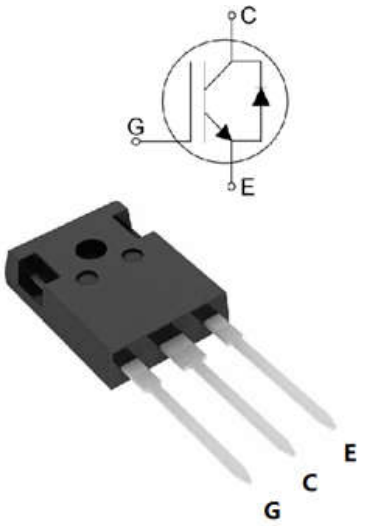
SPT20N120F1

1200V /20A Trench Field Stop IGBT

FEATURES

- High breakdown voltage to 1200V for improved reliability
- Trench-Stop Technology offering :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - Short circuit withstand time – 10μs
  - High ruggedness, temperature stable
  - Low $V_{CE(SAT)}$
  - Easy parallel switching capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Enhanced avalanche capability
- Soft current turn-off waveforms

V_{CE}	**1200**	**V**
I_C	**20**	**A**
$V_{CE(SAT)}$ I_C=20A	**1.9**	**V**



APPLICATION

- Inductive cooking
- Inverterized microwave ovens
- Resonant converters
- Soft switching application

Product	Package	Packaging
SPT20N120F1	TO247	Tube

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	1200	V
DC collector current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_C	40 20	A
Diode Forward current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_F	40 20	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	60	A
Turn off safe operating area V_{CE} ≤1200V, T_j ≤ 150°C	-	60	A
Short Circuit Withstand Time, VGE= 15V, VCE≤ 600V	Tsc	10	μs
Power dissipation , Tj=25℃	Ptot	208	W
Operating junction temperature T_j	-	-40...+150	°C
Storage temperature	T_s	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	-	260	°C

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	R_{θ}(j-c)	0.64	K/W
Diode thermal resistance, junction - case	R_{θ}(j-c)	1.5	K/W
Thermal resistance, junction - ambient	R_{θ}(j-a)	40	K/W

Electrical Characteristics of the IGBT（T_j= 25℃ unless otherwise specified）：

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static						
Collector-Emitter breakdown voltage	BV_{CES}	V_{GE}=0V , I_C=250μA	1200	-	-	V
Gate threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=250μA	5.2	6.0	6.8	V
Collector-Emitter Saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=20A T_j = 25°C T_j = 150°C	 - -	 1.9 2.4	 2.3 -	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_j = 25°C T_j = 150°C	 - -	 - -	 100 1000	μA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=20A	-	13	-	S

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1870	-	pF
Output capacitance	C_{oes}		-	72	-	
Reverse transfer capacitance	C_{res}		-	48	-	
Gate charge	Q_G	V_{CC} = 960V, I_C = 20A, V_{GE} = 15V	-	140	-	nC
Short circuit collector current	$I_{C(SC)}$	V_{GE}=15V,t_{SC}≤10us V_{CC}=600V, $T_{j,\ start}$=25°C	-	140	-	A

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic , at T_j = 25° C						
Turn-on delay time	$td_{(on)}$	V_{CC} = 600V, I_C = 20A, V_{GE} = 0/15V, R_g=42Ω	-	60	-	ns
Rise time	t_r		-	22	-	ns
Turn-on energy	E_{on}		-	2.5	-	mJ
Turn-off delay time	$td_{(off)}$		-	300	-	ns
Fall time	t_f		-	180	-	ns
Turn-off energy	E_{off}		-	0.43	-	mJ

Electrical Characteristics of the DIODE（T_j= 25℃ unless otherwise specified）

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Diode Forward Voltage	V_{FM}	I_F = 20A	-	2.9	-	V
Reverse Recovery Time	T_{rr}	I_F= 15A, di/dt= 600A/μs	-	270	-	ns
Reverse Recovery Current	I_{rr}		-	10	-	A
Reverse Recovery Charge	Q_{rr}		-	1800	-	nC

