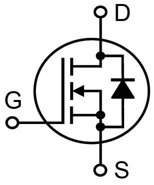
X4-Class Power MOSFET

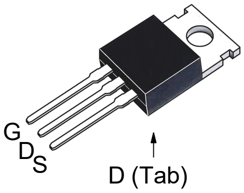
IXTP120N20X4

V_{DSS} = 200V
I_{D25} = 120A
$R_{DS(on)} \leq$ 9.5mΩ

N-Channel Enhancement Mode
Avalanche Rated



TO-220
(IXTP)



G = Gate		D	= Drain
S = Source		Tab	= Drain

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 175°C	200	V
V_{DGR}	T_J = 25°C to 175°C, R_{GS} = 1MΩ	200	V
V_{GSS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_C = 25°C	120	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	240	A
I_A	T_C = 25°C	60	A
E_{AS}	T_C = 25°C	1	J
dv/dt	$I_S \leq I_{DM}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150°C$	20	V/ns
P_D	T_C = 25°C	417	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering 1.6 mm (0.062 in.) from Case for 10s	300	°C
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		3	g

Features

- International Standard Package
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- Low Package Inductance

Advantages

- High Power Density
- Easy to Mount
- Space Savings

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

Symbol	Test Conditions	Characteristic Values			
	(T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 250µA	200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA	2.5		4.5	V
I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V			25	µA
	T_J = 150°C			500	µA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 0.5 • I_{D25}, Note 1			9.5	mΩ

Symbol	**Test Conditions** ($T_J = 25°C$, Unless Otherwise Specified)	**Characteristic Values** Min.	Typ.	Max	
g_{fs}	$V_{DS} = 10V$, $I_D = 0.5 \bullet I_{D25}$, Note 1	72	120		S
R_{Gi}	Gate Input Resistance		6		Ω
C_{iss}	$V_{GS} = 0V$, $V_{DS} = 25V$, f = 1MHz		6100		pF
C_{oss}			865		pF
C_{rss}			1.8		pF
	Effective Output Capacitance				
$C_{o(er)}$	Energy related, $V_{GS} = 0V$		510		pF
$C_{o(tr)}$	Time related, $V_{DS} = 0.8 \bullet V_{DSS}$		2000		pF
$t_{d(on)}$	**Resistive Switching Times** $V_{GS} = 10V$, $V_{DS} = 0.5 \bullet V_{DSS}$, $I_D = 0.5 \bullet I_{D25}$ $R_G = 2\Omega$ (External)		13		ns
t_r			24		ns
$t_{d(off)}$			100		ns
t_f			12		ns
$Q_{g(on)}$	$V_{GS} = 10V$, $V_{DS} = 0.5 \bullet V_{DSS}$, $I_D = 0.5 \bullet I_{D25}$		108		nC
Q_{gs}			27		nC
Q_{gd}			27		nC
R_{thJC}				0.36	°C/W
R_{thCS}			0.50		°C/W

Source-Drain Diode

Symbol	**Test Conditions** ($T_J = 25°C$, Unless Otherwise Specified)	**Characteristic Values** Min.	Typ.	Max	
I_S	$V_{GS} = 0V$			120	A
I_{SM}	Repetitive, pulse Width Limited by T_{JM}			480	A
V_{SD}	$I_F = 100A$, $V_{GS} = 0V$, Note 1			1.4	V
t_{rr}	$I_F = 60A$, $-di/dt = 200A/\mu s$ $V_R = 100V$		190		ns
Q_{RM}			3.2		µC
I_{RM}			33.7		A

Note 1. Pulse test, $t \leq 300\mu s$, duty cycle, $d \leq 2\%$.

