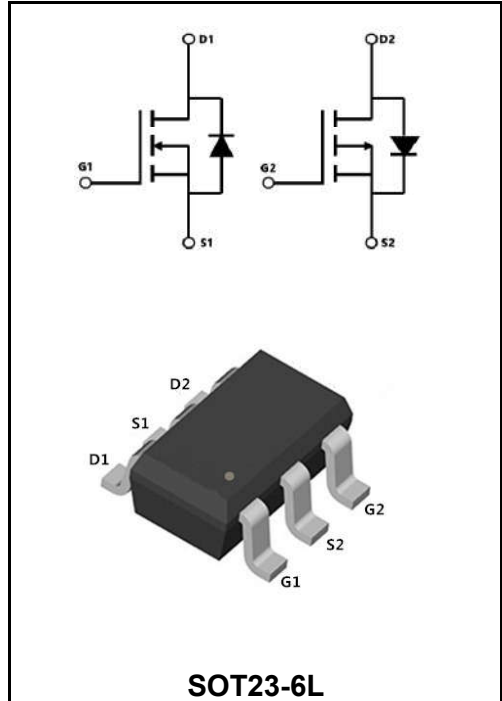


**20V N+P-CHANNEL ENHANCEMENT MODE MOSFET**

**MAIN CHARACTERISTICS**

$I_D$	4.5A
$V_{DSS}$	20V
$R_{DS(on)-typ}(@V_{GS}=4.5V)$	< 35mΩ ( <b>Type:28 mΩ</b> )
$I_D$	-3.8A
$V_{DSS}$	-20V
$R_{DS(on)-typ}(@V_{GS}=-4.5V)$	< 80mΩ ( <b>Type:55 mΩ</b> )



**Application**

◆BLDC

**Product Specification Classification**

Part Number	Package	Marking	Pack
YFW4G02LI	SOT23-6L	YFW 4G02LI	3000PCS/Tape

**Maximum Ratings at Tc=25°C unless otherwise specified**

Characteristics	Symbols	Value		Units
		N-Ch	P-Ch	
Drain-Source Voltage	$V_{DS}$	20	-20	V
Gate - Source Voltage	$V_{GS}$	±20	±20	V
Continuous Drain Current, $V_{GS} @ 10V^1 @ T_A=25^\circ C$	$I_D$	4.5	-3.8	A
Continuous Drain Current, $V_{GS} @ 10V^1 @ T_A=70^\circ C$	$I_D$	3.0	-2.5	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	52	-40	A
Single Pulse Avalanche Energy <sup>3</sup>	$E_{AS}$	12	18	mJ
Total Power Dissipation <sup>4</sup> @ $T_A=25^\circ C$	$P_D$	1.5	1.5	W
Storage Temperature Range	$T_{STG}$	-55 to +150		°C
Operating Junction Temperature Range	$T_J$	-55 to +150		°C
Thermal Resistance Junction-Ambient <sup>1</sup>	$R_{\theta JA}$	105		°C/W
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	50		°C/W

**N-Channel Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	<b>BV<sub>DSS</sub></b>	20	22	-	<b>V</b>
Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	<b>R<sub>DS(ON)</sub></b>	-	28	35	<b>mΩ</b>
	V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A		-	32	40	<b>mΩ</b>
Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	<b>V<sub>GS(th)</sub></b>	0.5	0.75	1.2	<b>V</b>
Drain-Source Leakage Current	V <sub>DS</sub> 16V, V <sub>GS</sub> =0V T <sub>J</sub> =25°C	<b>I<sub>DSS</sub></b>	-	-	1	<b>uA</b>
	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C		-	-	5	
Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	<b>I<sub>GSS</sub></b>	-	-	±100	<b>nA</b>
Forward Transconductance	V <sub>DS</sub> = 5V, I <sub>D</sub> = 3A	<b>g<sub>fs</sub></b>	-	10.5	-	<b>S</b>
Total Gate Charge(4.5V)	V <sub>DS</sub> =15V V <sub>GS</sub> =4.5V I <sub>D</sub> =3A	<b>Q<sub>g</sub></b>	-	4.6	-	<b>nC</b>
Gate-Source Charge		<b>Q<sub>gs</sub></b>	-	0.7	-	
Gate-Drain Charge		<b>Q<sub>gd</sub></b>	-	1.5	-	
Turn-on delay time	V <sub>DD</sub> = 10V V <sub>GS</sub> = 4.5V R <sub>G</sub> = 3.3Ω I <sub>D</sub> = 3A	<b>t<sub>d(on)</sub></b>	-	1.6	-	<b>ns</b>
Rise Time		<b>T<sub>r</sub></b>	-	42	-	
Turn-Off Delay Time		<b>t<sub>d(OFF)</sub></b>	-	14	-	
Fall Time		<b>t<sub>f</sub></b>	-	7	-	
Input Capacitance	V <sub>DS</sub> =15V V <sub>GS</sub> =0V f=1MHz	<b>C<sub>iss</sub></b>	-	310	-	<b>pF</b>
Output Capacitance		<b>C<sub>oss</sub></b>	-	49	-	
Reverse Transfer Capacitance		<b>C<sub>rss</sub></b>	-	35	-	
Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	<b>I<sub>S</sub></b>	-	-	3.6	<b>A</b>
Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	<b>V<sub>SD</sub></b>	-	-	1.2	<b>V</b>

