GOOD-ARK

SEMICONDUCTOR

SSF2116
20V N-Channel + P-Channel Complementary MOSFETs

Main Product Characteristics

Polarity	N-Ch	P-Ch
V_{DSS}	20V	-20V
$R_{DS(ON)(Max.)}$	40mΩ	100mΩ
I_D	3.8A	-2.5A

SOT-23-6L

Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for notebook, load switch, networking and hand-held devices
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery

RoHS Compliant

Description

The SSF2116 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supply and a wide variety of other applications.

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	N-Channel	P-Channel	Unit
V_{DS}	Drain-Source Voltage	20	-20	V
V_{GS}	Gate-Source Voltage	±10	±10	V
I_D	Drain Current – Continuous (T_C=25°C	3.8	-2.5	A
	Drain Current – Continuous (T_C=100°C)	2.3	-1.5	A
I_{DM}	Drain Current – Pulsed[1]	15.2	-10	A
P_D	Power Dissipation (T_C=25°C)	1.25	1.25	W
	Power Dissipation – Derate above 25°C	0.01	0.01	W/°C
T_{STG}	Storage Temperature Range	-55 to +150		°C
T_J	Operating Junction Temperature Range	-55 to +150		°C

Thermal Characteristics

Symbol	Parameter	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	100	°C/W

N-Channel Electrical Characteristics (T_J=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V , I_D=250uA	20	---	---	V
BV_{DSS} Temperature Coefficient	$\triangle BV_{DSS}/\triangle T_J$	Reference to 25°C , I_D=1mA	---	0.02	---	V/°C
Drain-Source Leakage Current	I_{DSS}	V_{DS}=20V , V_{GS}=0V , T_J=25°C	---	---	1	uA
		V_{DS}=16V , V_{GS}=0V , T_J=125°C	---	---	10	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±10V , V_{DS}=0V	---	---	±100	nA
On Characteristics						
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=4.5V , I_D=3A	---	30	40	mΩ
		V_{GS}=2.5V , I_D=2A	---	42	55	
		V_{GS}=1.8V , I_D=1.5A	---	55	70	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS} , I_D =250uA	0.3	0.6	1	V
$V_{GS(th)}$ Temperature Coefficient	$\triangle V_{GS(th)}$		---	-2	---	mV/°C
Forward Transconductance	gfs	V_{DS}=10V , I_D=2A	---	4.4	---	S
Dynamic and Switching Characteristics						
Total Gate Charge[2, 3]	Q_g	V_{DS}=10V , V_{GS}=4.5V , I_D=3A	---	5.8	10	nC
Gate-Source Charge[2, 3]	Q_{gs}		---	0.6	1.5	
Gate-Drain Charge[2, 3]	Q_{gd}		---	1.5	3	
Turn-On Delay Time[2, 3]	$T_{d(on)}$	V_{DD}=10V , V_{GS}=4.5V , R_G=25Ω , I_D=1A	---	2.9	6	nS
Rise Time[2, 3]	T_r		---	8.4	16	
Turn-Off Delay Time[2, 3]	$T_{d(off)}$		---	19.2	38	
Fall Time[2, 3]	T_f		---	5.6	12	
Input Capacitance	C_{iss}	V_{DS}=15V , V_{GS}=0V , F=1MHz	---	315	600	pF
Output Capacitance	C_{oss}		---	50	80	
Reverse Transfer Capacitance	C_{rss}		---	40	60	
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current	I_S	V_G=V_D=0V , Force Current	---	---	3.8	A
Pulsed Source Current	I_{SM}		---	---	7.6	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V , I_S=1A , T_J=25°C	---	---	1	V

Notes:

