FH4602K

N and P-Channel Enhancement Mode Power MOSFET

■ Description

The FH4602K uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge . Thecomplementary MOSFETs may be used to form a level shifted high sideswitch, and for a host of other applications.

■ Applications

- Hhigh-frequency switching and synchronous rectification
- DC/DC Converter
- Surface mount package

■ General Features

- **N-Channel** ：V_{DS} = 20V,I_D = 4.0A

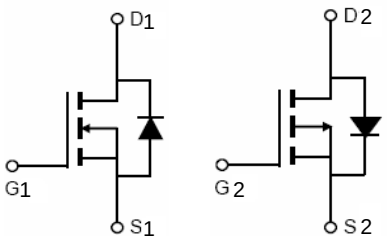
  $R_{DS(ON)}$(Typ.)= 29mΩ @V_{GS} = 4.5V

  $R_{DS(ON)}$(Typ.)= 39mΩ @V_{GS} = 2.5V

- **P-Channel** ：V_{DS} = -20V,I_D = -4.1A

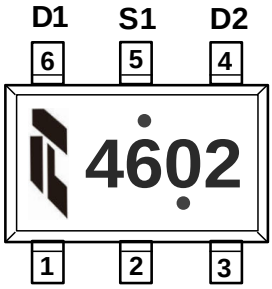
  $R_{DS(ON)}$(Typ.)= 32mΩ @V_{GS} =-4.5V

  $R_{DS(ON)}$(Typ.)= 39mΩ @V_{GS} =-2.5V

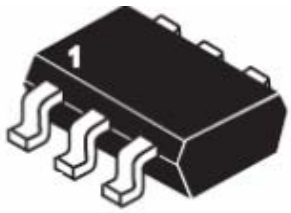


N-channel P-channel

Schematic diagram



Marking and pin assignment



SOT23-6 top view

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	20	-20	V
Gate-Source Voltage		V_{GS}	±12	±12	V
Continuous Drain Current	T_A=25℃	I_D	4.0	-4.1	A
	T_A=80℃		2.4	-2.5	
Pulsed Drain Current (Note 1)		I_{DM}	16	-16.4	A
Maximum Power Dissipation	T_A=25℃	P_D	1.6		W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150		℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note2)	$R_{\theta JA}$	96	℃/W

N-CH Electrical Characteristics (T_A=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 Current	I_{GSS}	V_{GS}=±12V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	0.45	0.7	1.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=4A	-	29	38	mΩ
		V_{GS}=2.5V, I_D=2A	-	39	48	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=4A	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=10V,V_{GS}=0V, F=1.0MHz	-	582	-	pF
Output Capacitance	C_{oss}		-	95	-	pF
Reverse Transfer Capacitance	C_{rss}		-	35	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=10V, R_L=2.5Ω V_{GS}=4.5V,R_{GEN}=3Ω	-	13	-	nS
Turn-on Rise Time	t_r		-	4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	21	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g	V_{DS}=10V,I_D=4A, V_{GS}=4.5V	-	8	-	nC
Gate-Source Charge	Q_{gs}		-	2.1	-	nC
Gate-Drain Charge	Q_{gd}		-	3.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=1A	-	0.8	1.2	V

P-CH Electrical Characteristics (T_A=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 Current	I_{GSS}	V_{GS}=±12V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-0.45	-0.7	-1.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V, I_D=-4A	-	32	41	mΩ
		V_{GS}=-2.5V, I_D=-2A	-	39	48	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-4A	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-10V,V_{GS}=0V, F=1.0MHz	-	952	-	PF
Output Capacitance	C_{oss}		-	131	-	PF
Reverse Transfer Capacitance	C_{rss}		-	117	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-10V,R_L=3.6Ω V_{GS}=-4.5V,R_{GEN} =3Ω	-	12	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	V_{DS}=-10V,I_D=-4A,V_{GS}=-4.5V	-	7.8	-	nC
Gate-Source Charge	Q_{gs}		-	1.2	-	nC
Gate-Drain Charge	Q_{gd}		-	1.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-1A	-	-0.8	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

N- Channel Typical Electrical and Thermal Characteristics (Curves)