Note :

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≅ 300us , duty cycle ≅ 2%
- 3、 The power dissipation is limited by 150°C junction temperature
- 4、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

**P-Channel Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	<b>BV<sub>DSS</sub></b>	-20	-22	-	<b>V</b>
Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	<b>R<sub>DS(ON)</sub></b>	-	55	80	<b>mΩ</b>
	V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2A		-	75	100	<b>mΩ</b>
Gate -Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	<b>V<sub>GS(th)</sub></b>	-0.45	-0.6	-1.0	<b>V</b>
Drain-Source Leakage Current	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V T <sub>J</sub> =25 °C	<b>I<sub>DSS</sub></b>	-	-	-1	<b>uA</b>
	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>J</sub> =55 °C		-	-	-5	
Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	<b>I<sub>GSS</sub></b>	-	-	±100	<b>nA</b>
Forward Transconductance	V <sub>DS</sub> = -5V, I <sub>D</sub> =- 3A	<b>g<sub>fs</sub></b>	-	12.2	-	<b>S</b>
Total Gate Charge(-4.5V)	V <sub>DS</sub> =-15V V <sub>GS</sub> =-4.5V I <sub>D</sub> =-3A	<b>Q<sub>g</sub></b>	-	10.1	-	<b>nC</b>
Gate-Source Charge		<b>Q<sub>gs</sub></b>	-	1.21	-	
Gate-Drain Charge		<b>Q<sub>gd</sub></b>	-	2.46	-	
Turn-on delay time	V <sub>DD</sub> =-10V V <sub>GS</sub> =-4.5V R <sub>G</sub> = 3.3Ω I <sub>D</sub> =-3A	<b>t<sub>d(on)</sub></b>	-	5.6	-	<b>ns</b>
Rise Time		<b>T<sub>r</sub></b>	-	32.2	-	
Turn-Off Delay Time		<b>t<sub>d(OFF)</sub></b>	-	45.6	-	
Fall Time		<b>t<sub>f</sub></b>	-	29.2	-	
Input Capacitance	V <sub>DS</sub> =-15V V <sub>GS</sub> =0V f=1MHz	<b>C<sub>iss</sub></b>	-	677	-	<b>pF</b>
Output Capacitance		<b>C<sub>oss</sub></b>	-	82	-	
Reverse Transfer Capacitance		<b>C<sub>rss</sub></b>	-	73	-	
Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	<b>I<sub>S</sub></b>	-	-	-3	<b>A</b>
Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25 °C	<b>V<sub>SD</sub></b>	-	-	-1	<b>V</b>

Note :

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≅ 300us , duty cycle ≅ 2%
- 3、 The power dissipation is limited by 150 °C junction temperature
- 4、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

