GOOD-ARK SEMICONDUCTOR

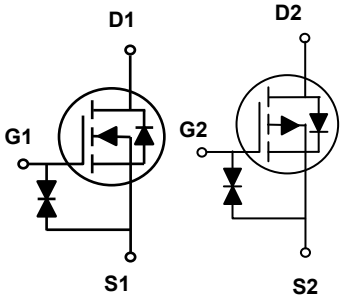
SSF2120Y

20V N-Channel + P-Channel Complementary MOSFET

Main Product Characteristics

$V_{(BR)DSS}$	20V	-20V
$R_{DS(ON)}$	300mΩ	600mΩ
I_D	800mA	-400mA

SOT-563



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

Description

The SSF2120Y 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)

Parameter	Symbol	Value		Unit
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	±8	±8	V
Drain Current – Continuous (T_C=25°C)	I_D	800	-400	mA
Drain Current – Continuous (T_C=100°C)		510	-250	mA
Drain Current – Pulsed[1]	I_{DM}	3.2	-1.6	A
Power Dissipation (T_C=25°C)	P_D	312	312	mW
Power Dissipation – Derate above 25°C	P_D	2.5	2.5	mW/°C
Storage Temperature Range	T_{STG}	-55 to +150	-55 to +150	°C
Operating Junction Temperature Range	T_J	-55 to +150	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	---	400	°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	---	-0.01	---	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}=±6V , V_{DS}=0V	---	---	±20	uA
On Characteristics						
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=4.5V , I_D=0.5A	---	200	300	mΩ
		V_{GS}=2.5V , I_D=0.4A	---	235	400	
		V_{GS}=1.8V , I_D=0.2A	---	295	550	
		V_{GS}=1.5V , I_D=0.1A	---	365	800	
		V_{GS}=1.2V , I_D=0.1A	---	600	1500	
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
Dynamic and Switching Characteristics						
Total Gate Charge[2, 3]	Q_g	V_{DS}=10V , V_{GS}=4.5V , I_D=0.5A	---	1	2	nC
Gate-Source Charge[2, 3]	Q_{gs}		---	0.26	0.5	
Gate-Drain Charge[2, 3]	Q_{gd}		---	0.2	0.4	
Turn-On Delay Time[2, 3]	$T_{d(on)}$	V_{DD}=10V , V_{GS}=4.5V , R_G=10Ω I_D=0.5A	---	5	10	nS
Rise Time[2, 3]	T_r		---	3.5	7	
Turn-Off Delay Time[2, 3]	$T_{d(off)}$		---	14	28	
Fall Time[2, 3]	T_f		---	6	12	
Input Capacitance	C_{iss}	V_{DS}=10V , V_{GS}=0V , F=1MHz	---	38.2	75	pF
Output Capacitance	C_{oss}		---	14.4	28	
Reverse Transfer Capacitance	C_{rss}		---	6	12	
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current	I_S	V_G=V_D=0V , Force Current	---	---	0.8	A
Pulsed Source Current	I_{SM}		---	---	1.6	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V , I_S=0.2A , T_J=25°C	---	---	1	V

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}=±8V , V_{DS}=0V	---	---	±20	uA
On Characteristics						
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V , I_D=-0.3A	---	440	600	mΩ
		V_{GS}=-2.5V , I_D=-0.2A	---	610	850	
		V_{GS}=-1.8V , I_D=-0.1A	---	810	1200	
		V_{GS}=-1.5V , I_D=-0.1A	---	1020	1600	
		V_{GS}=-1.2V , I_D=-0.1A	---	1800	3000	
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
Dynamic and Switching Characteristics						
Total Gate Charge[2, 3]	Q_g	V_{DS}=-10V , V_{GS}=-4.5V , I_D=-0.2A	---	1	2	nC
Gate-Source Charge[2, 3]	Q_{gs}		---	0.28	0.5	
Gate-Drain Charge[2, 3]	Q_{gd}		---	0.18	0.4	
Turn-On Delay Time[2, 3]	$T_{d(on)}$	V_{DD}=-10V , V_{GS}=-4.5V , R_G=10Ω I_D=-0.2A	---	8	16	nS
Rise Time[2, 3]	T_r		---	5.2	10	
Turn-Off Delay Time[2, 3]	$T_{d(off)}$		---	30	60	
Fall Time[2, 3]	T_f		---	18	36	
Input Capacitance	C_{iss}	V_{DS}=-10V , V_{GS}=0V , F=1MHz	---	40	78	pF
Output Capacitance	C_{oss}		---	15	30	
Reverse Transfer Capacitance	C_{rss}		---	6.5	13	
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Current	I_S	V_G=V_D=0V , Force Current	---	---	-0.4	A
Pulsed Source Current	I_{SM}		---	---	-0.8	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V , I_S=-0.2A , 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.