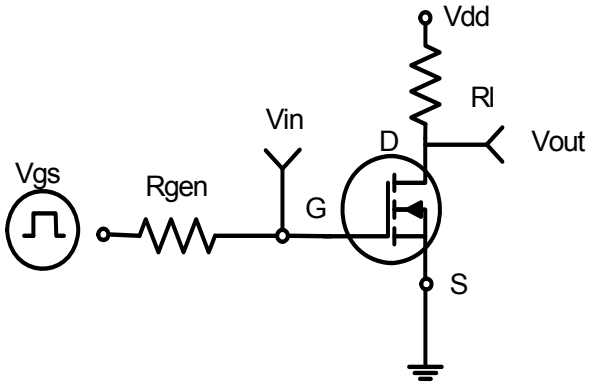


Figure 1:Switching Test Circuit

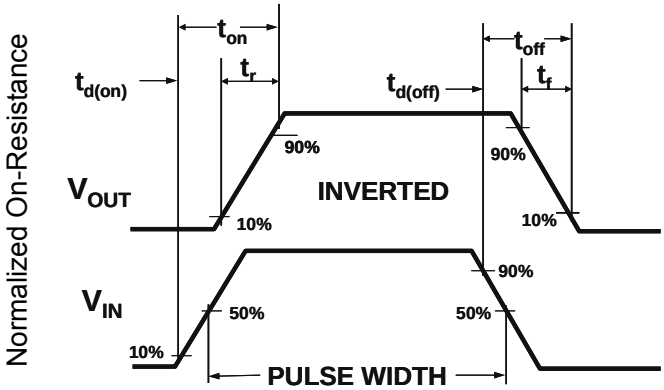


Figure 2:Switching Waveforms

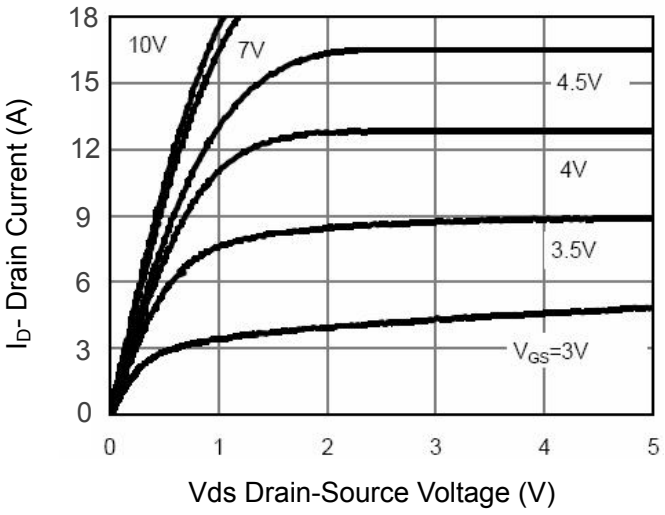


Figure 3 Output Characteristics

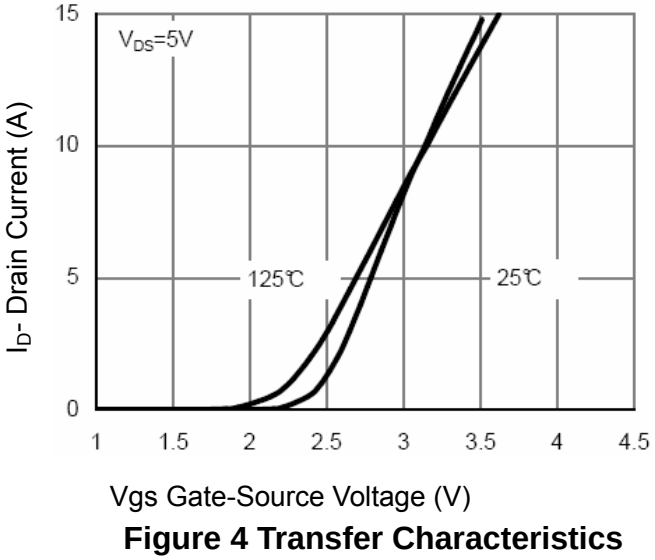


Figure 4 Transfer Characteristics