Ratings and Characteristic Curves

N-Channel Typical Characteristics

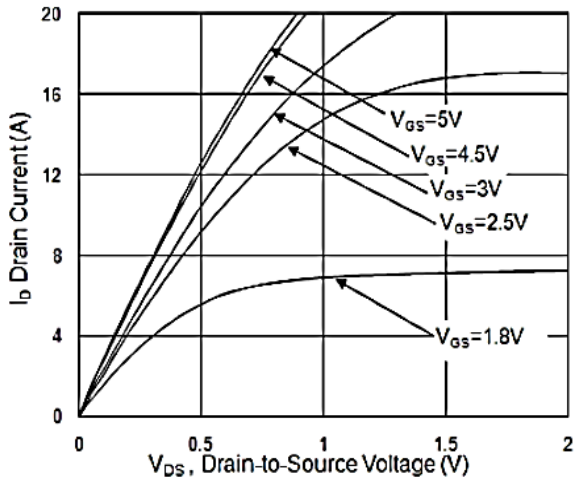


Fig.1 Typical Output Characteristics

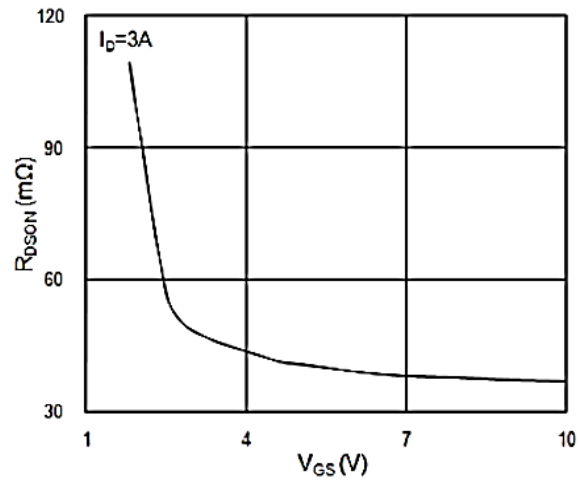


Fig.2 On-Resistance vs. G-S Voltage

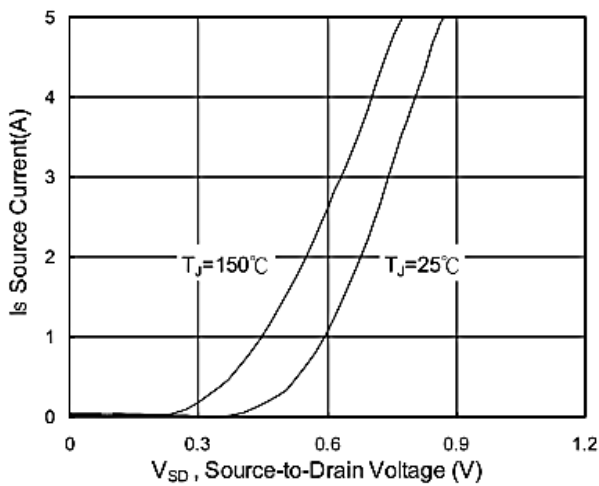


Fig.3 Source Drain Forward Characteristics

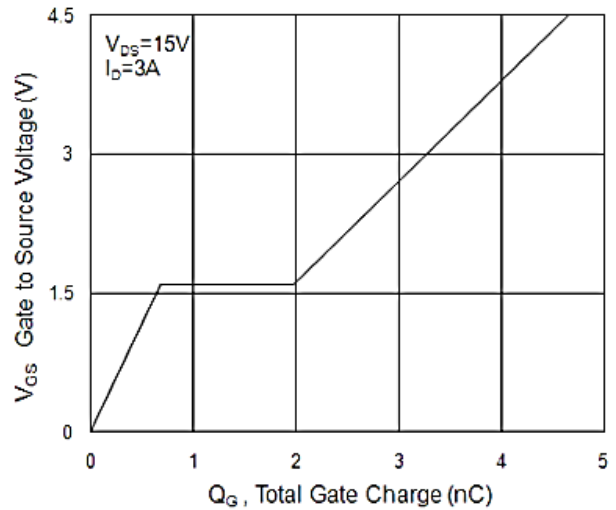