N-Channel Typical Electrical and Thermal Characteristic Curves

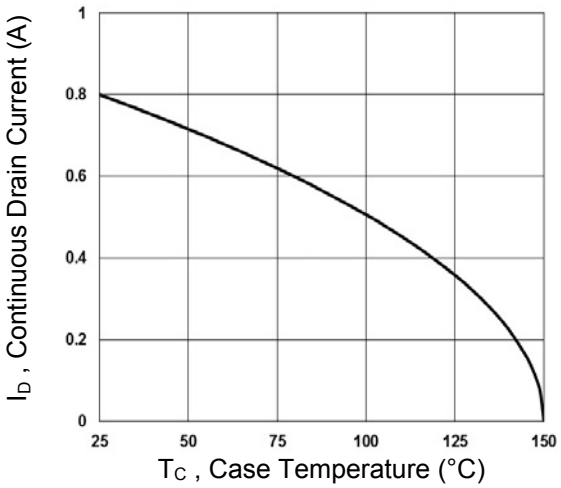


Fig.1 Continuous Drain Current vs. T_C

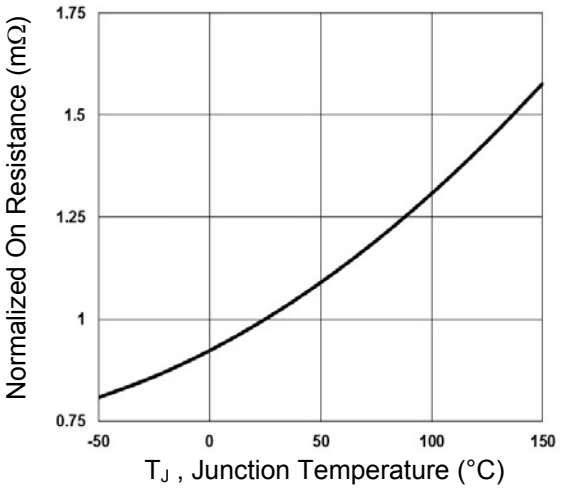


Fig.2 Normalized $R_{DS(ON)}$ vs. T_J

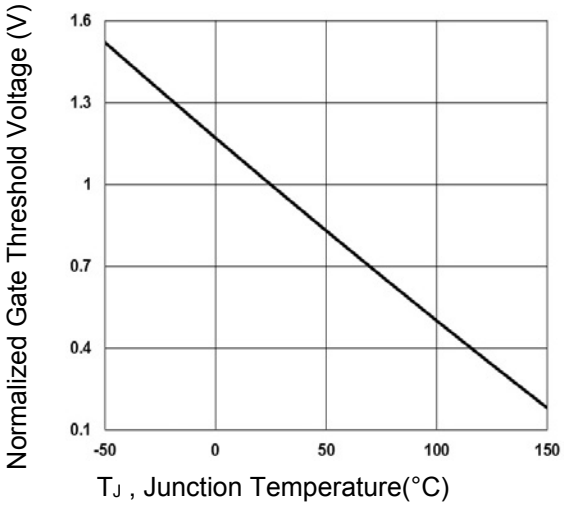


Fig.3 Normalized V_{th} vs T_J

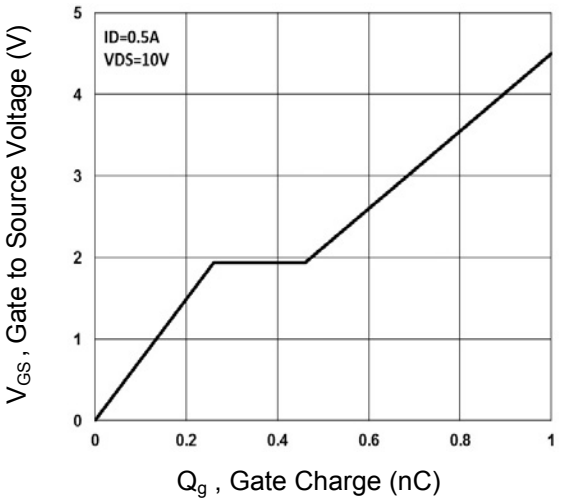


Fig.4 Gate Charge Waveform

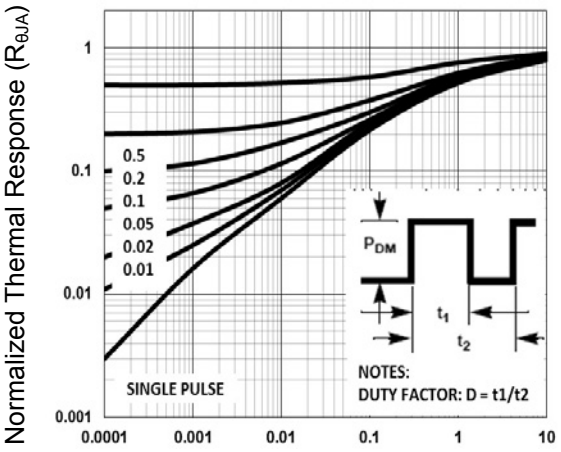