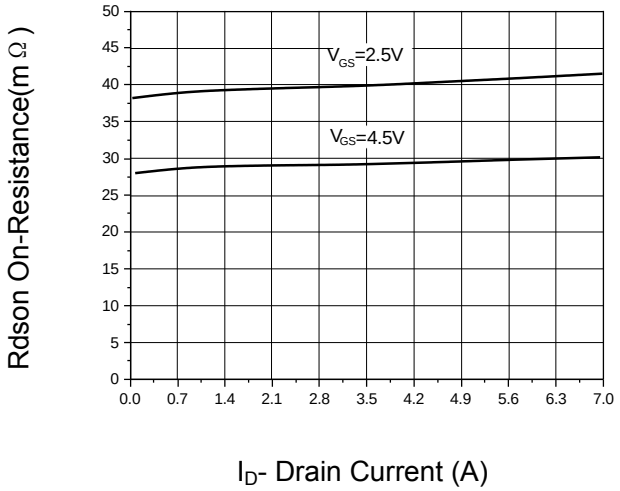


Figure 5 Drain-Source On-Resistance

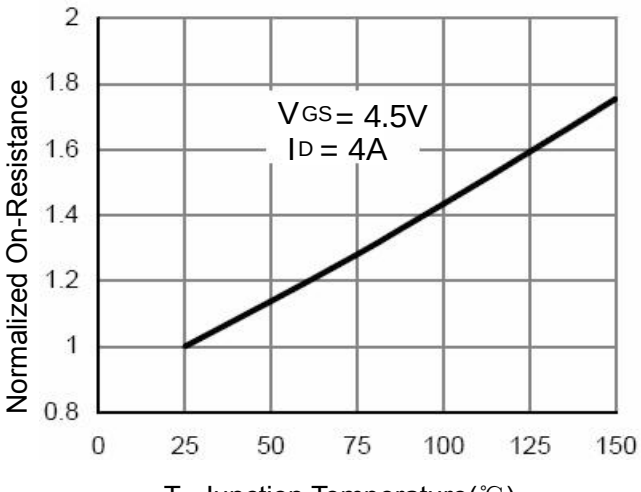
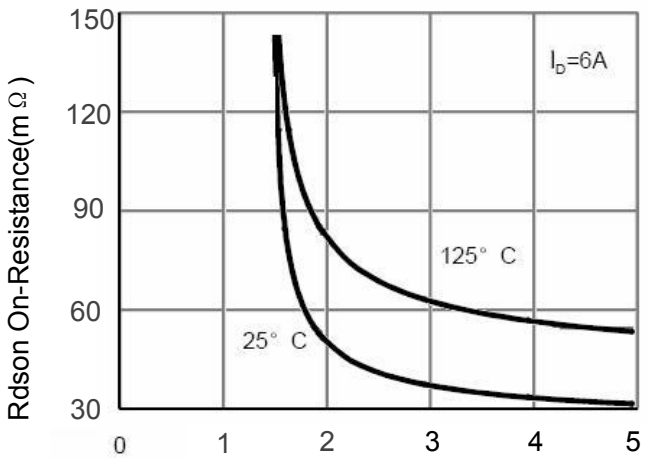
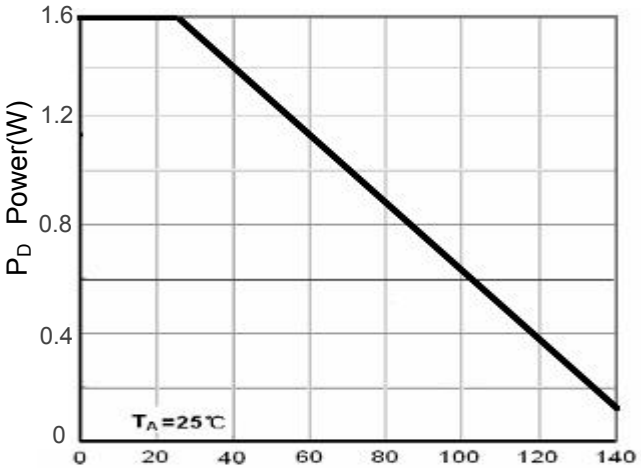


Figure 6 Drain-Source On-Resistance



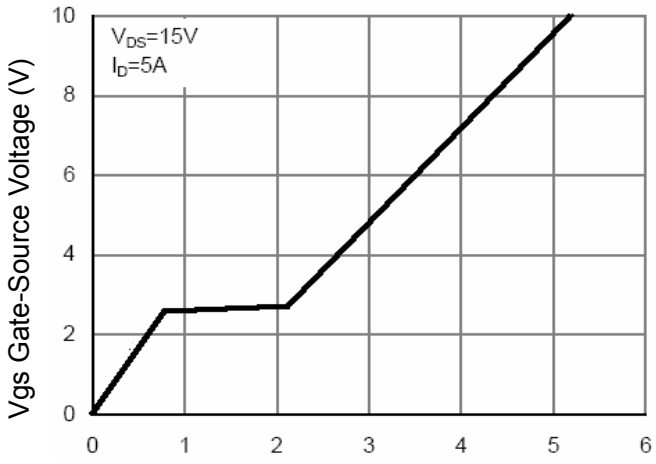
Vgs Gate-Source Voltage (V)