Fig. 1 FBSOA characteristics

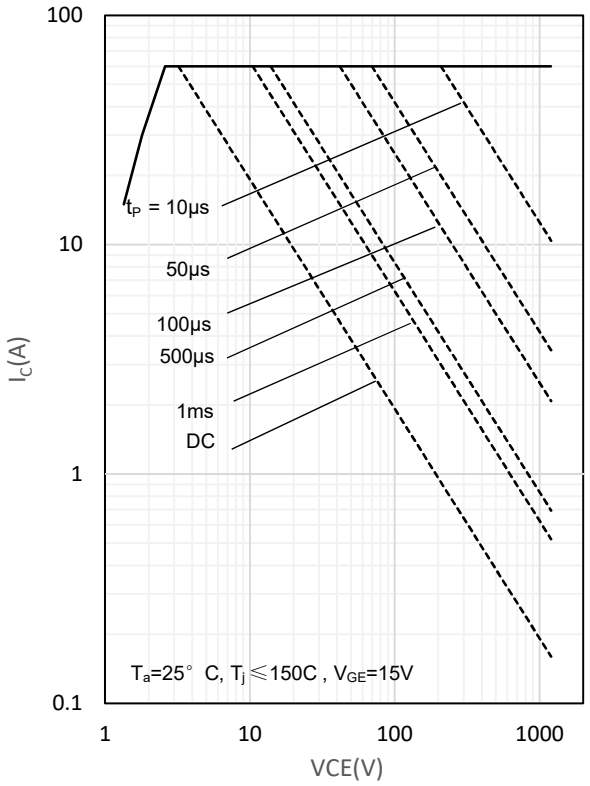


Fig. 2 Load Current vs. Frequency

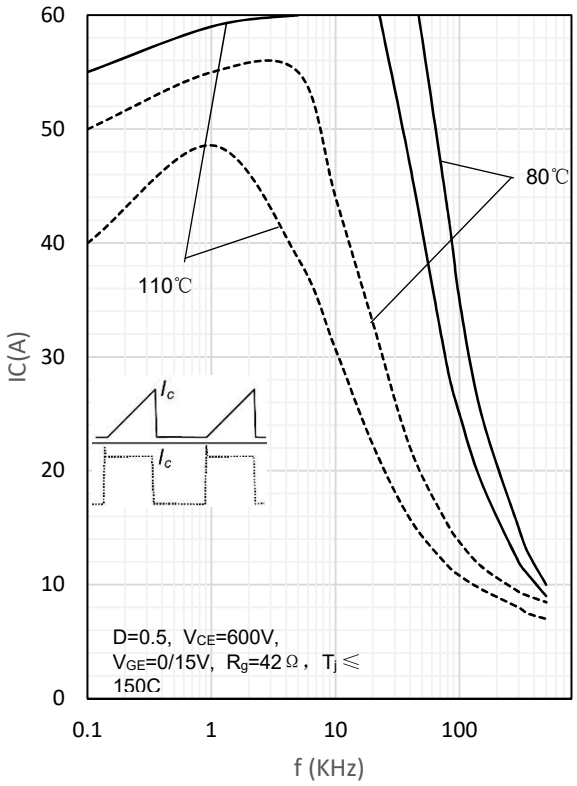


Fig. 3 Output characteristics

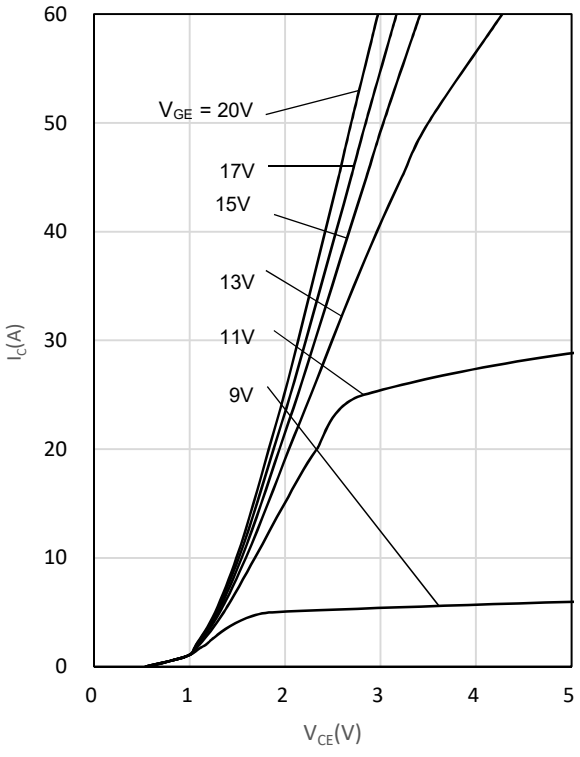