Fig. 1. Output Characteristics @ T_J = 25°C

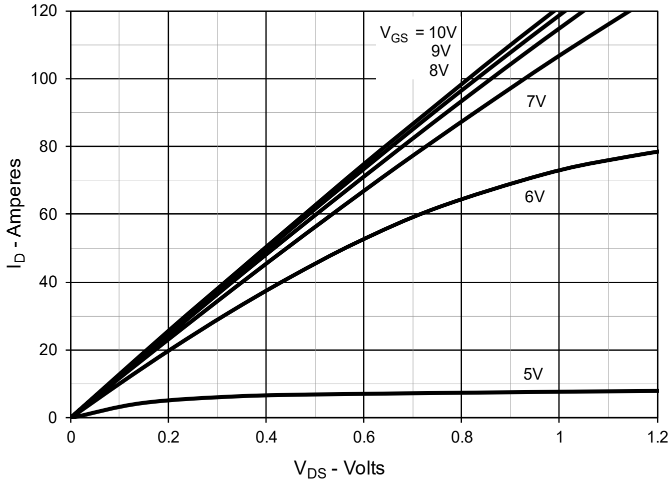


Fig. 2. Extended Output Characteristics @ T_J = 25°C

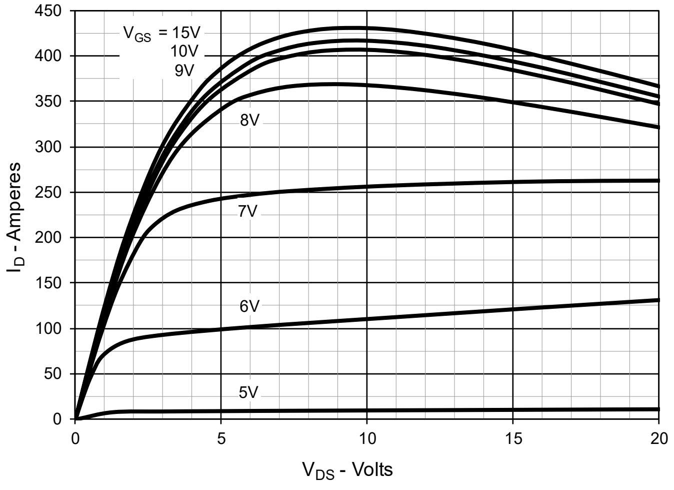


Fig. 3. Output Characteristics @ T_J = 150°C

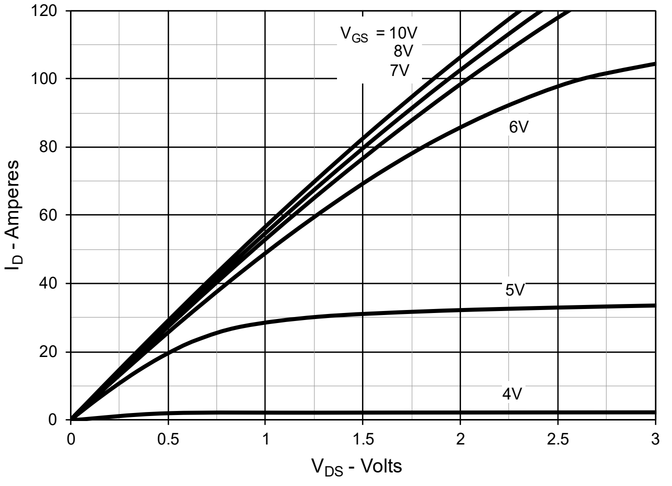


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 60A Value vs. Junction Temperature

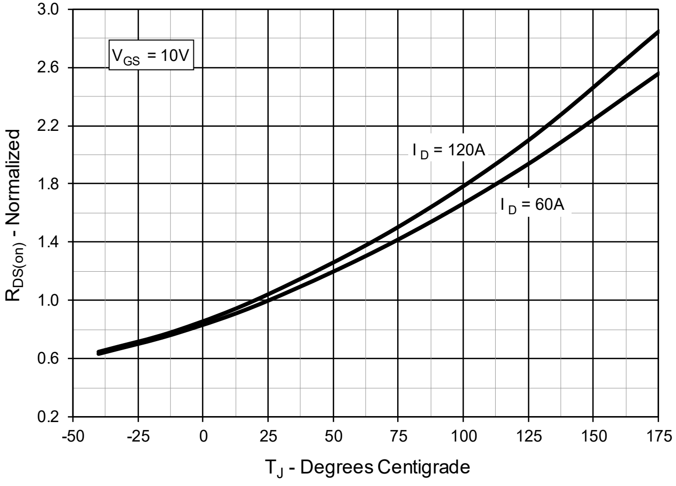


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 60A Value vs. Drain Current