Figure7 Rdson vs Vgs



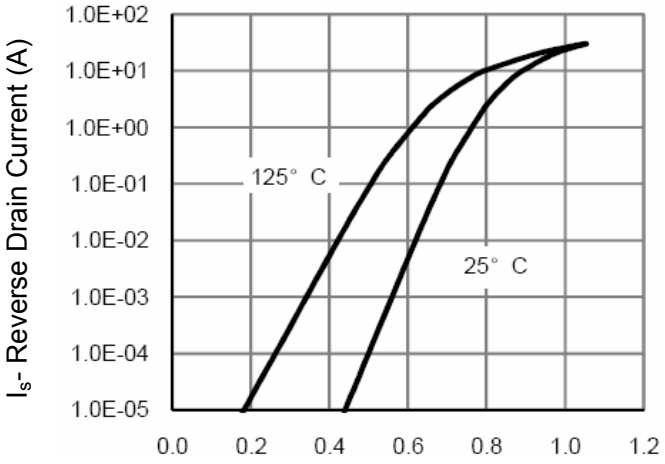
T_J-Junction Temperature(℃)

Figure 8 Power Dissipation



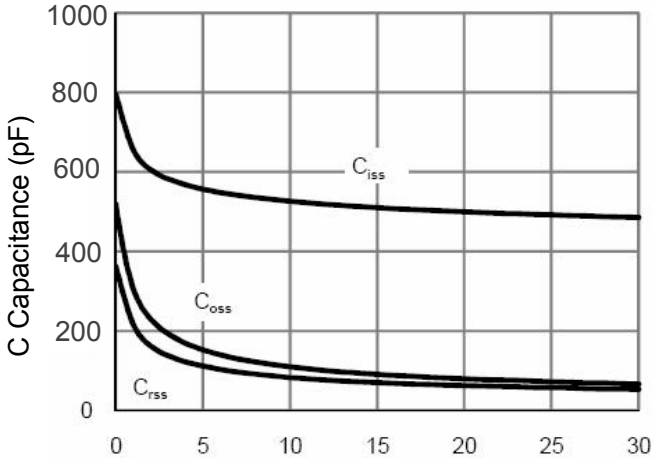
Qg Gate Charge (nC)

Figure 9 Gate Charge



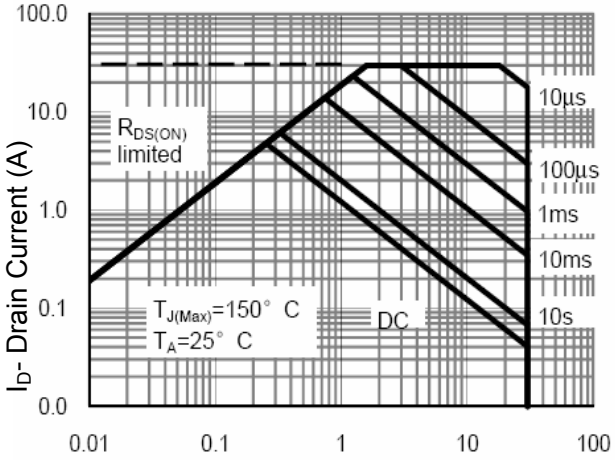
Vds Drain-Source Voltage (V)

Figure 10 Source- Drain Diode Forward



Vds Drain-Source Voltage (V)

Figure 11 Capacitance vs Vds



Vds Drain-Source Voltage (V)

