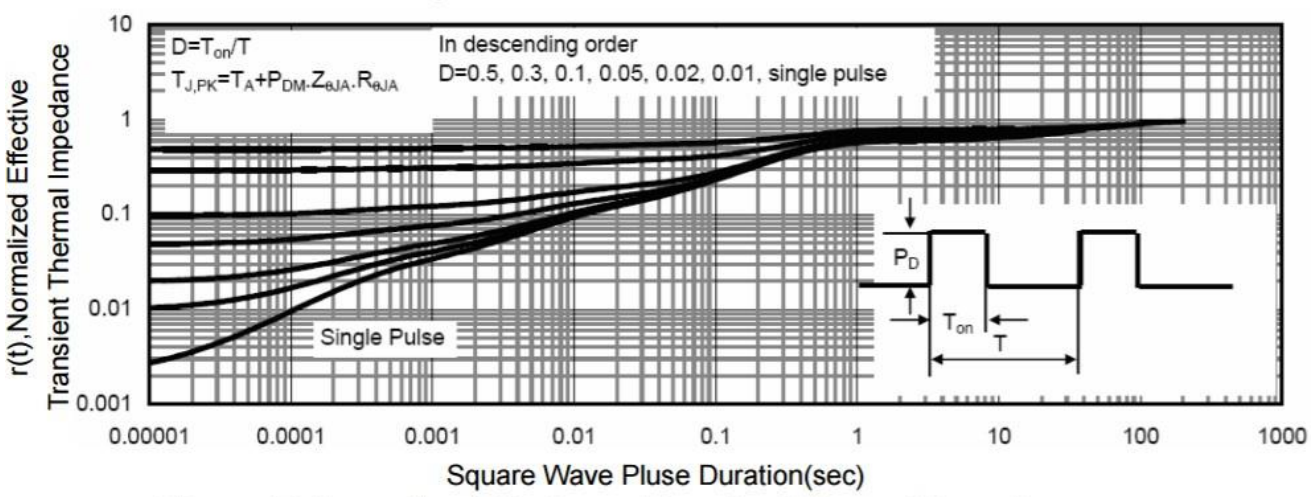


Figure 14 Normalized Maximum Transient Thermal Impedance

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	-20	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=-20V, 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	-0.4	-0.65	-1.2	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=-4.5V, I_D=-3A	-	64	80	mΩ
		V_{GS}=-2.5V, I_D=-2A	-	82	120	
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=-3A V_{GS}=-4.5V	-	6.1	-	nC
Gate-source charge	Qgs		-	1.7	-	
Gate-drain charge	Qgd		-	1.2	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	V_{GS}=0V,Is=-1.25A	-	-0.81	-1.2	V