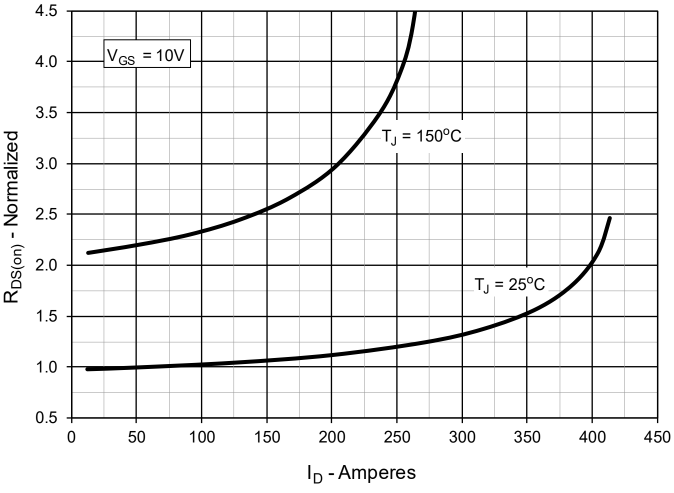
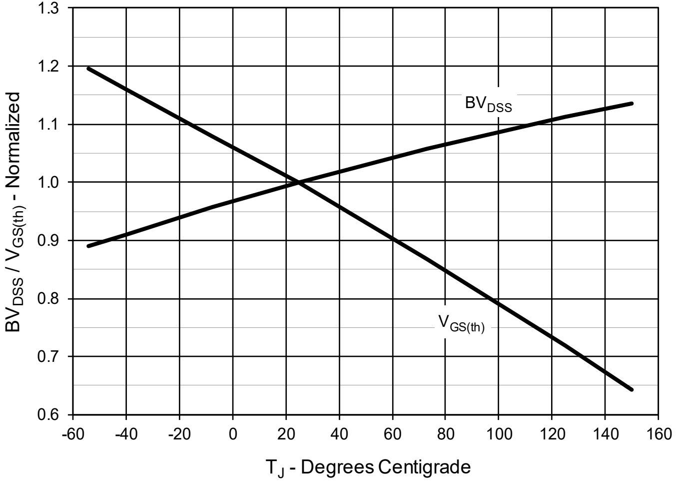


