

20V N And P-Channel Enhancement Mode MOSFET

Description

The PECN6604 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.

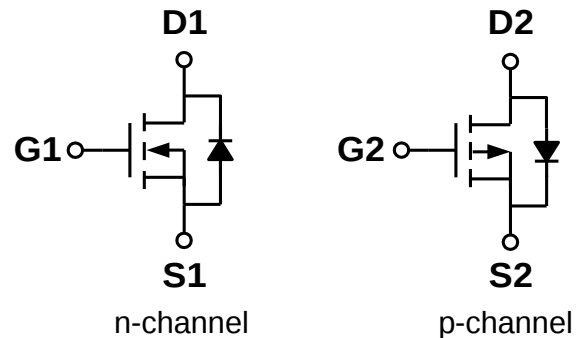
General Features

- ◆ **N-channel:**
 $V_{DS} = 20V, I_D = 4A$
 $R_{DS(ON)} = 38m\Omega$ (typical) @ $V_{GS} = 4.5V$
 $R_{DS(ON)} = 45m\Omega$ (typical) @ $V_{GS} = 2.5V$
- ◆ **P-Channel:**
 $V_{DS} = -20V, I_D = -3A$
 $R_{DS(ON)} = 64m\Omega$ (typical) @ $V_{GS} = -4.5V$
 $R_{DS(ON)} = 82m\Omega$ (typical) @ $V_{GS} = -2.5V$
- ◆ 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

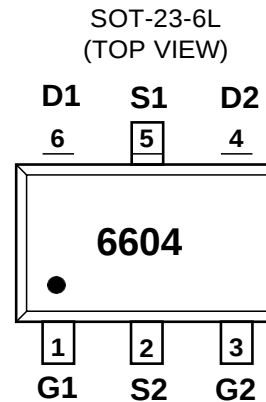
Application

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

Schematic diagram



Marking and pin assignment



Package

- ◆ SOT-23-6L



Ordering Information

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

Absolute Maximum Ratings (TA=25°C 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	°C

Drain Current-Continuous (Silicon Limited)	$T_A=25^{\circ}\text{C}$	I_D	4	-3.2	A
	$T_A=75^{\circ}\text{C}$		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		$^{\circ}\text{C}$

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 =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	g _{fs}	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, I _S =3A	-	0.76	1.16	V