Fig.4 Gate-Charge Characteristics

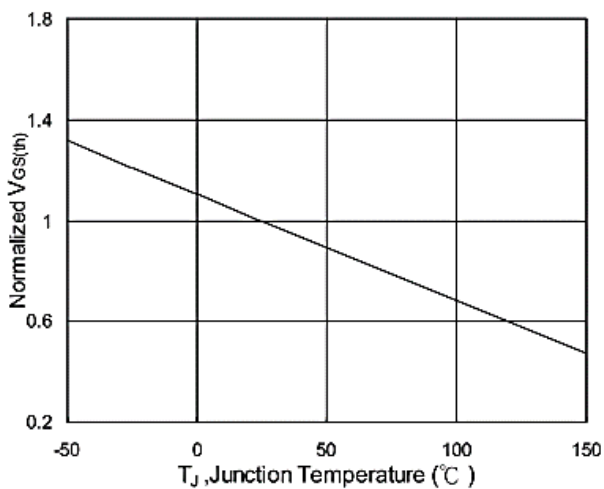


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

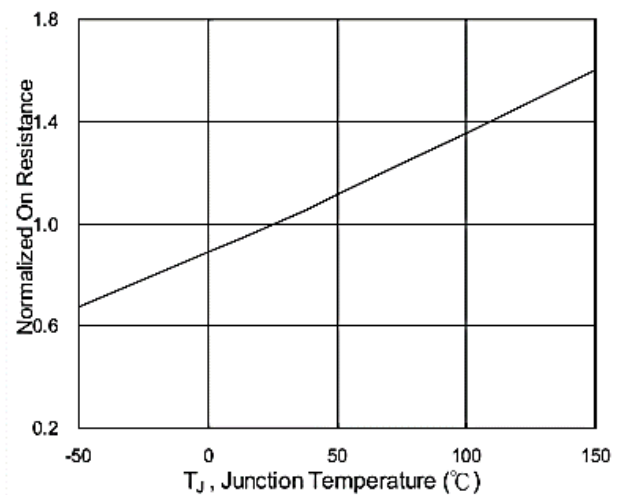


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

Ratings and Characteristic Curves

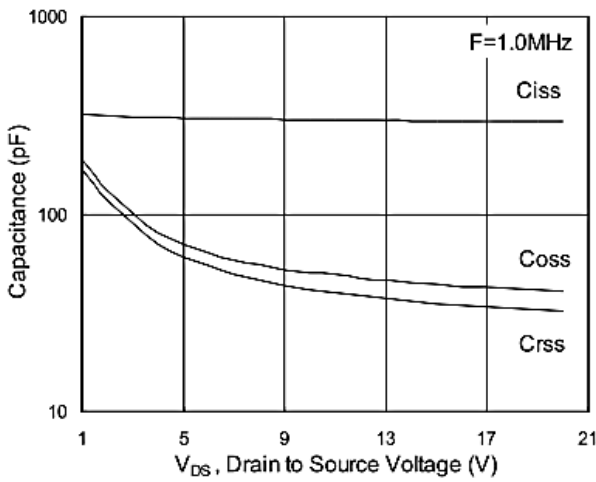


Fig.7 Capacitance