1. Repetitive Rating: Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≦ 300uS, duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$, $I_D=-250uA$	-20	---	---	V
BV_{DSS} Temperature Coefficient	$\triangle BV_{DSS}/\triangle T_J$	Reference to 25°C , $I_D=-1mA$	---	-0.01	---	V/°C
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-20V$, $V_{GS}=0V$, $T_J=25°C$	---	---	-1	uA
		$V_{DS}=-16V$, $V_{GS}=0V$, $T_J=125°C$	---	---	-10	uA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm10V$, $V_{DS}=0V$	---	---	±100	nA
On Characteristics						
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V$, $I_D=-3A$	---	82	100	mΩ
		$V_{GS}=-2.5V$, $I_D=-2A$	---	125	140	
		$V_{GS}=-1.8V$, $I_D=-1A$	---	197	230	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=-250uA$	-0.3	-0.6	-1.0	V
$V_{GS(th)}$ Temperature Coefficient	$\triangle V_{GS(th)}$		---	3	---	mV/°C
Forward Transconductance	gfs	$V_{DS}=-10V$, $I_D=-1A$	---	2.2	---	S
Dynamic and Switching Characteristics						
Total Gate Charge[2, 3]	Q_g	$V_{DS}=-10V$, $V_{GS}=-4.5V$, $I_D=-2A$	---	4.8	10	nC
Gate-Source Charge[2, 3]	Q_{gs}		---	0.5	1	
Gate-Drain Charge[2, 3]	Q_{gd}		---	1.9	4	
Turn-On Delay Time[2, 3]	$T_{d(on)}$	$V_{DD}=-10V$, $V_{GS}=-4.5V$, $R_G=25\Omega$, $I_D=-1A$	---	3.5	7	nS
Rise Time[2, 3]	T_r		---	12.6	24	
Turn-Off Delay Time[2, 3]	$T_{d(off)}$		---	32.6	62	
Fall Time[2, 3]	T_f		---	8.4	16	
Input Capacitance	C_{iss}	$V_{DS}=-15V$, $V_{GS}=0V$, F=1MHz	---	350	510	pF
Output Capacitance	C_{oss}		---	65	95	
Reverse Transfer Capacitance	C_{rss}		---	50	75	
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current	I_S	$V_G=V_D=0V$, Force Current	---	---	-2.5	A
Pulsed Source Current	I_{SM}		---	---	-5	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0V$, $I_S=-1A$, $T_J=25°C$	---	---	-1	V

Notes:
1. Repetitive Rating: Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width $\leqq$ 300uS, duty cycle $\leqq$ 2%.
3. Essentially independent of operating temperature.

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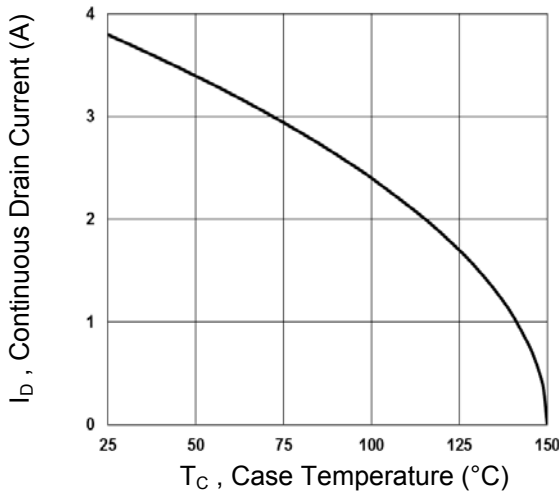## N-Channel Typical Characteristic Curves

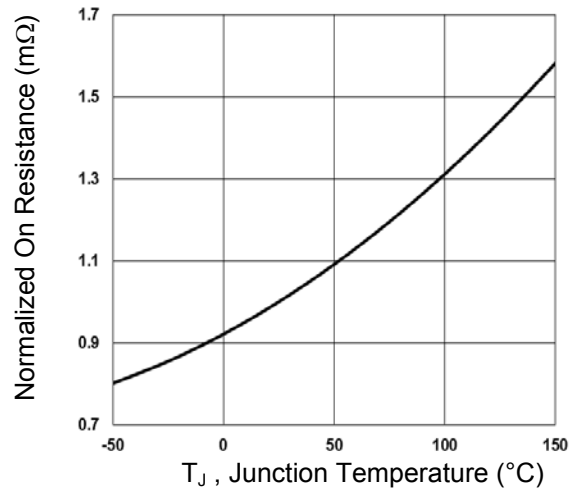**Fig.1   Continuous Drain Current vs. T_C**