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

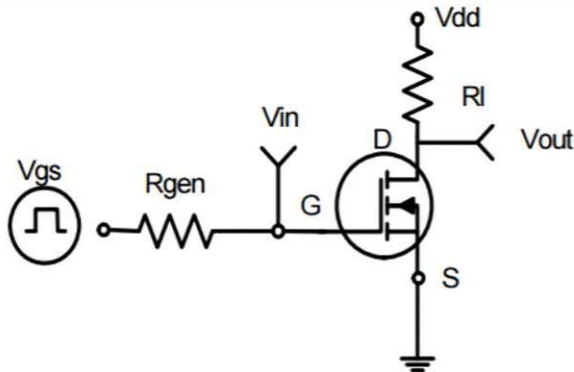


Figure 1: Switching Test Circuit

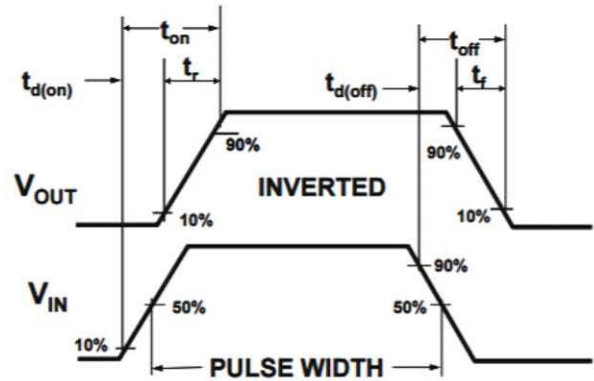


Figure 2: Switching Waveforms

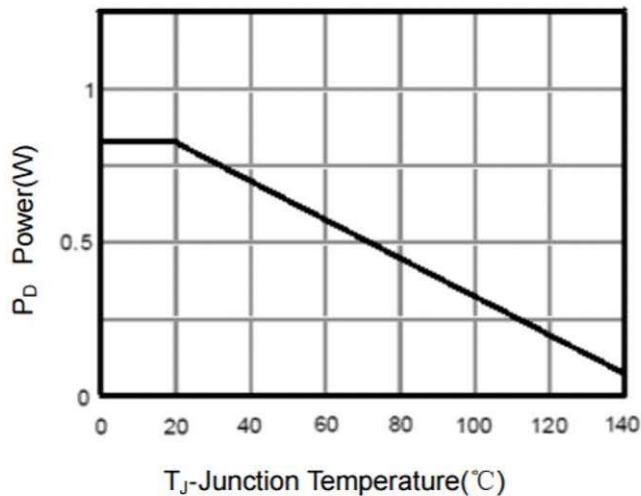


Figure 3 Power Dissipation

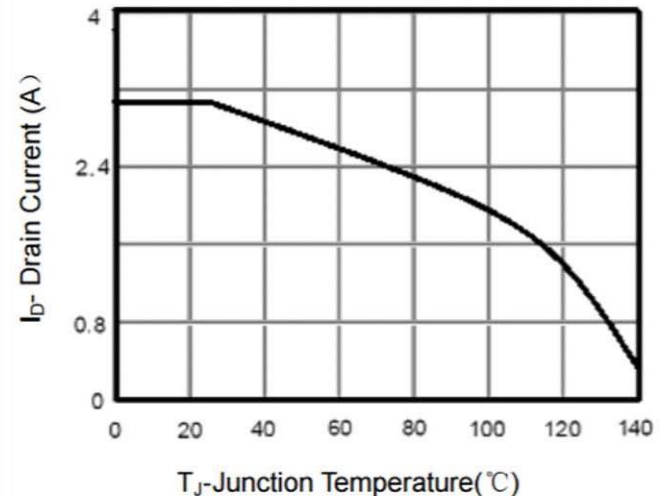


Figure 4 Drain Current

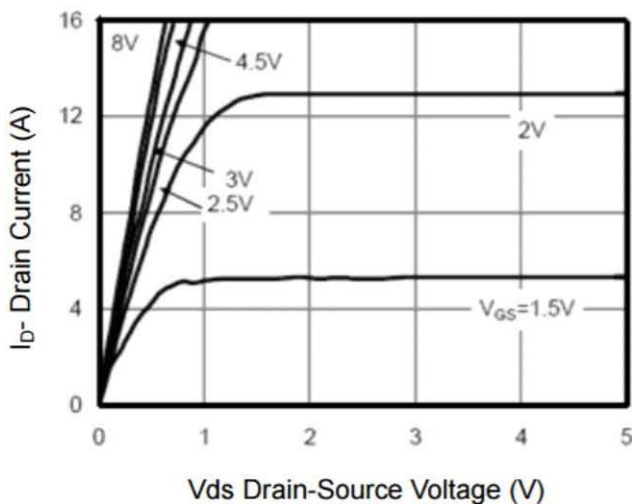