Figure 12 Safe Operation Area

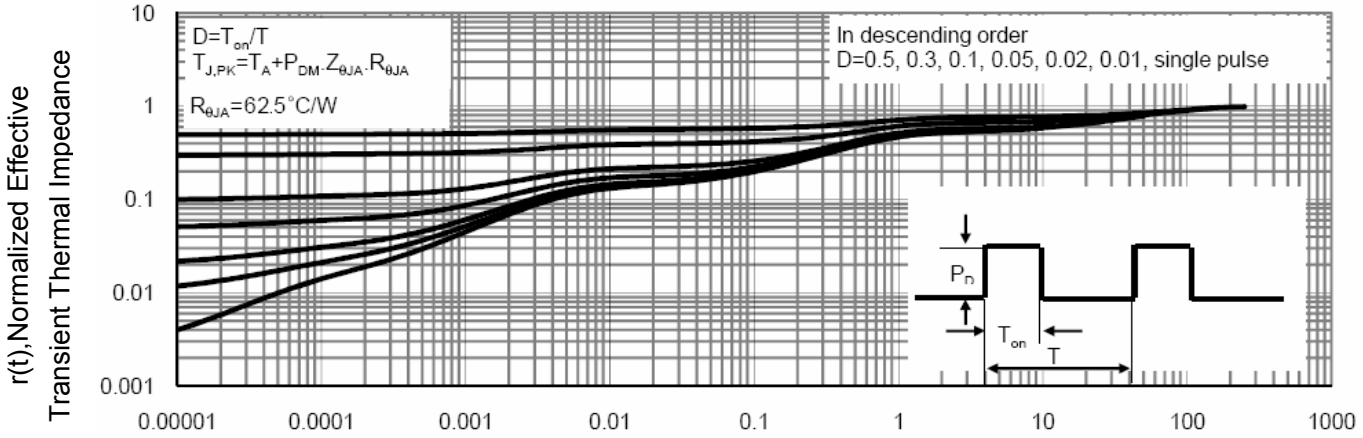


Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics (Curves)