Fig.2   Normalized $R_{DS(ON)}$ vs. T_J
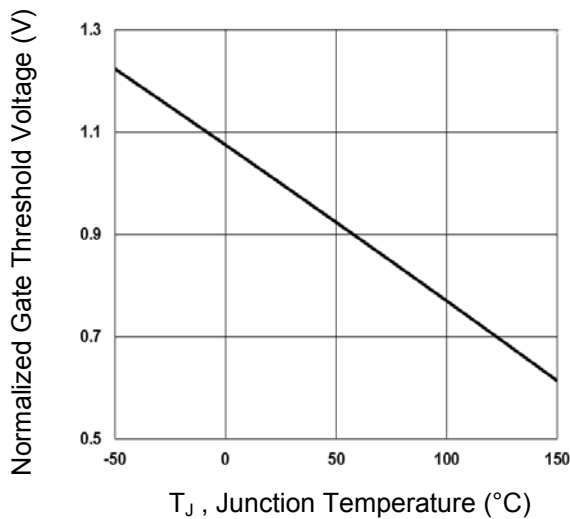

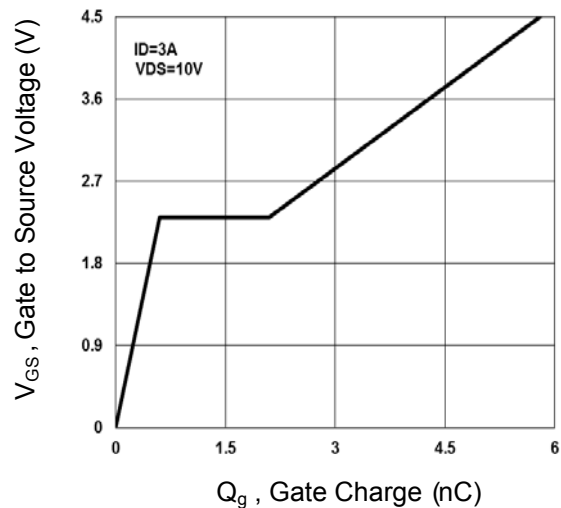**Fig.3   Normalized V_{th} vs. T_J**
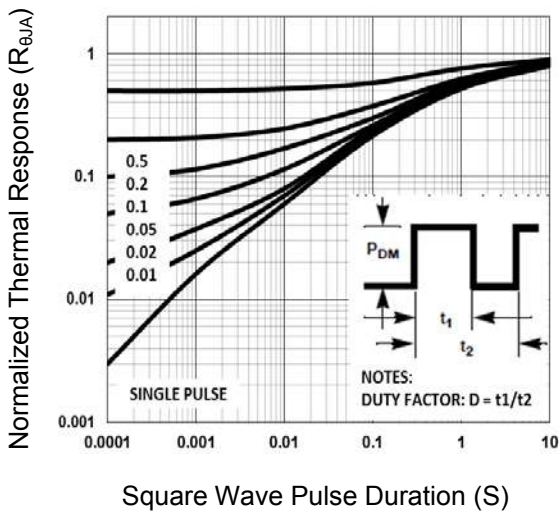