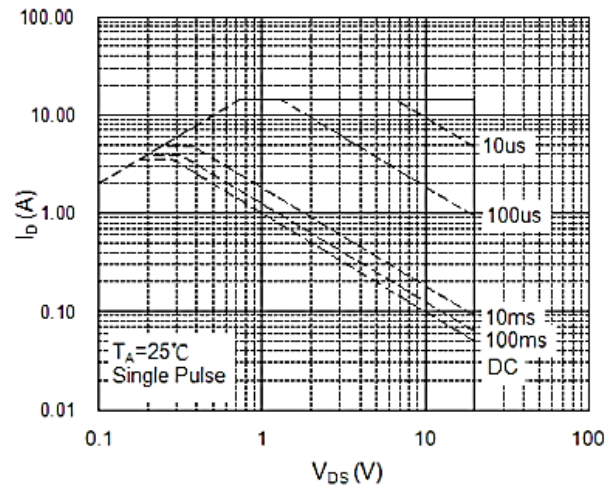


Fig.8 Safe Operating Area

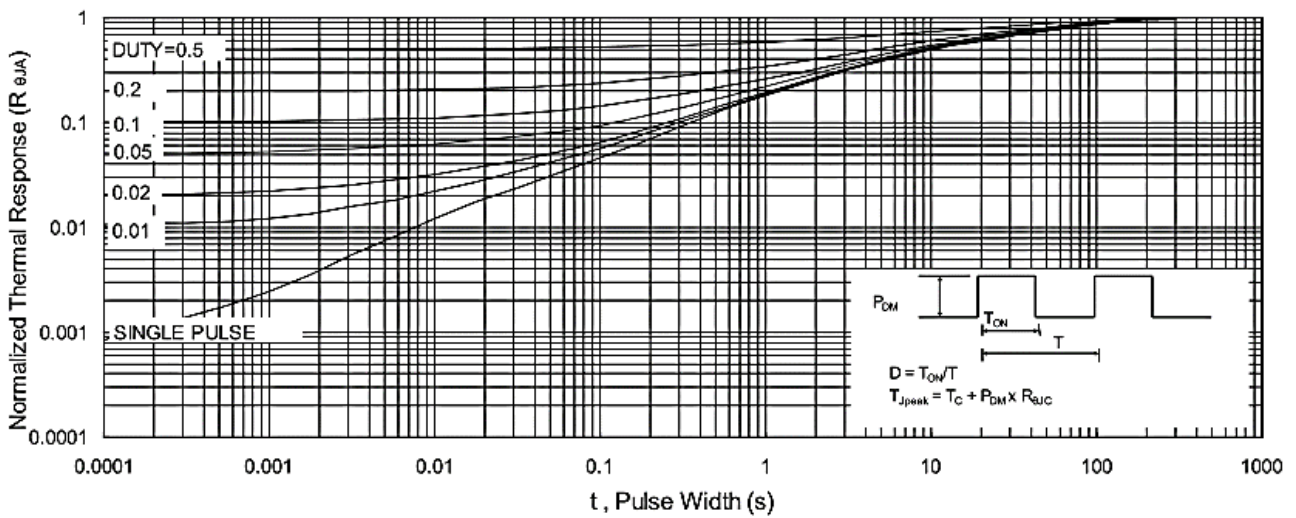


Fig.9 Normalized Maximum Transient Thermal Impedance

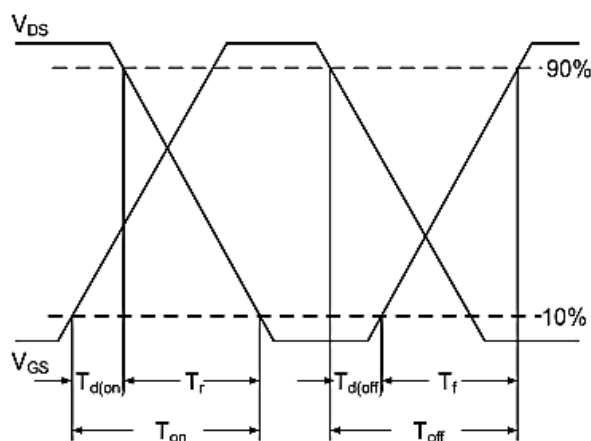


Fig.10 Switching Time Waveform

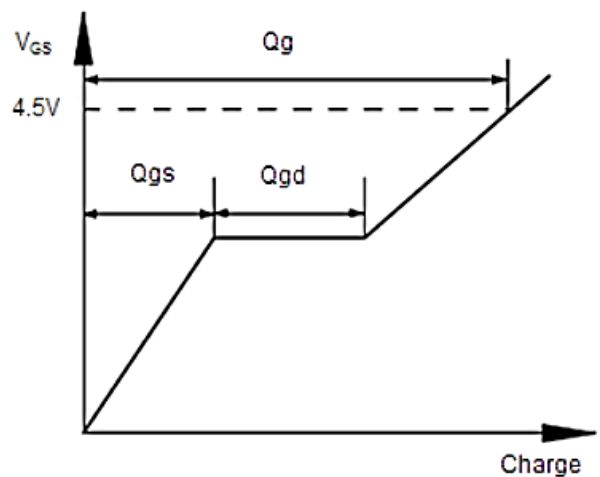


Fig.11 Gate Charge Waveform

Ratings and Characteristic Curves

P-Channel Typical Characteristics