Fig.5 Normalized Transient Impedance

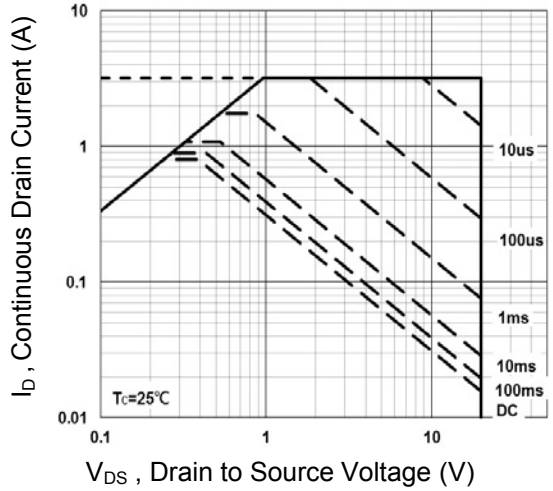


Fig.6 Maximum Safe Operation Area

N-Channel Typical Electrical and Thermal Characteristic Curves

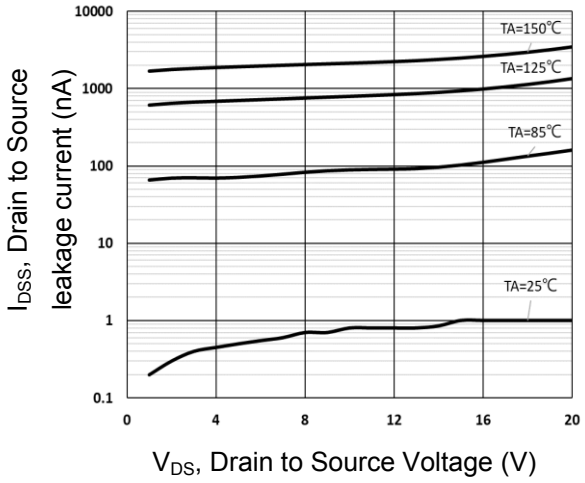


Fig.7 Leakage Current vs. V_{DS}

P-Channel Typical Electrical and Thermal Characteristic Curves

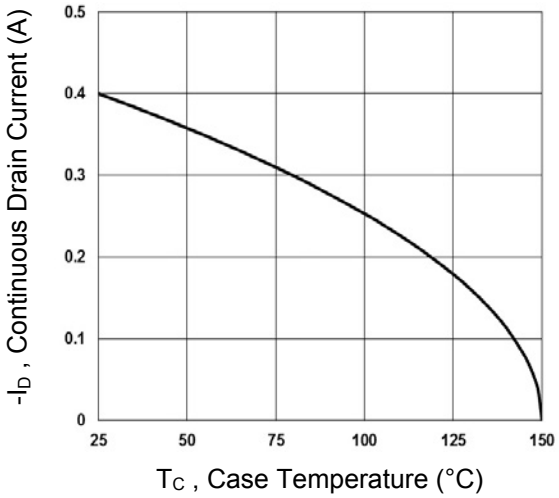


Fig.8 Continuous Drain Current vs. T_C