Fig. 4 Saturation voltage characteristics

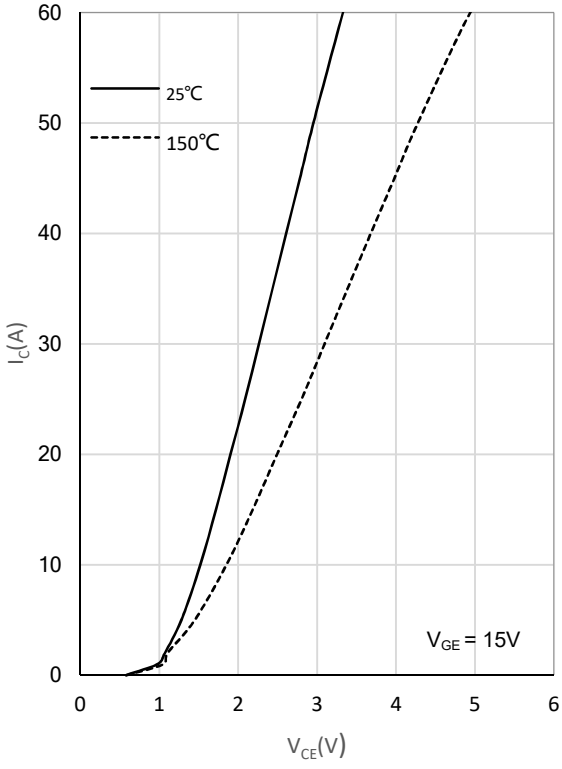


Fig. 5 Switching times vs. gate resistor

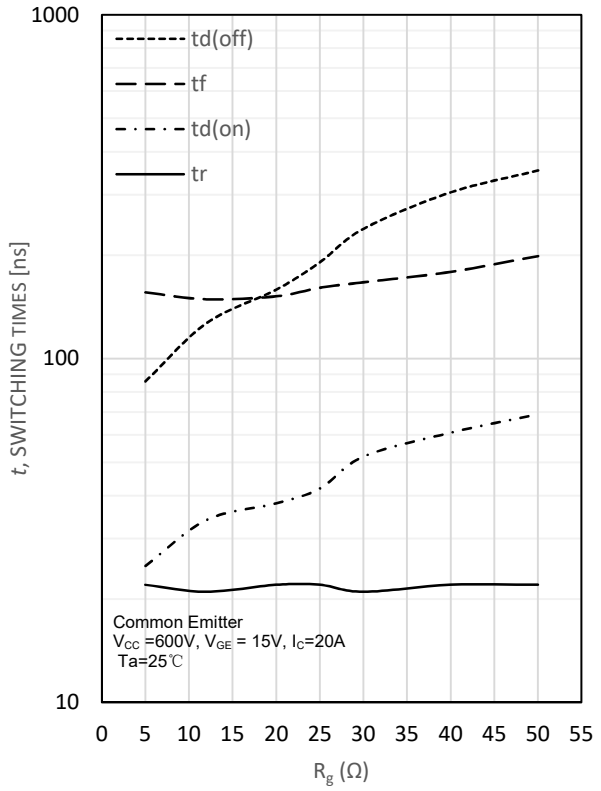


Fig. 6 Switching times vs. collector current

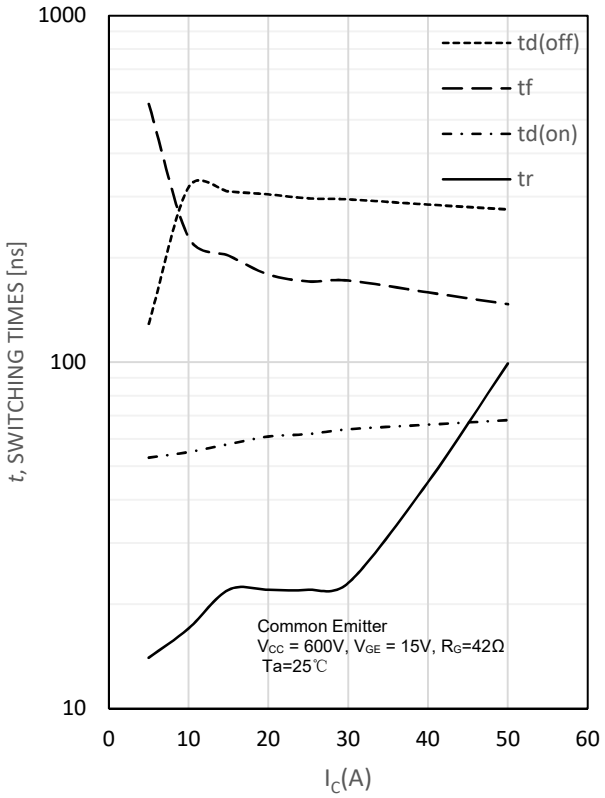