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature



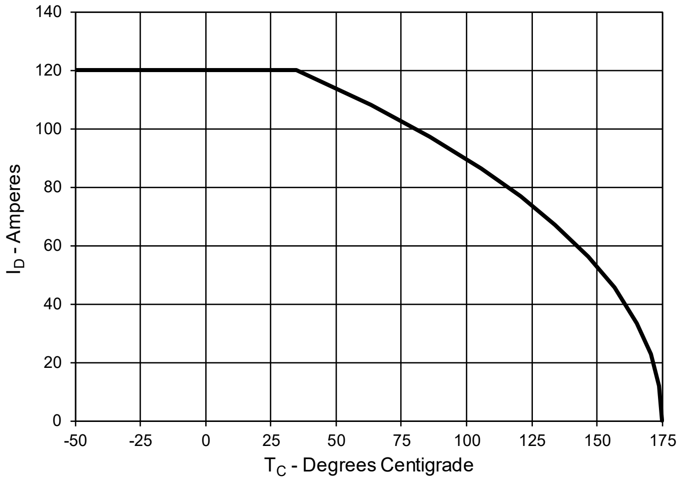


Fig. 7. Maximum Drain Current vs. Case Temperature

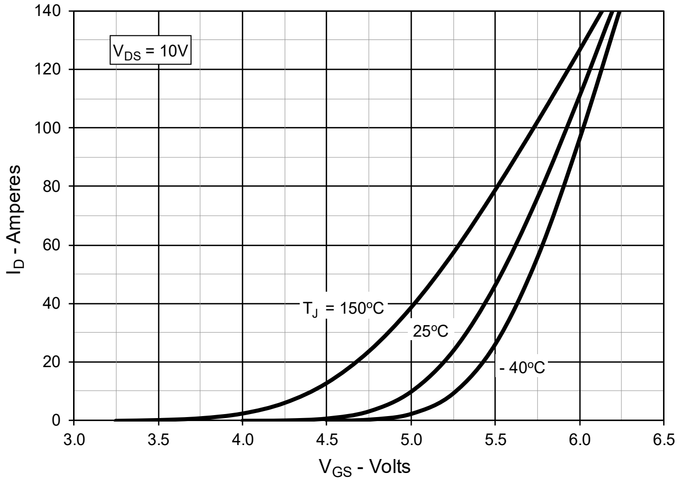


Fig. 8. Input Admittance

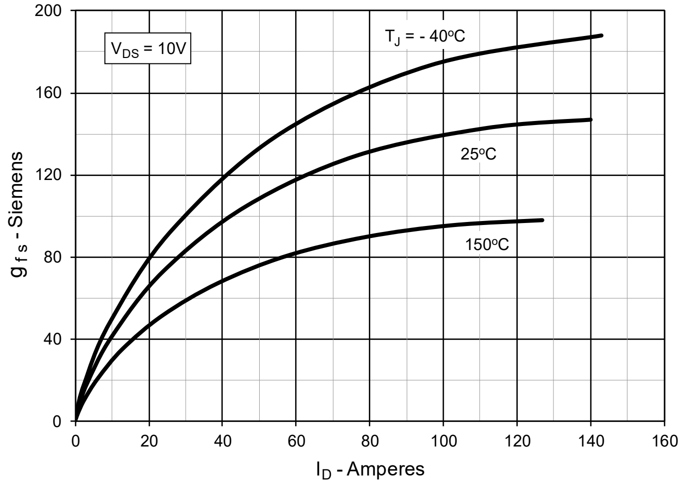


Fig. 9. Transconductance