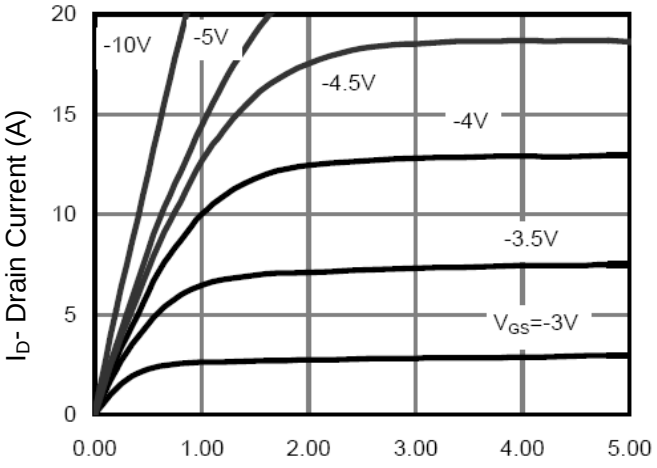


Figure 1 Output CHARACTERISTICS

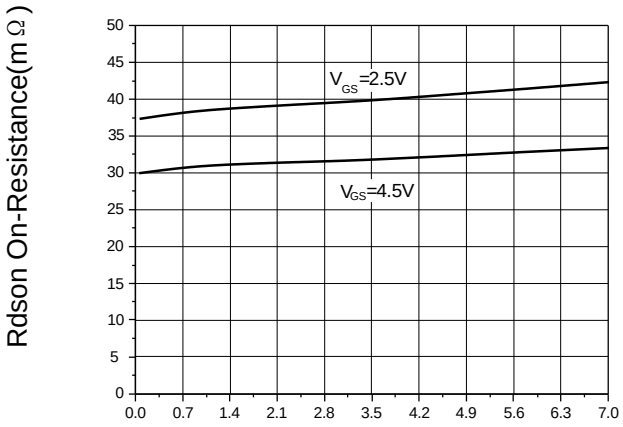


Figure 2 Drain-Source On-Resistance

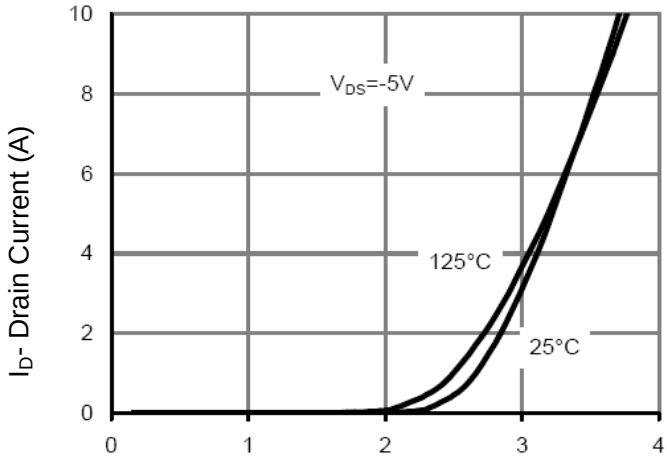


Figure 3 Transfer Characteristics

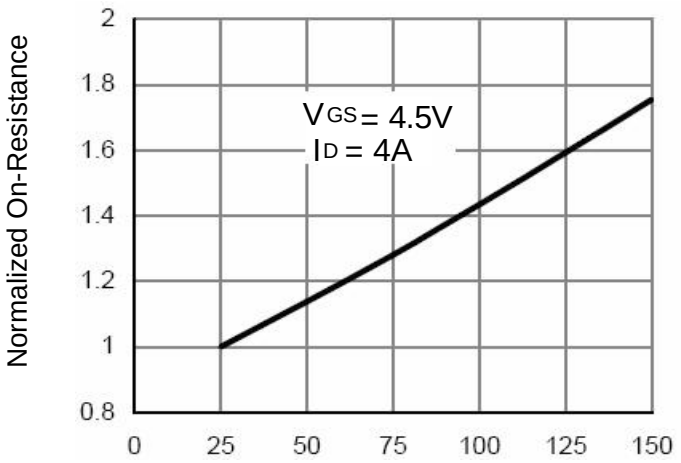


Figure 4 Drain-Source On-Resistance

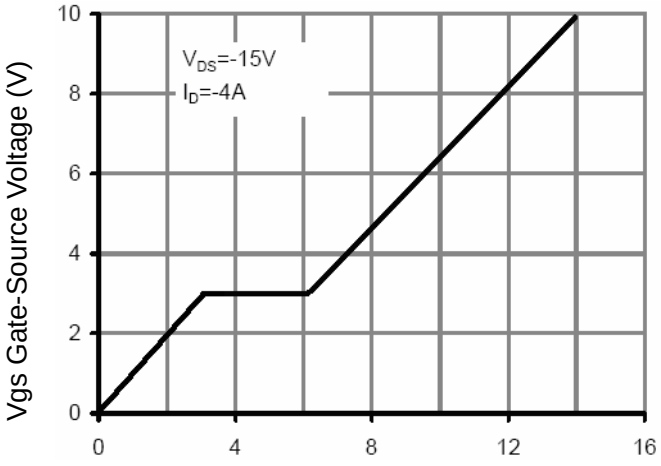