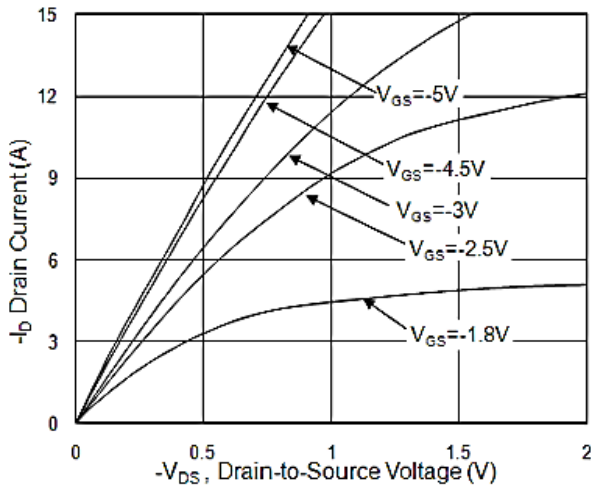


Fig.1 Typical Output Characteristics

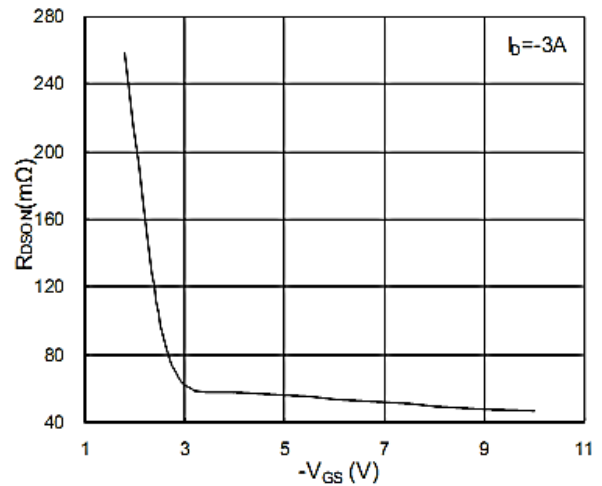


Fig.2 On-Resistance vs. Gate-Source

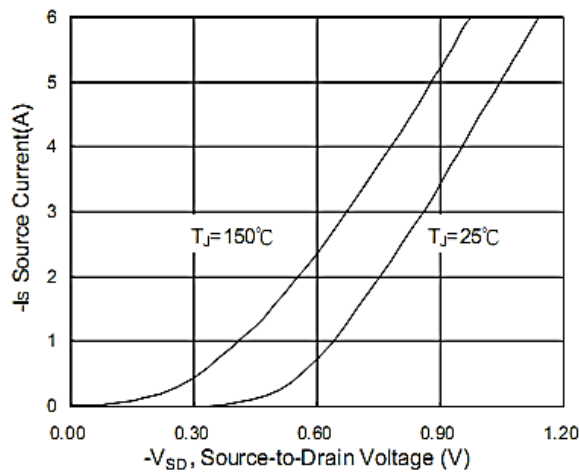


Fig.3 Forward Characteristics Of Reverse

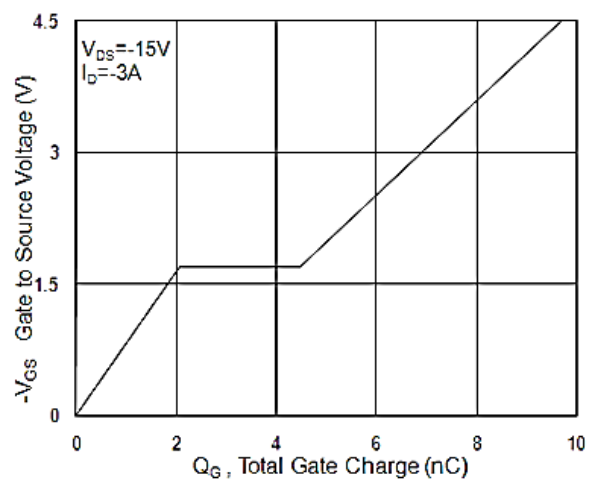


Fig.4 Gate-Charge Characteristics