P-Channel: Typical Electrical And Thermal Characteristics

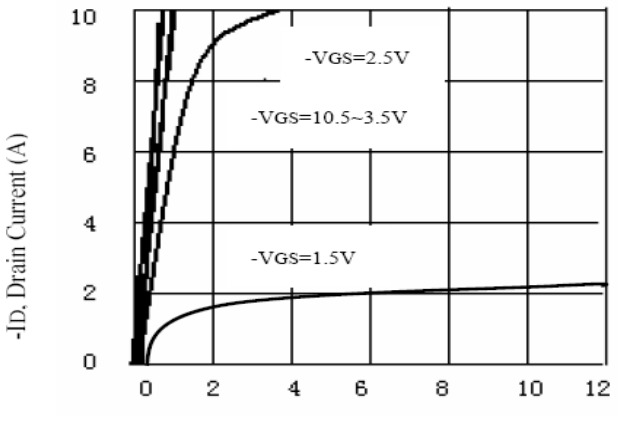


Figure 1. Output Characteristics

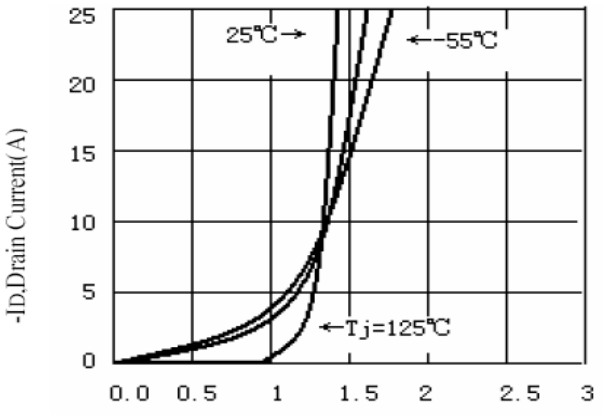


Figure 2. Transfer Characteristics

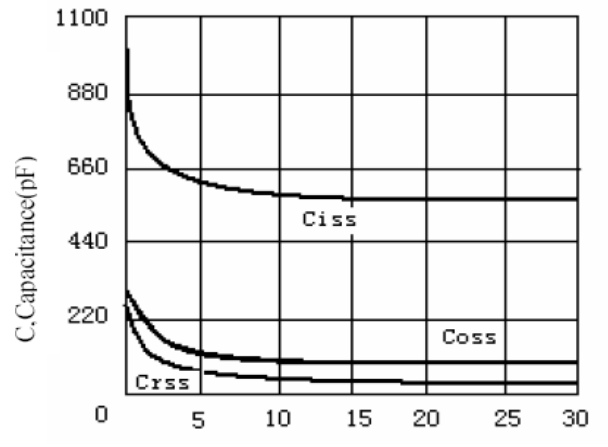


Figure3. Capacitance

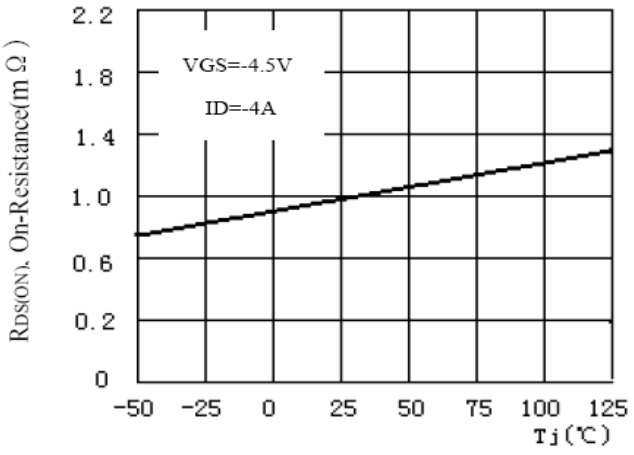


Figure4. On-Resistance Variation with Temperature

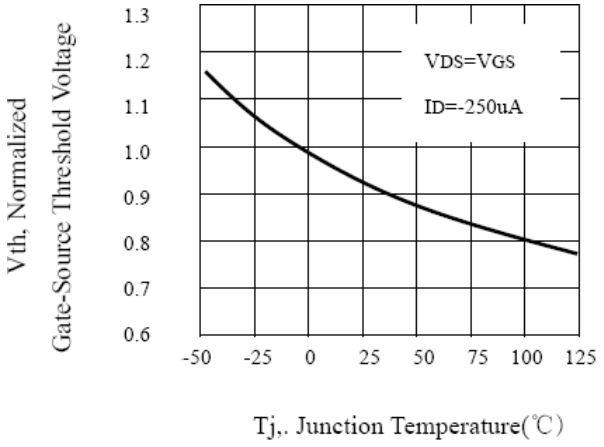


Figure5.Gate Threshold Variation With Temperature