Figure 5 Gate Charge

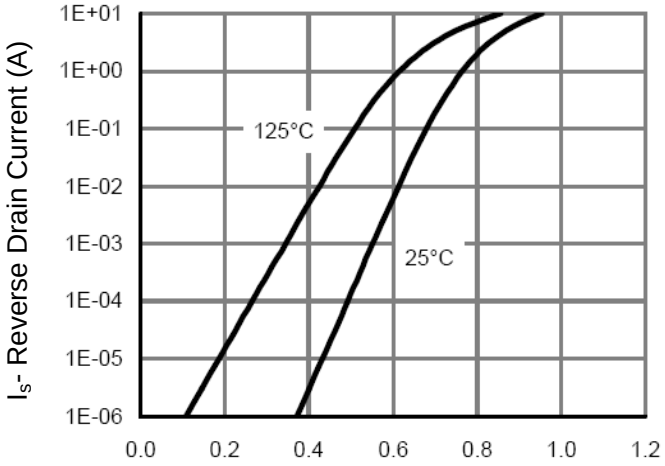


Figure 6 Source- Drain Diode Forward

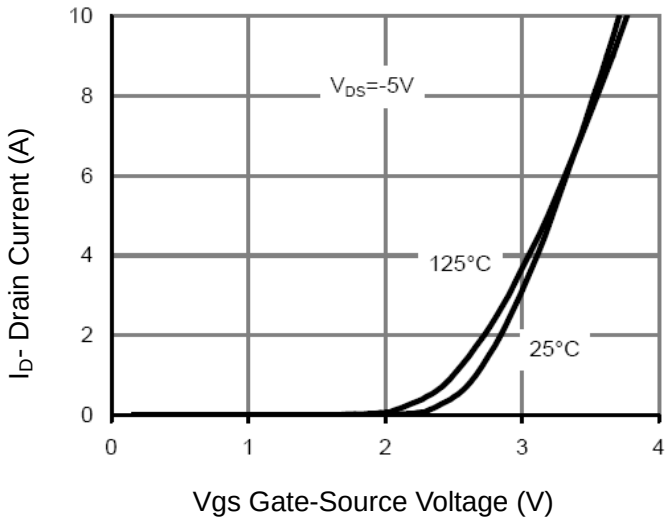


Figure 7 Transfer Characteristics

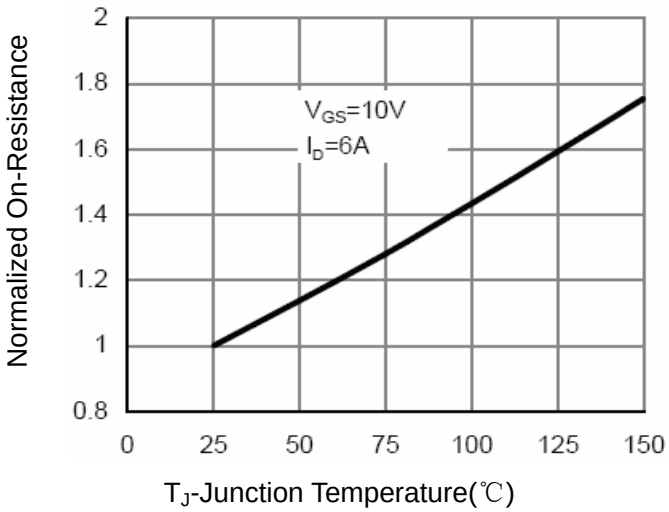


Figure 8 Drain-Source On-Resistance

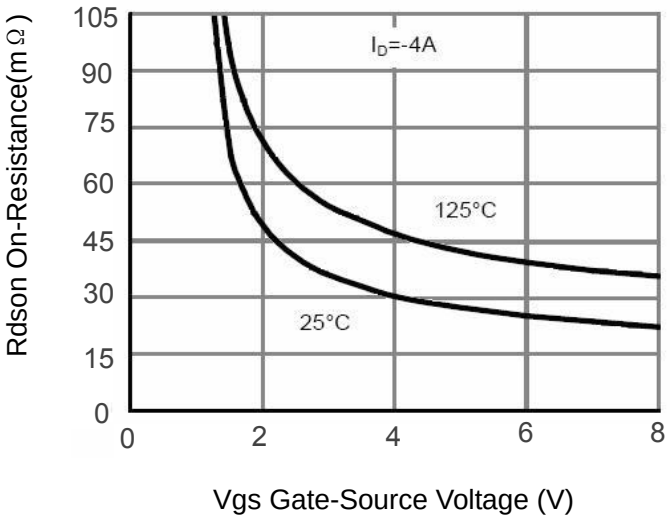


Figure 9 Rdson vs Vgs