Figure 5 Output Characteristics

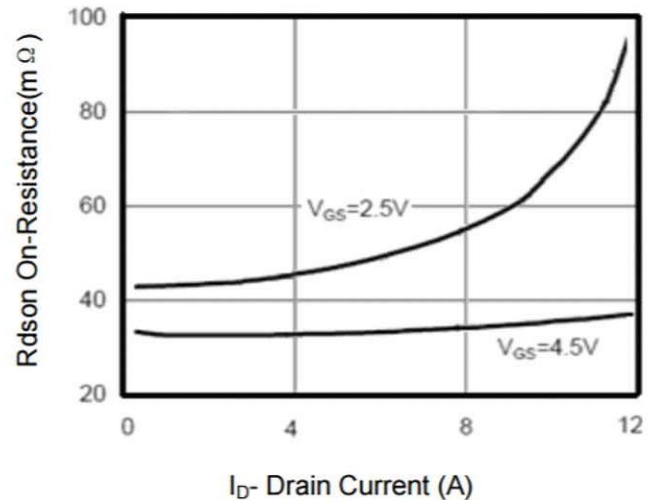


Figure 6 Drain-Source On-Resistance

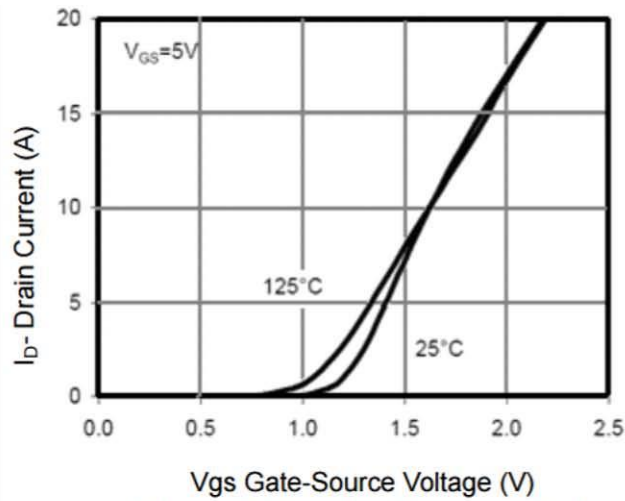


Figure 7 Transfer Characteristics

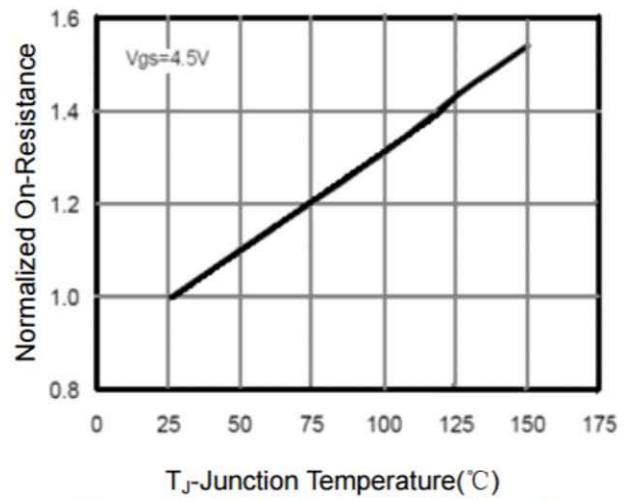


Figure 8 Drain-Source On-Resistance

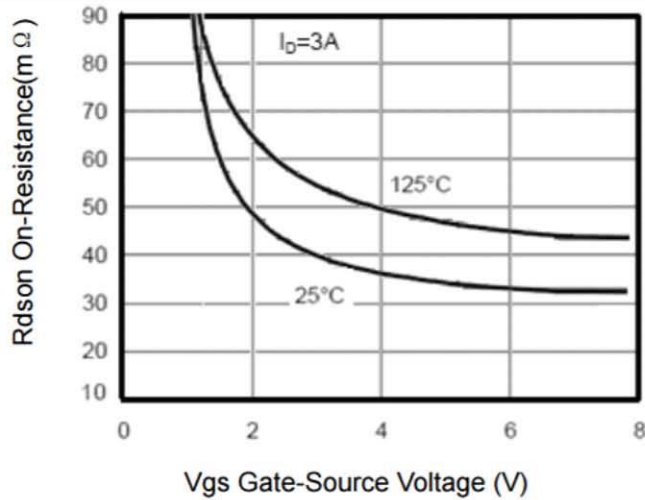


Figure 9 $R_{DS(on)}$ vs V_{GS}