Fig.4   Gate Charge Waveform

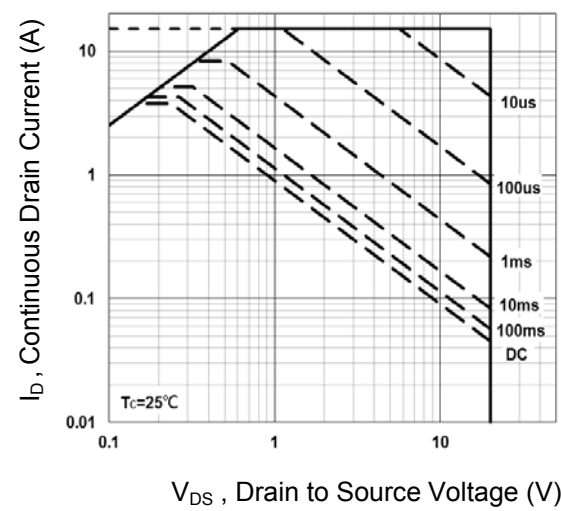

Fig.5   Normalized Transient Impedance

Fig.6   Maximum Safe Operation Area
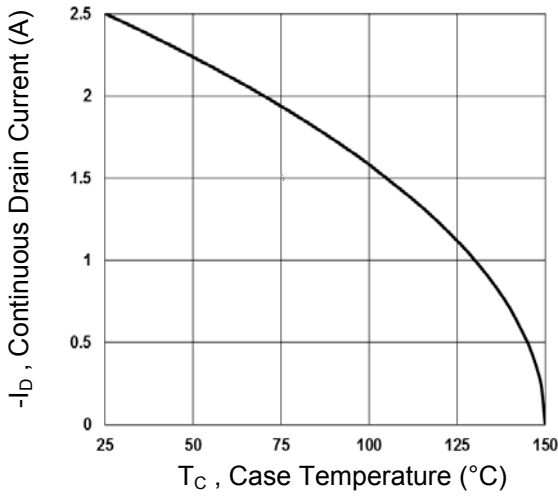
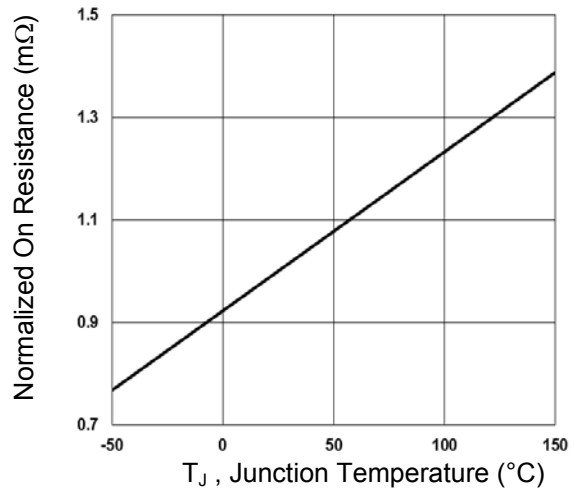## P-Channel Typical Characteristic Curves

Fig.7 Continuous Drain Current vs. T_C

Fig.8 Normalized R_DS(ON) vs. T_J
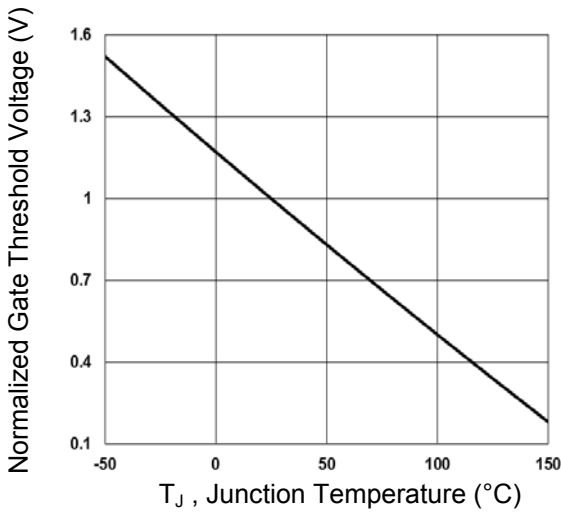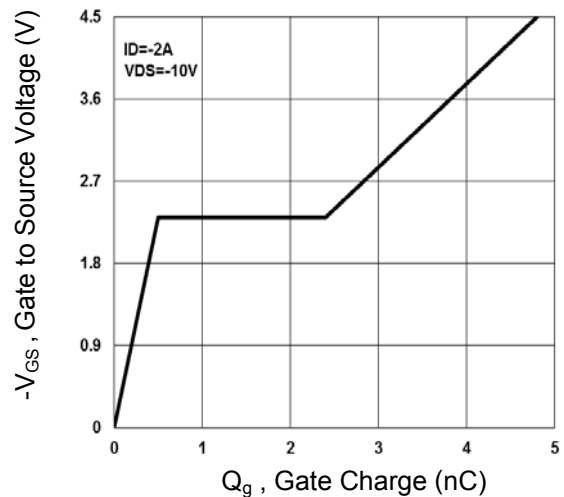