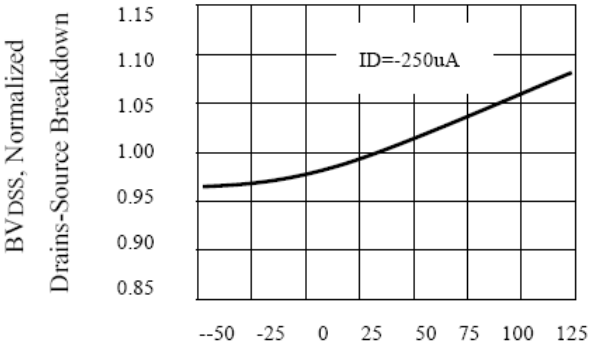


Figure6.Breakdown Voltage Variation With Temperature

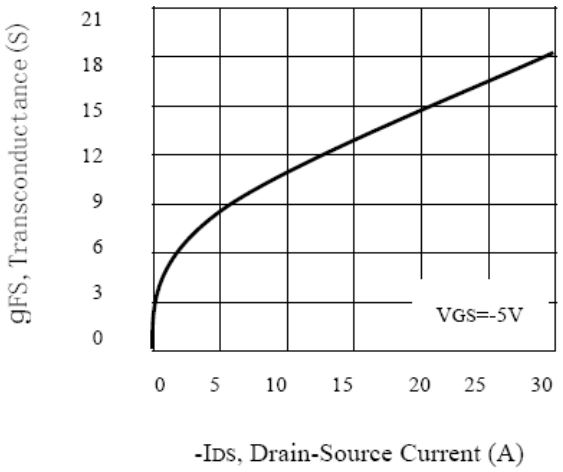


Figure7.Transconductance Variation With Drain Current

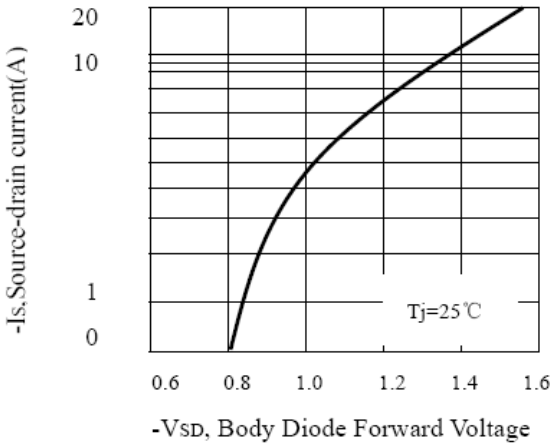


Figure8.Body Diode Forward Voltage Variation with Source Current

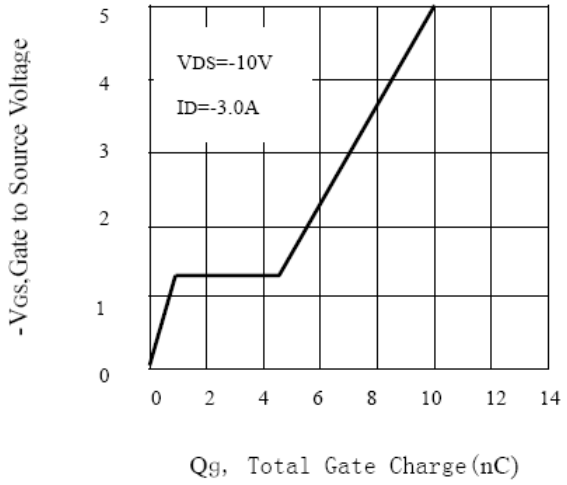


Figure9. Gate Charge

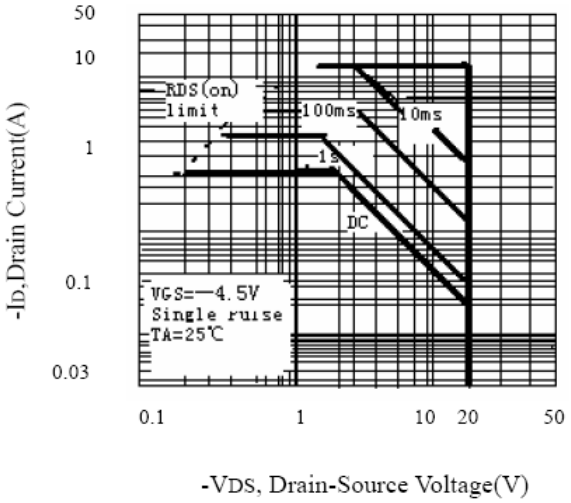
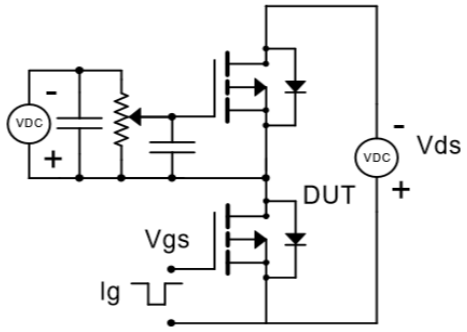
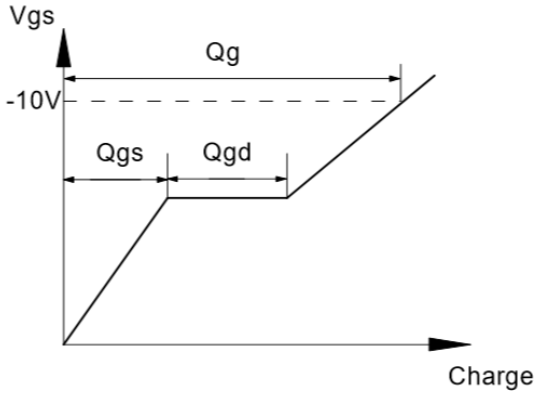