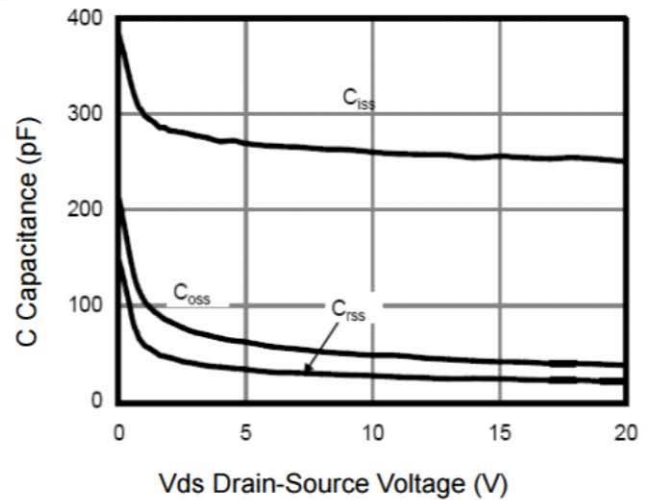


Figure 10 Capacitance vs V_{DS}

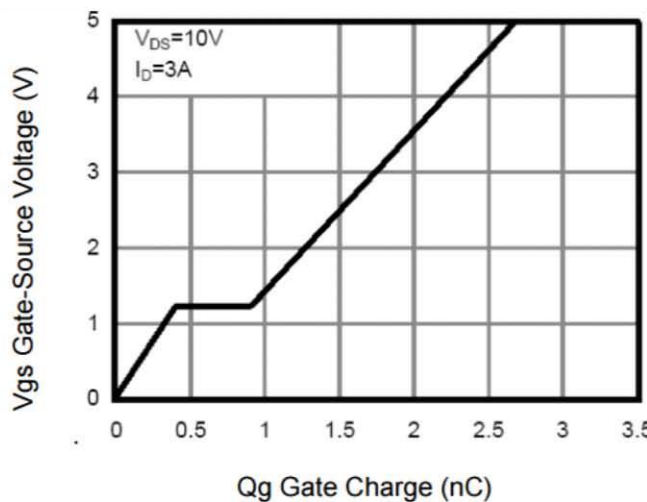


Figure 11 Gate Charge

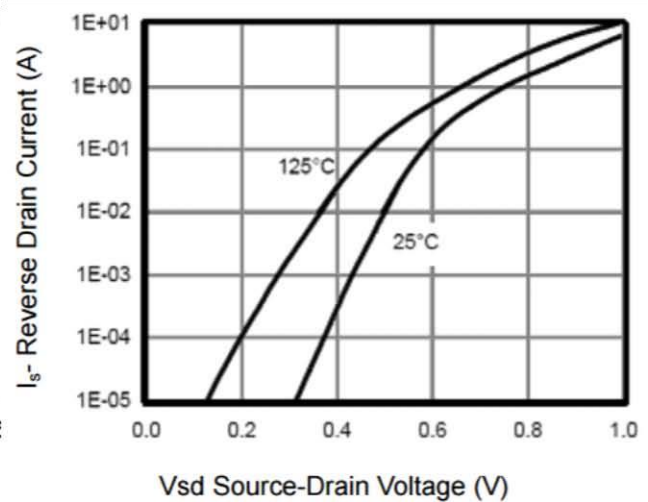


Figure 12 Source-Drain Diode Forward

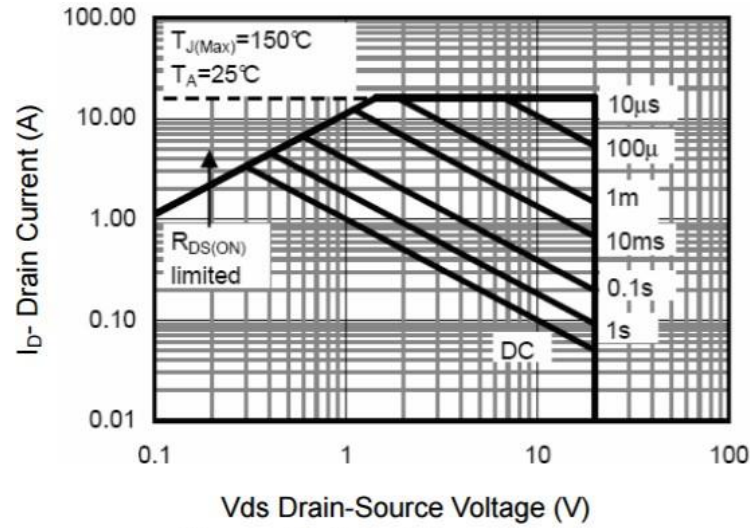


Figure 13 Safe Operation Area

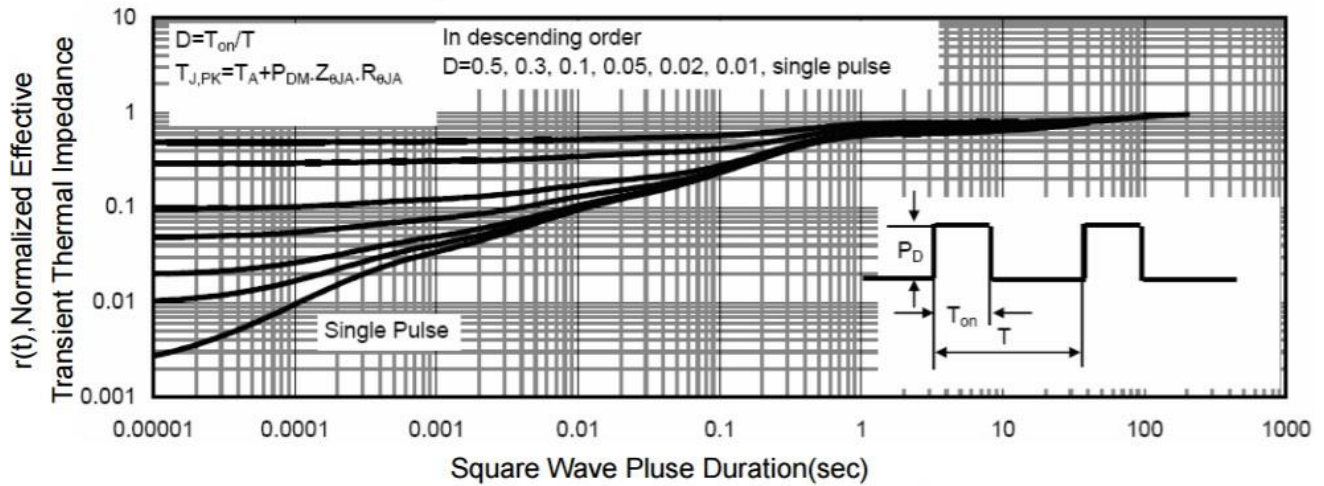
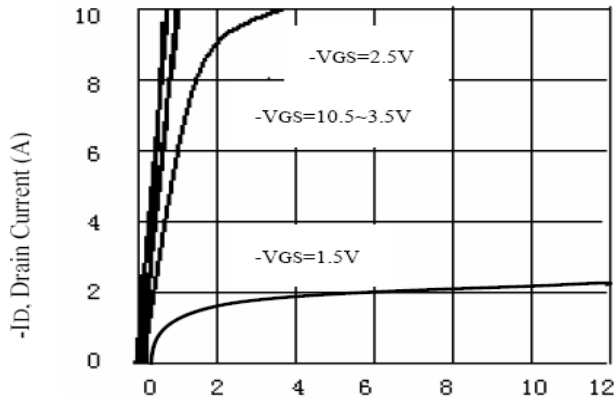