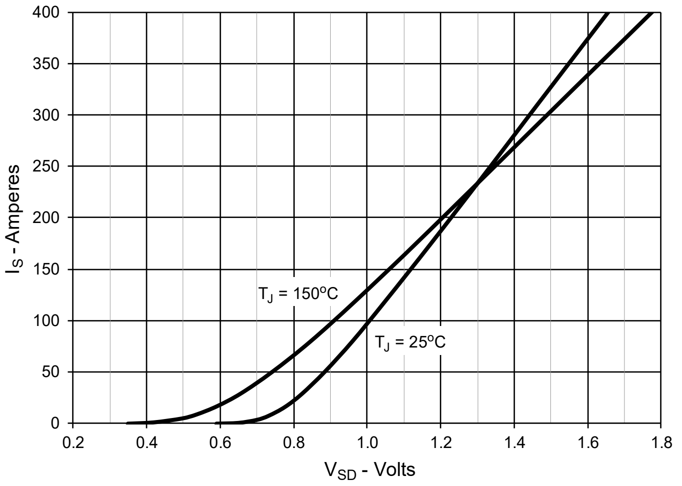


Fig. 10. Forward Voltage Drop of Intrinsic Diode

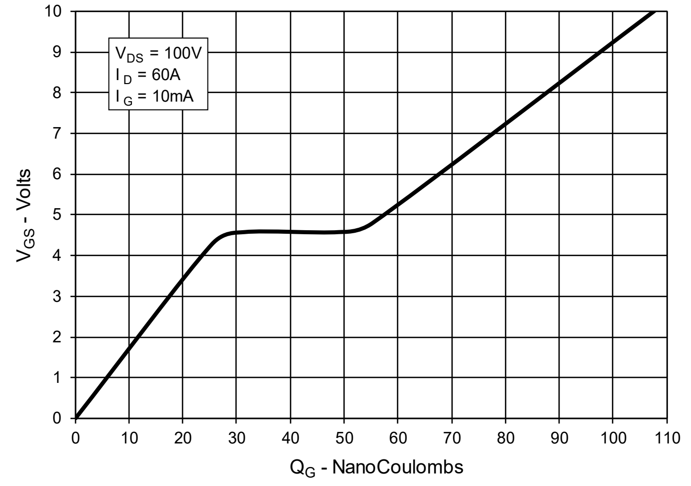


Fig. 11. Gate Charge

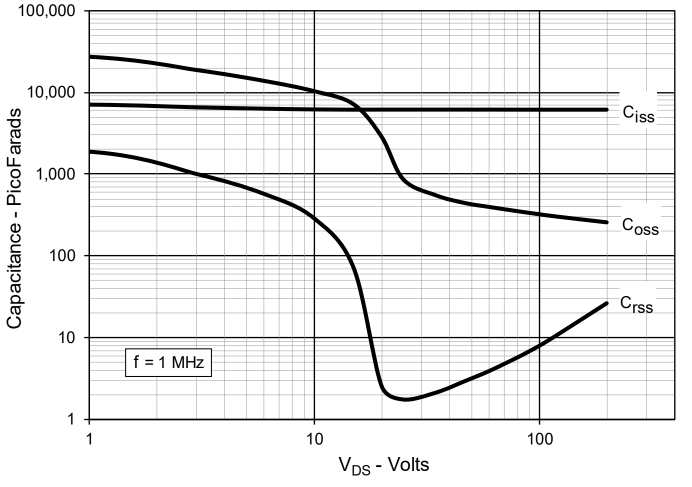


Fig. 12. Capacitance

Littelfuse reserves the right to change limits, test conditions and dimensions.