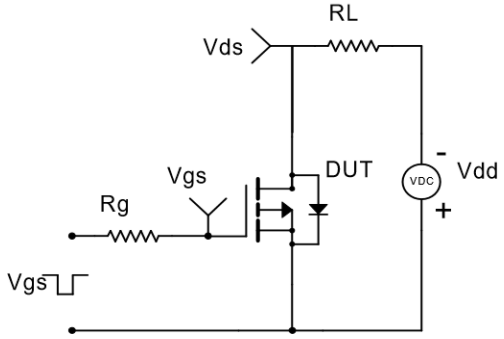
Figure10.Maximum Safe Operating Area

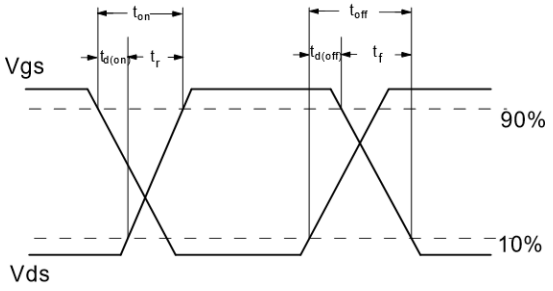
Gate Charge Test Circuit & Waveform



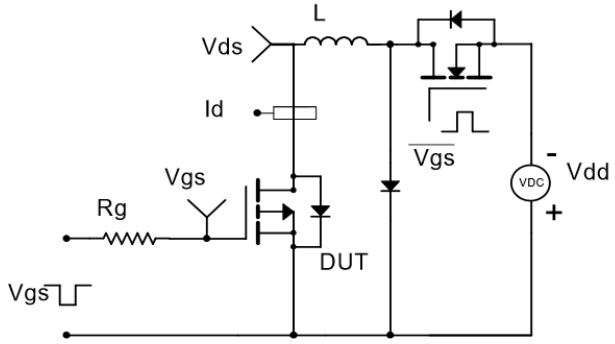


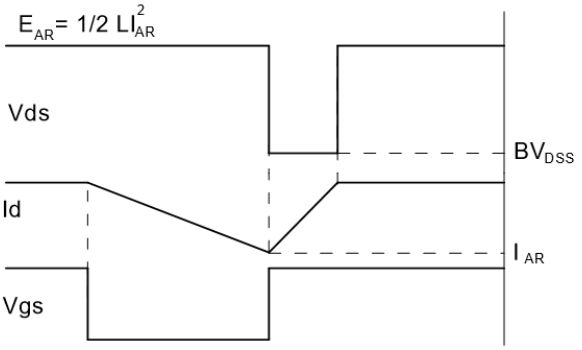
Resistive Switching Test Circuit & Waveforms



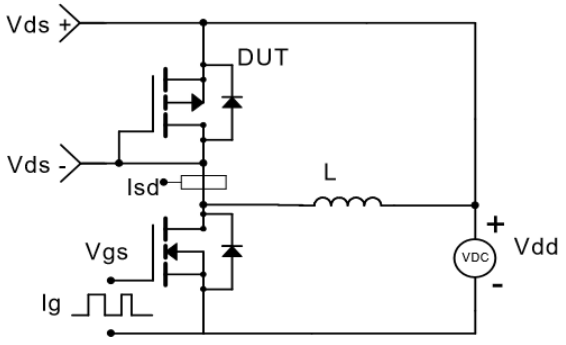


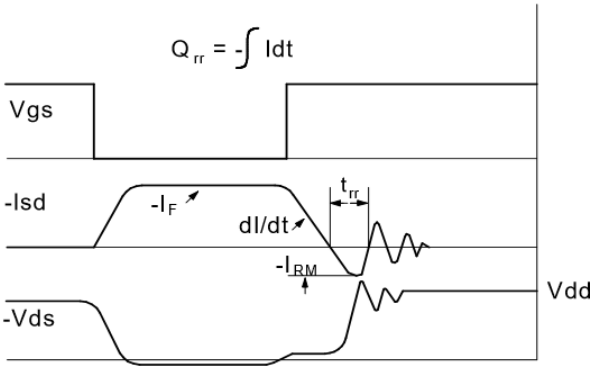
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