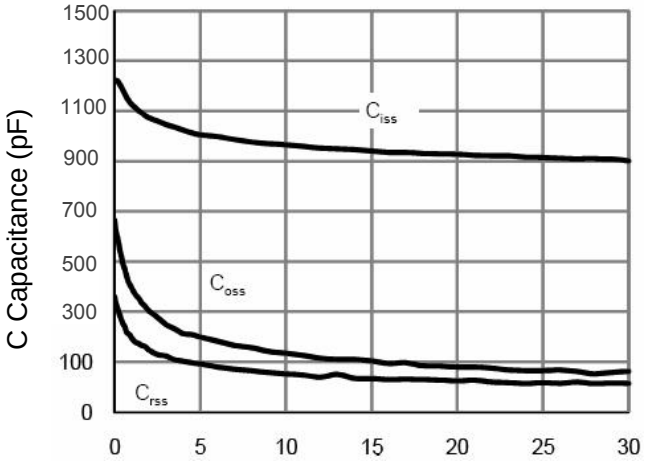


Figure 10 Capacitance vs Vds

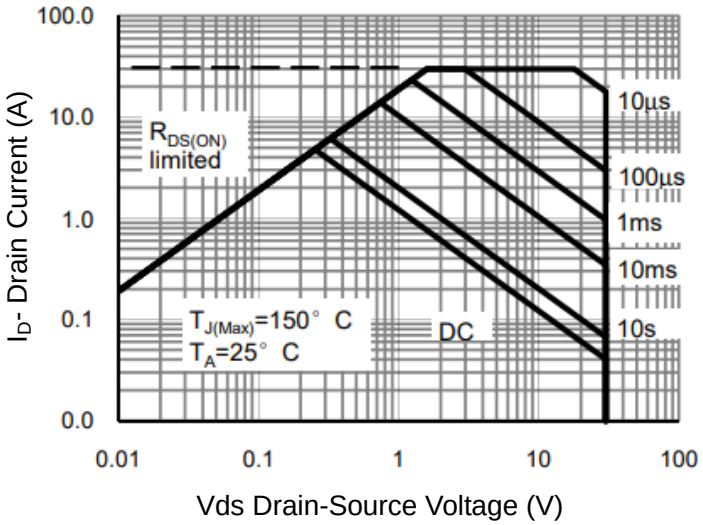


Figure 11 Safe Operation Area

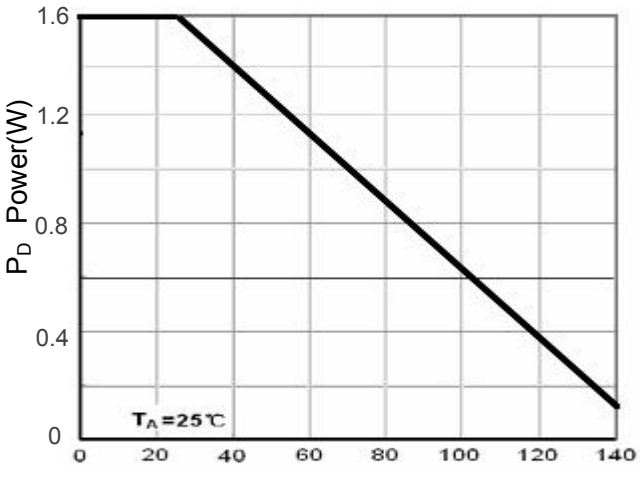
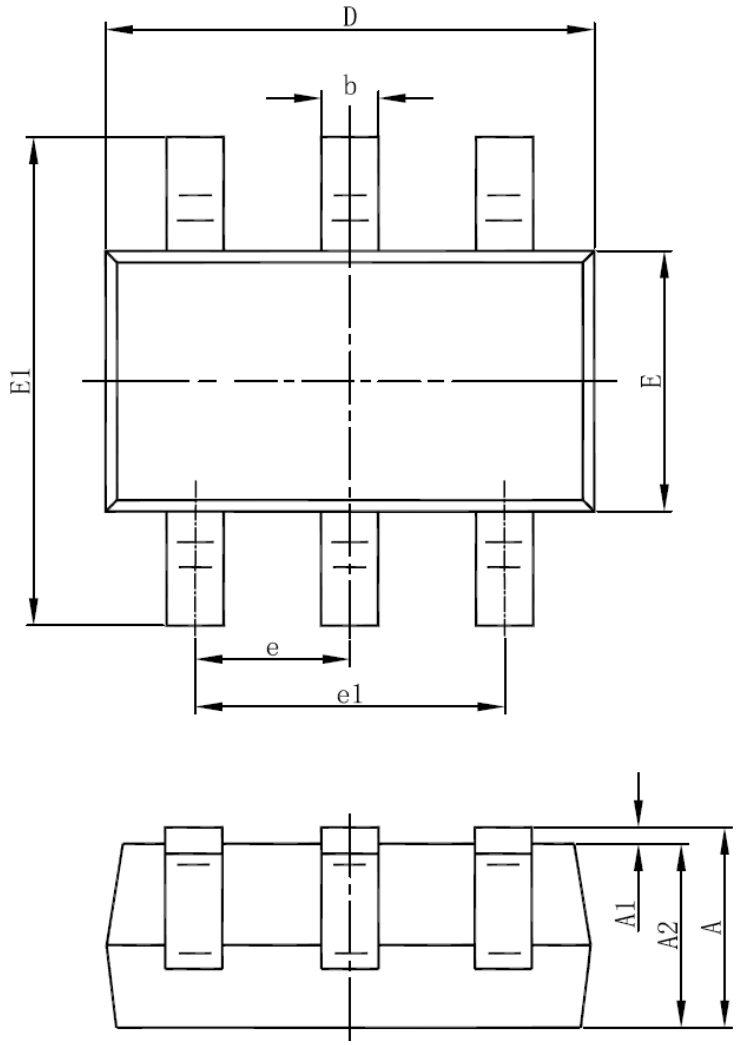


Figure 12 Power Dissipation

Package Information : SOT23-6



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°