Figure 14 Normalized Maximum Transient Thermal Impedance

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

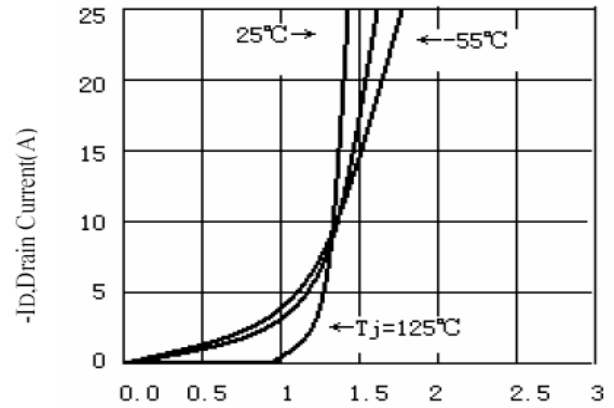
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-20	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-20V, V _{GS} =0V	-	-	-1	μA
Gate-body leakage	I _{GSS}	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
ON Characteristics						
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	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	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V _{SD}	V _{GS} =0V,I _S =-1.25A	-	-0.81	-1.2	V

P-Channel: Typical Electrical And Thermal Characteristics



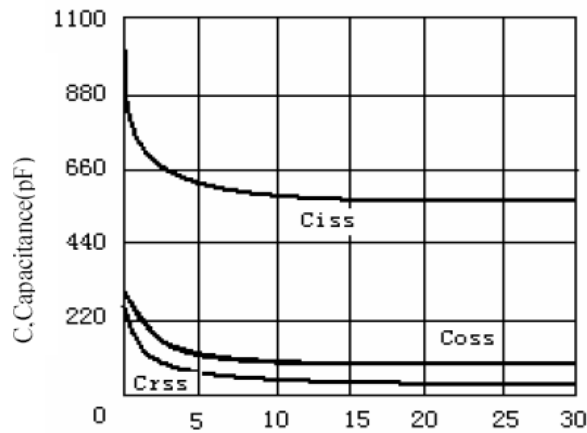
- VDS, Drain-to-Source Voltage (V)

Figure 1. Output Characteristics



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

Figure 2. Transfer Characteristics



- VGS, Drain-to Source Voltage

Figure3. Capacitance

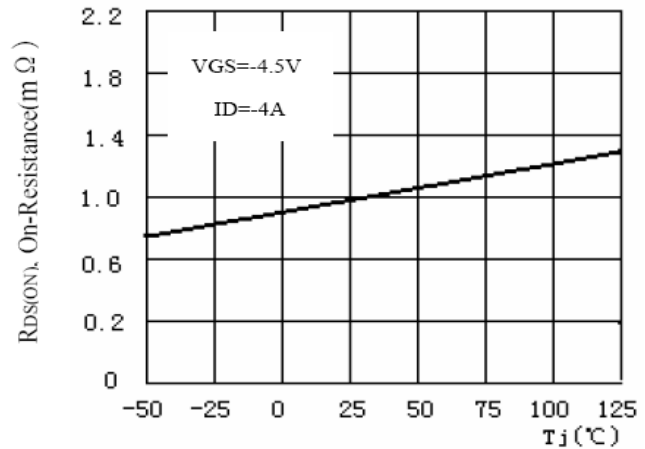
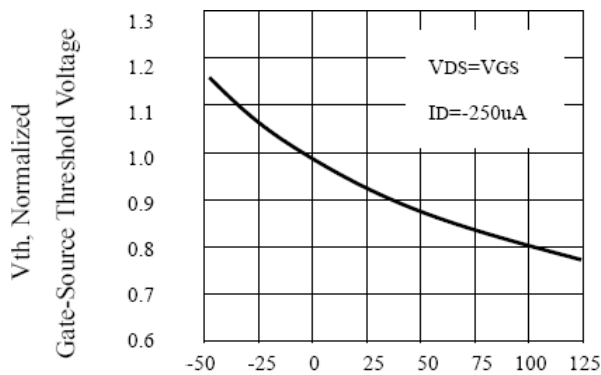
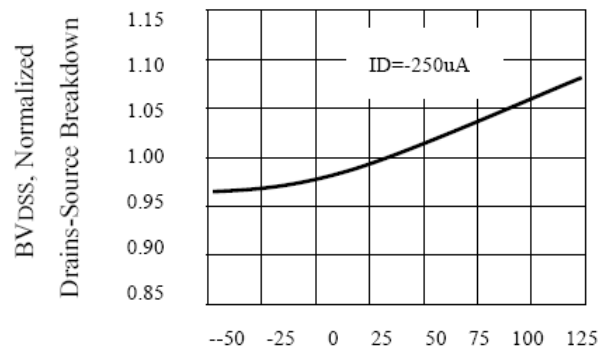