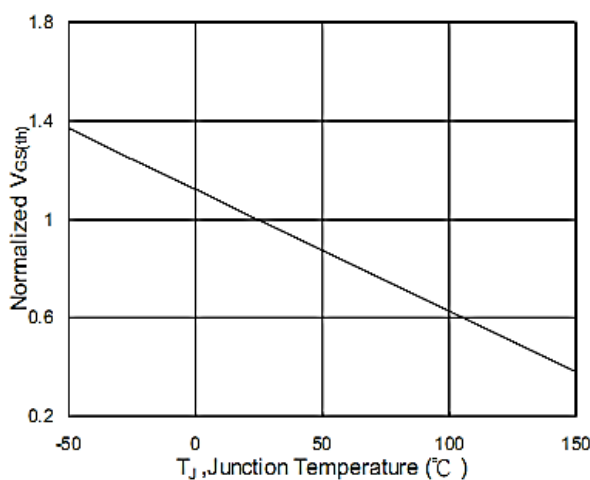


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

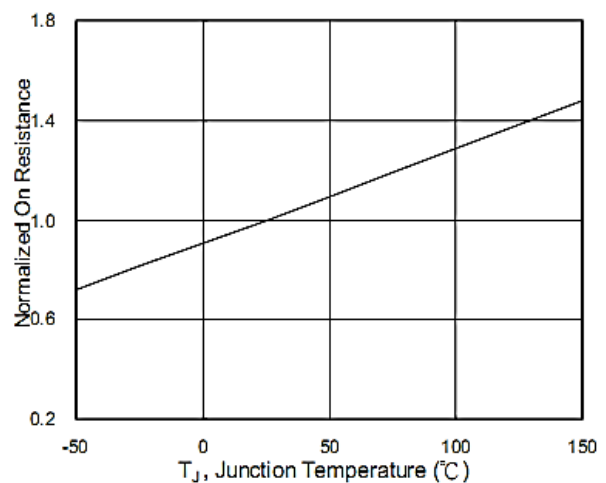


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

Ratings and Characteristic Curves

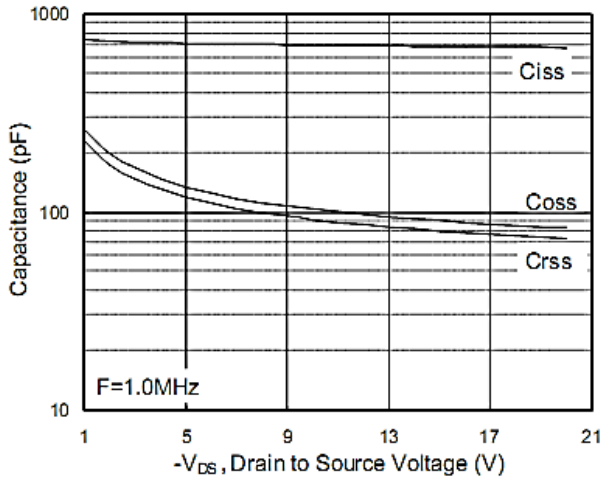


Fig.7 Capacitance

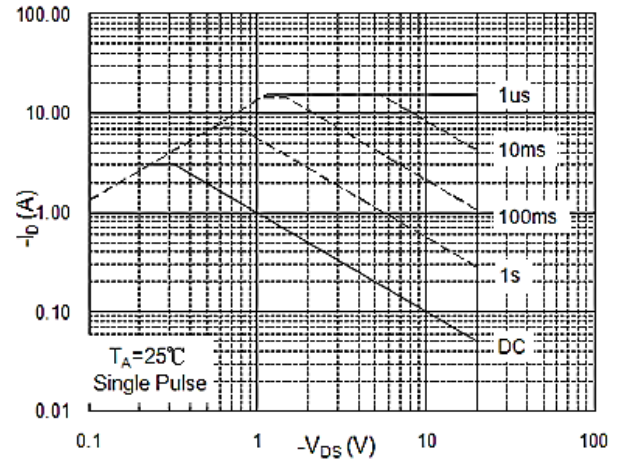


Fig.8 Safe Operating Area