Fig.9 Normalized V_th vs. T_J
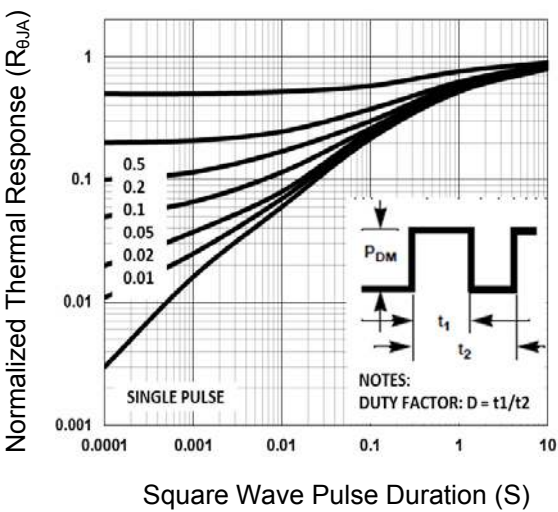

Fig.10 Gate Charge Waveform

Fig.11 Normalized Transient Impedance
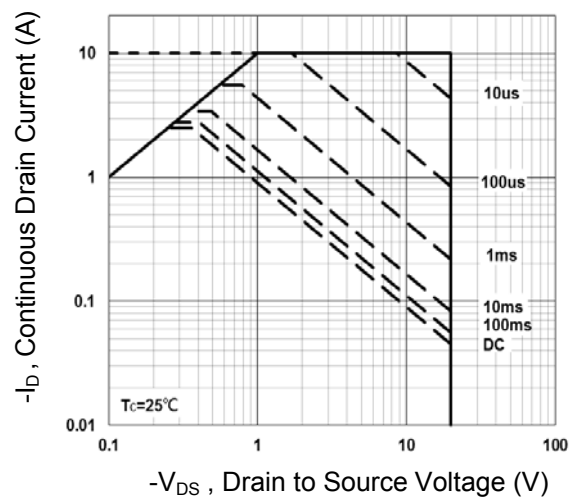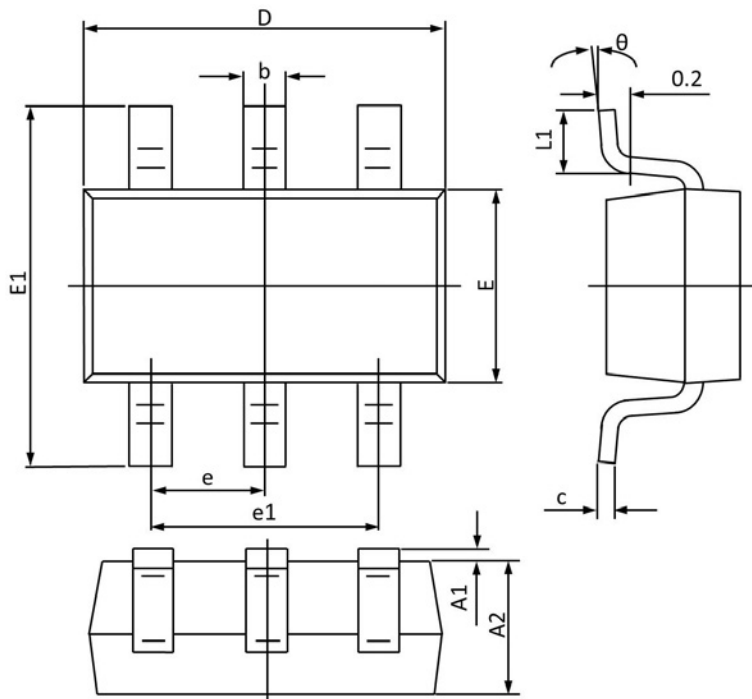

Fig.12 Maximum Safe Operation Area

Package Outline Dimensions   SOT-23-6L

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A1	0.000	0.100	0.000	0.004
A2	1.000	1.200	0.040	0.047
b	0.300	0.500	0.012	0.019
c	0.047	0.207	0.002	0.008
D	2.800	3.000	0.110	0.118
E	1.500	1.800	0.059	0.070
E1	2.600	3.000	0.103	0.118
e	0.950 TYP		0.037 TYP	
e1	1.900 TYP		0.075 TYP	
L1	0.250	0.550	0.010	0.021
θ	0°	8°	0°	8°

Order Information

Device	Package	Marking Code	Carrier	Quantity	HSF Status
SSF2116	SOT-23-6L	c	Tape & Reel	3000/Reel	RoHS Compliant