Fig. 13. Output Capacitance Stored Energy

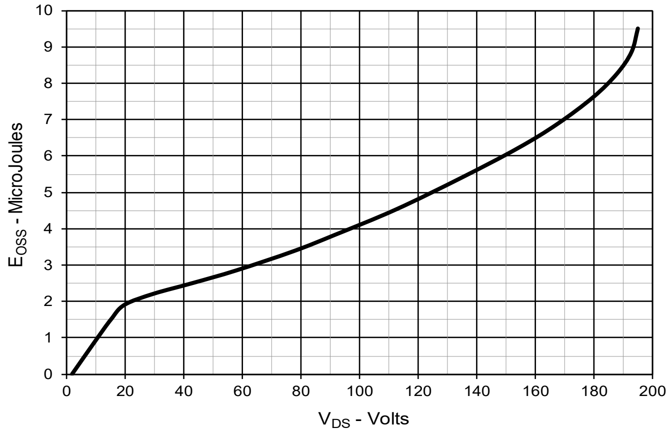


Fig. 14. Forward-Bias Safe Operating Area

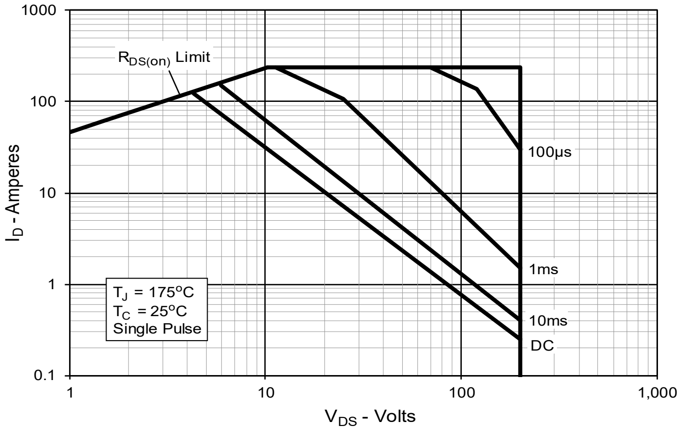
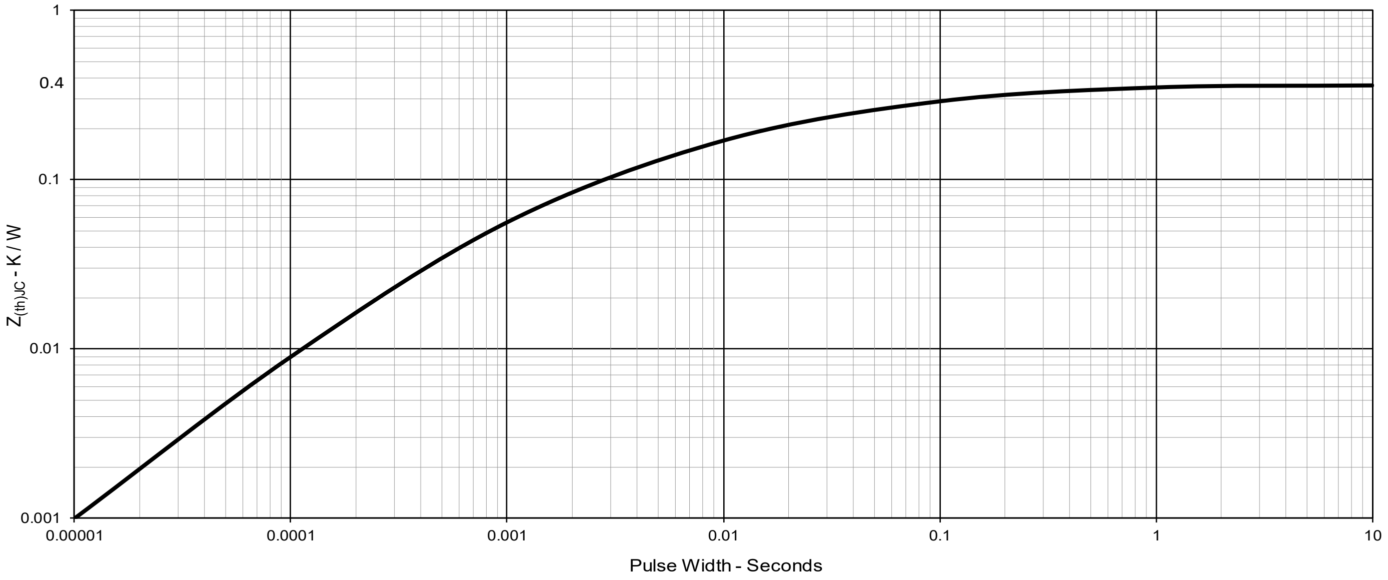


Fig. 15. Maximum Transient Thermal Impedance



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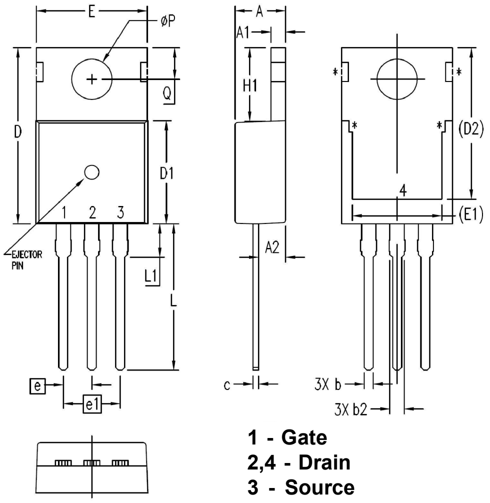
TO-220 Outline



1 - Gate
2,4 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
c	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	7.20	8.20
e	.100 BSC		2.54 BSC	
e1	.200 BSC		5.08 BSC	
H1	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
∅P	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20