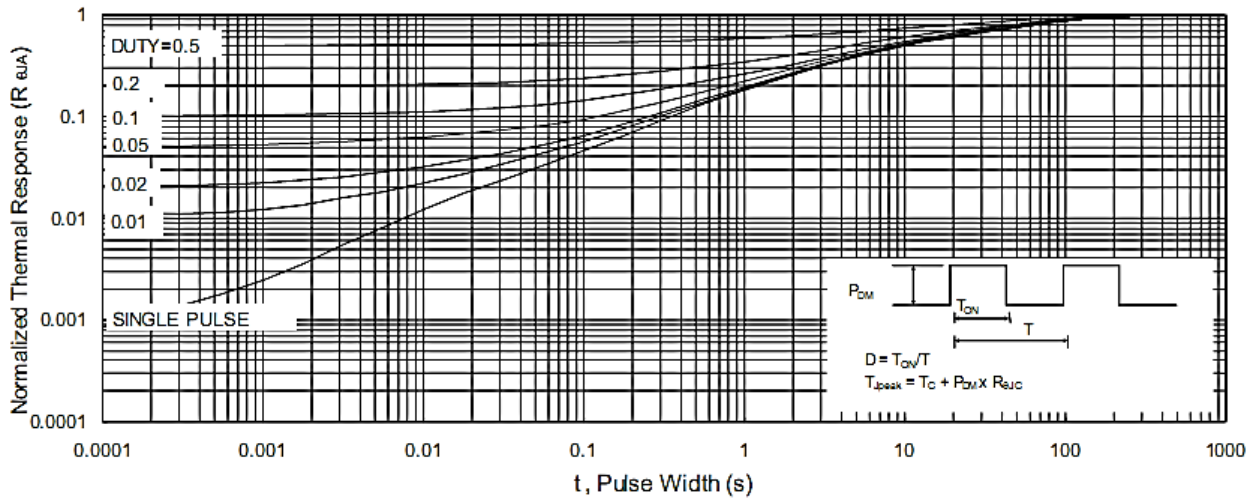


Fig.9 Normalized Maximum Transient Thermal Impedance

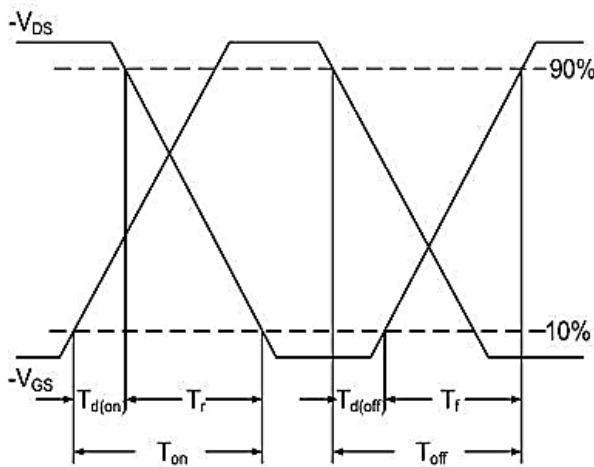


Fig.10 Switching Time Waveform

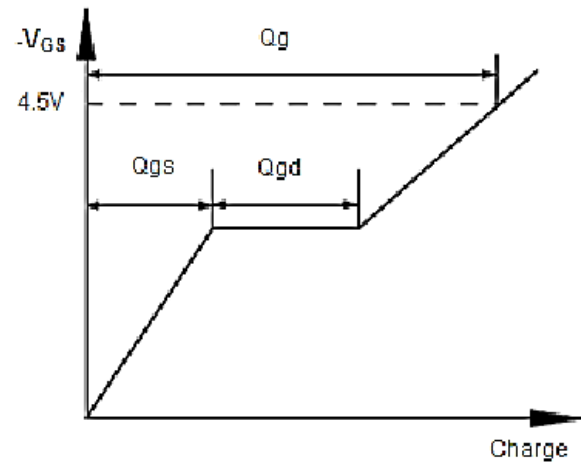
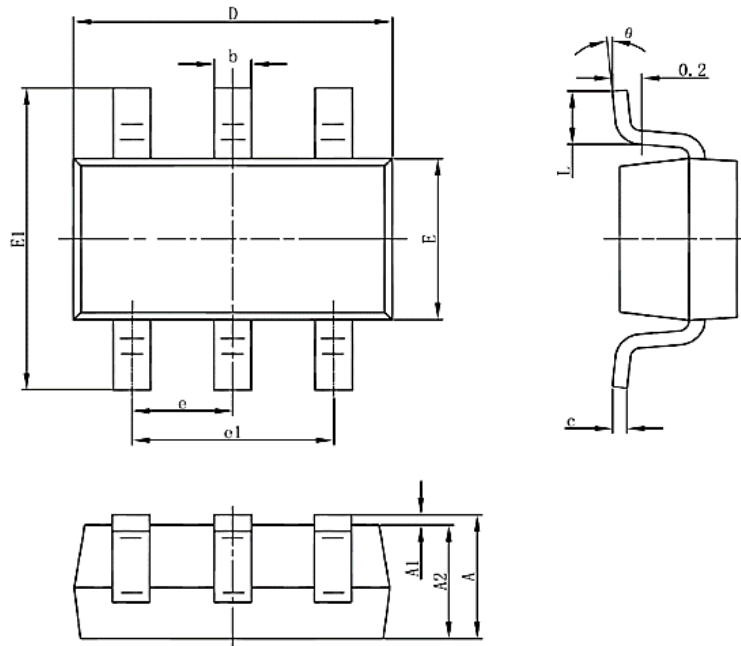


Fig.11 Gate Charge Waveform

**SOT23-6L**



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