Figure4. On-Resistance Variation with Temperature



TJ, Junction Temperature(°C)

Figure5. Gate Threshold Variation With Temperature



TJ, Junction Temperature (°C)

Figure6. Breakdown Voltage Variation With Temperature

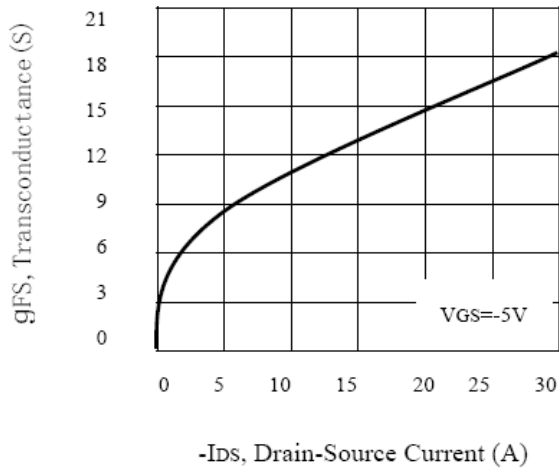


Figure7. Transconductance Variation
With Drain Current

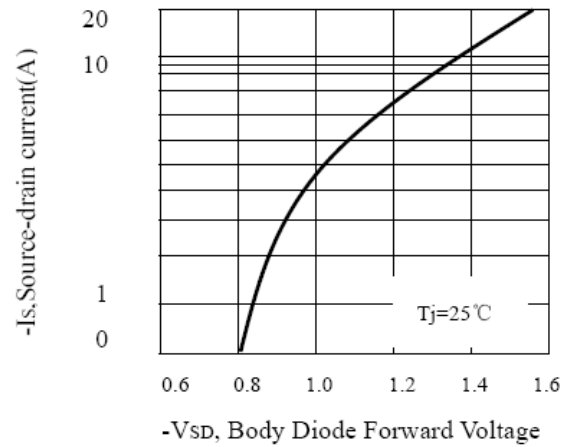


Figure8. Body Diode Forward Voltage
Variation with Source Current