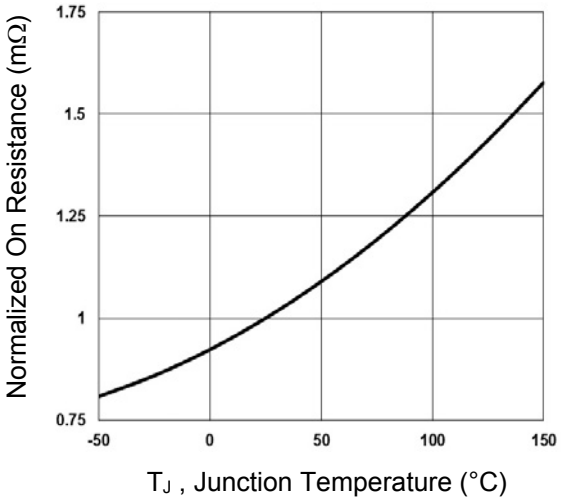


Fig.9 Normalized $R_{DS(ON)}$ vs. T_J

P-Channel Typical Electrical and Thermal Characteristic Curves

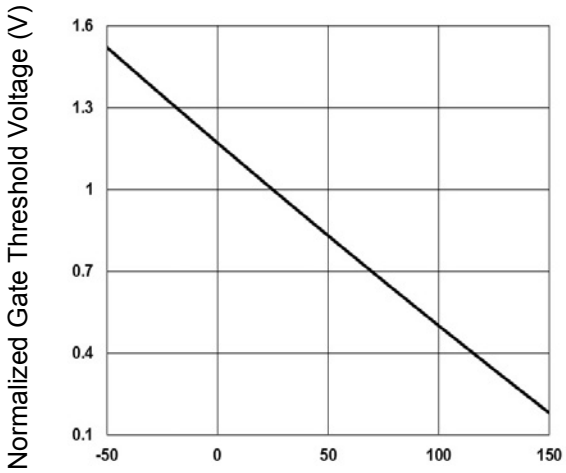


Fig.10 Normalized V_{th} vs T_J

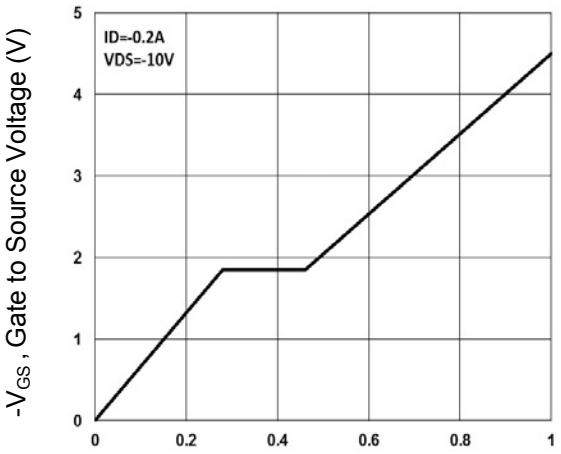


Fig.11 Gate Charge Waveform

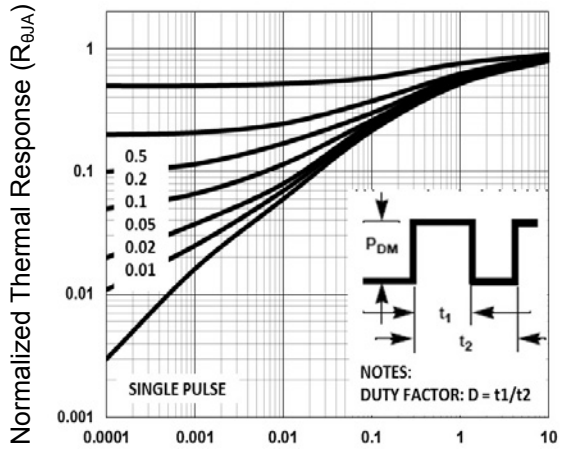


Fig.12 Normalized Transient Impedance

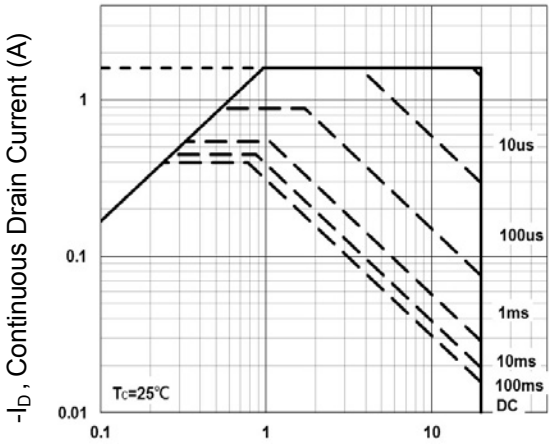


Fig.13 Maximum Safe Operation Area