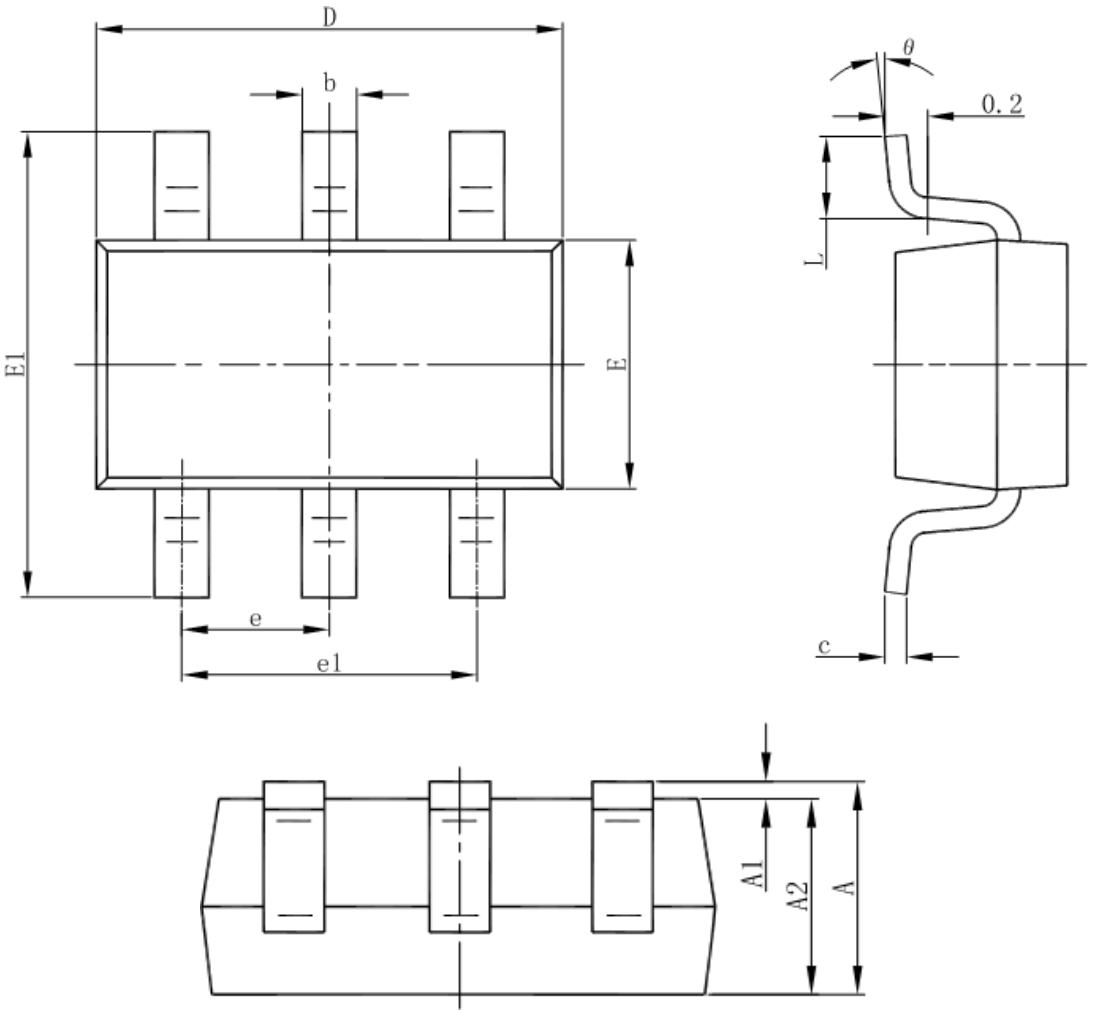
Diode Recovery Test Circuit & Waveforms





Package Information

- **SOT-23-6L**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°