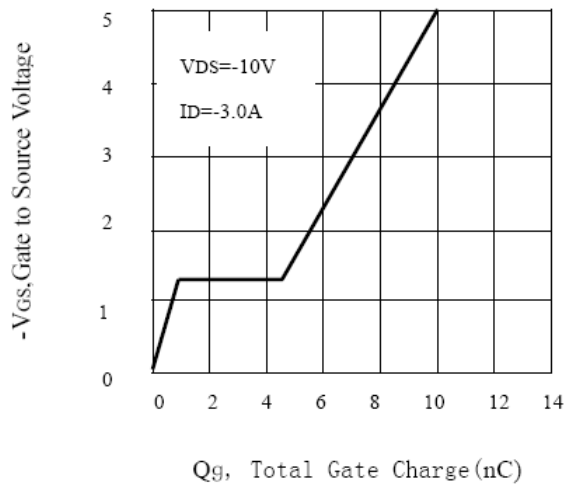


Figure9. Gate Charge

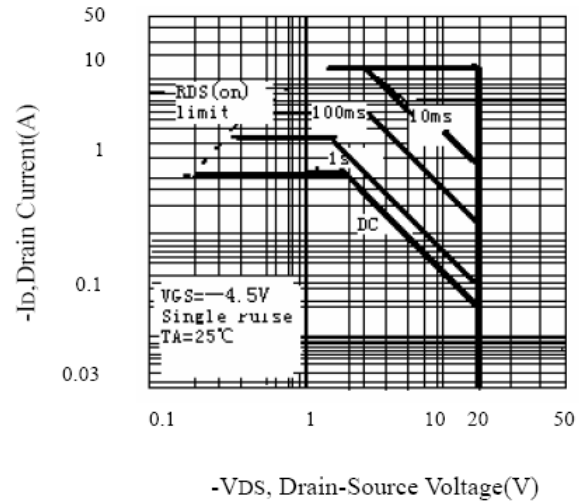
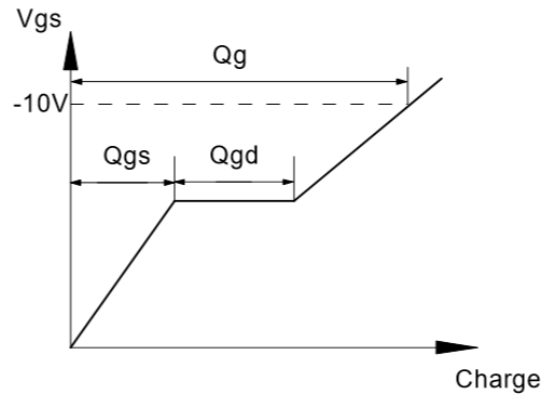
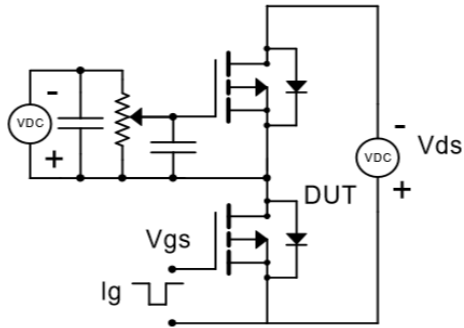
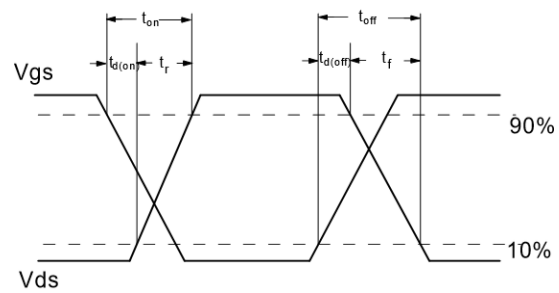
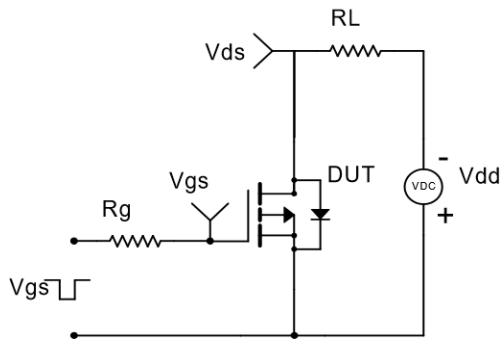


Figure10. Maximum Safe Operating Area

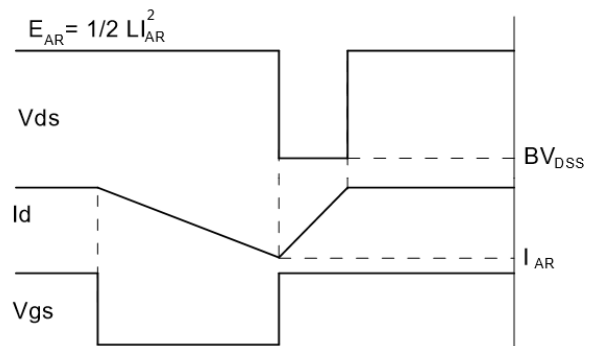
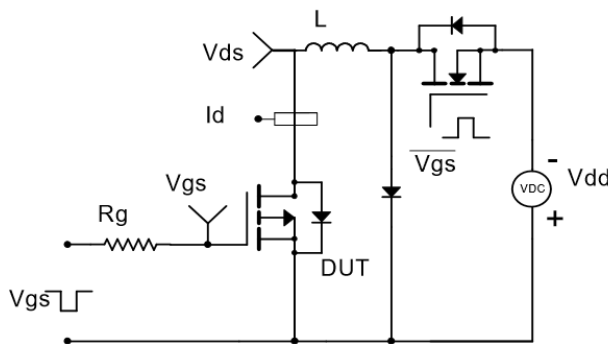
Gate Charge Test Circuit & Waveform