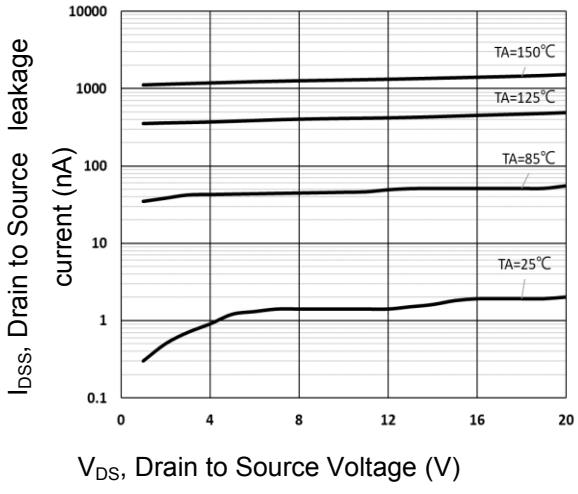
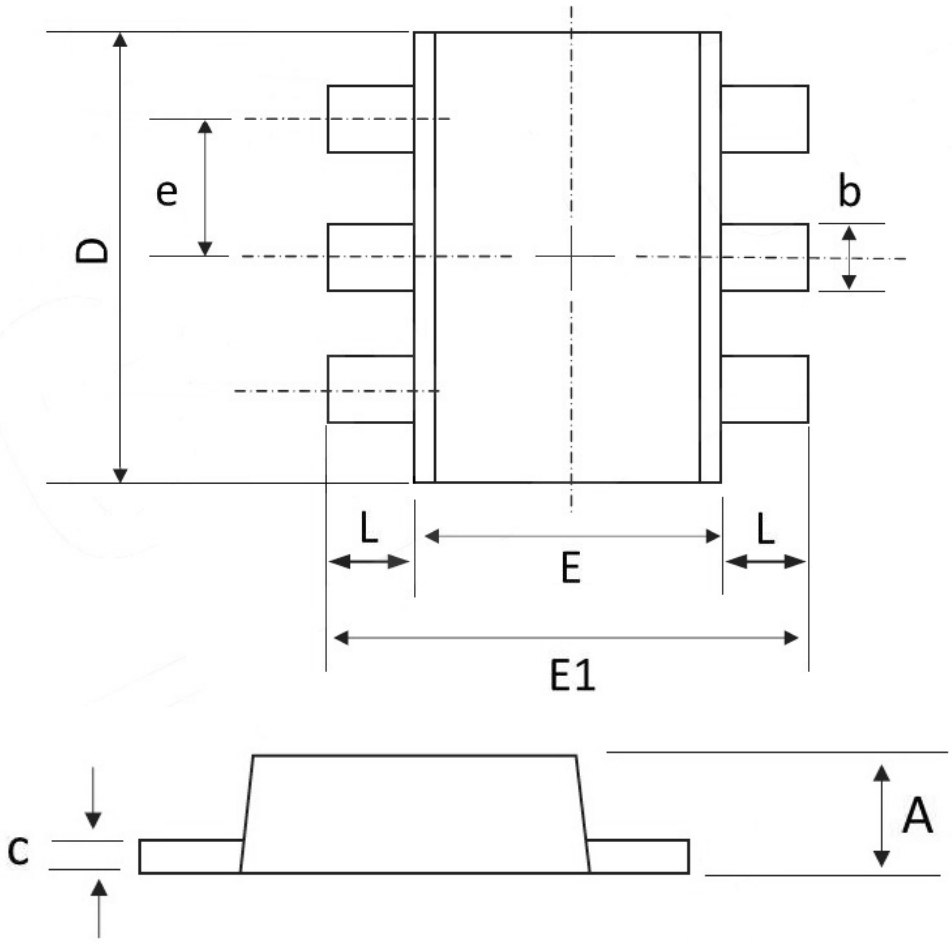


Fig.14 Leakage Current vs. V_{DS}

Package Outline Dimensions SOT-563



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	0.600	0.500	0.024	0.020
b	0.300	0.150	0.012	0.006
c	0.180	0.100	0.007	0.004
D	1.700	1.500	0.067	0.059
E	1.250	1.100	0.049	0.043
E1	1.700	1.550	0.067	0.061
e	0.5BSC		0.02BSC	
L	0.300	0.100	0.012	0.004