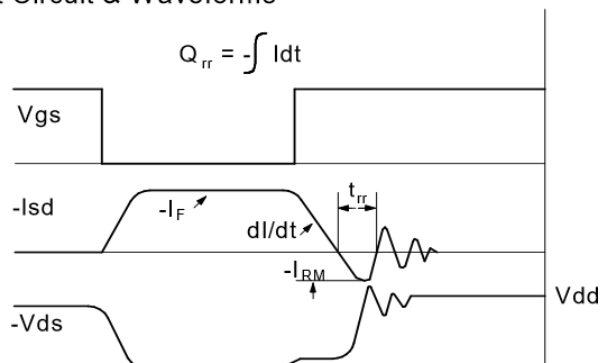
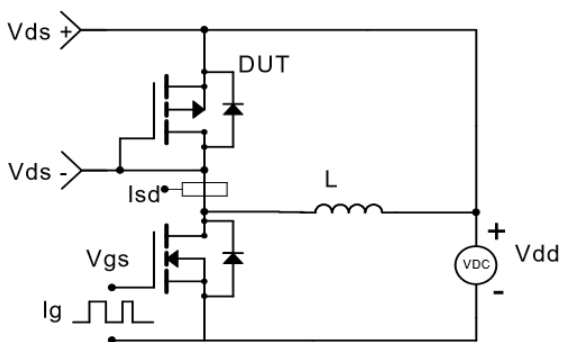
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

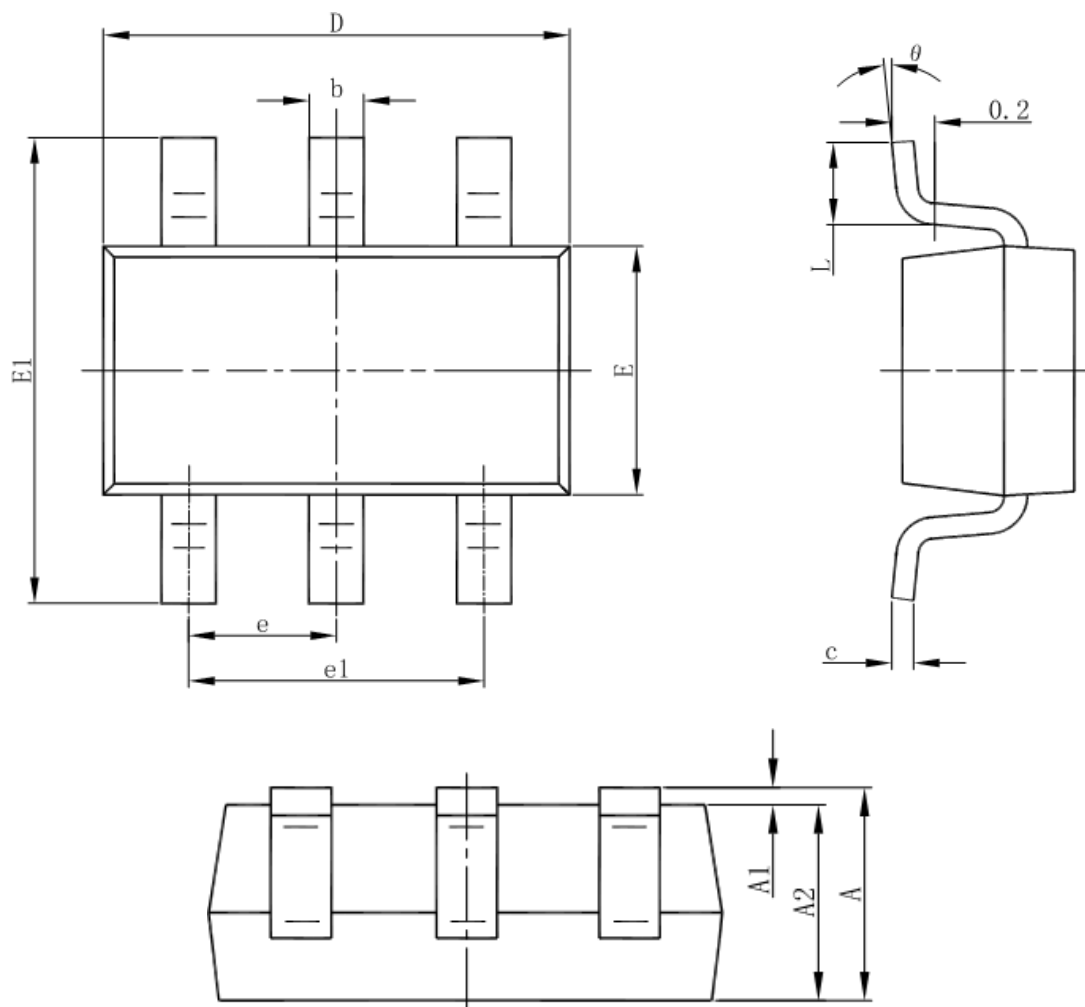


Diode Recovery Test Circuit & Waveforms



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°