Fig. 7 Switching loss vs. gate resistor

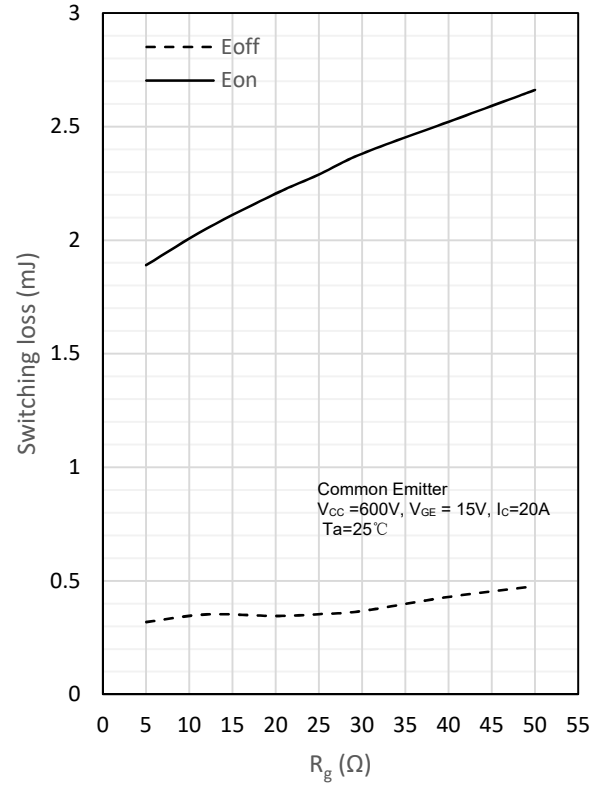


Fig. 8 Switching loss vs. collector current

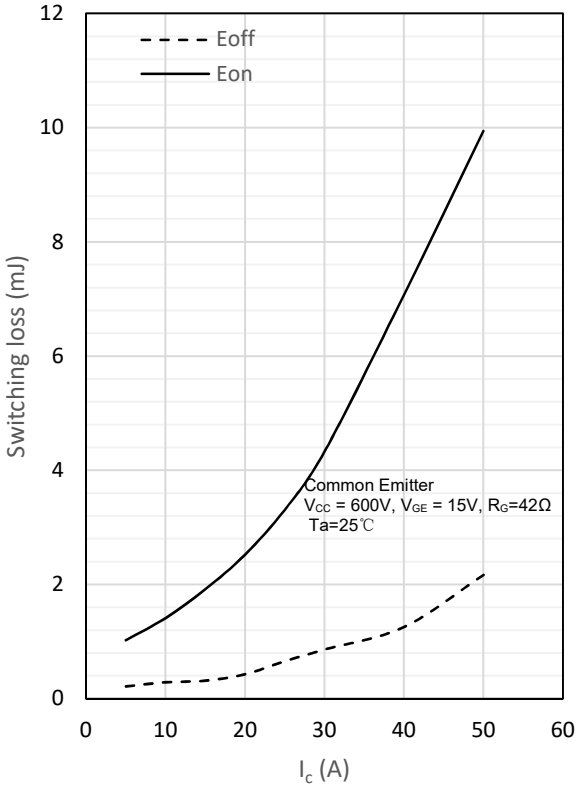


Fig. 9 Gate charge characteristics

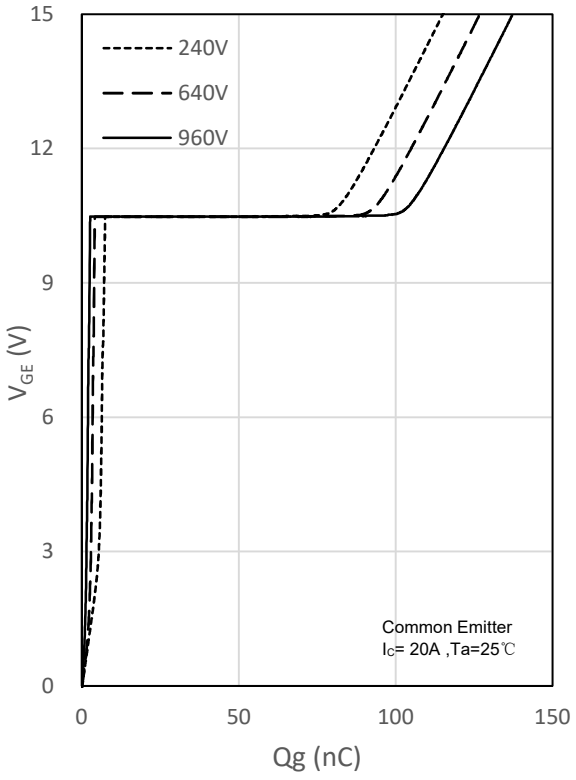
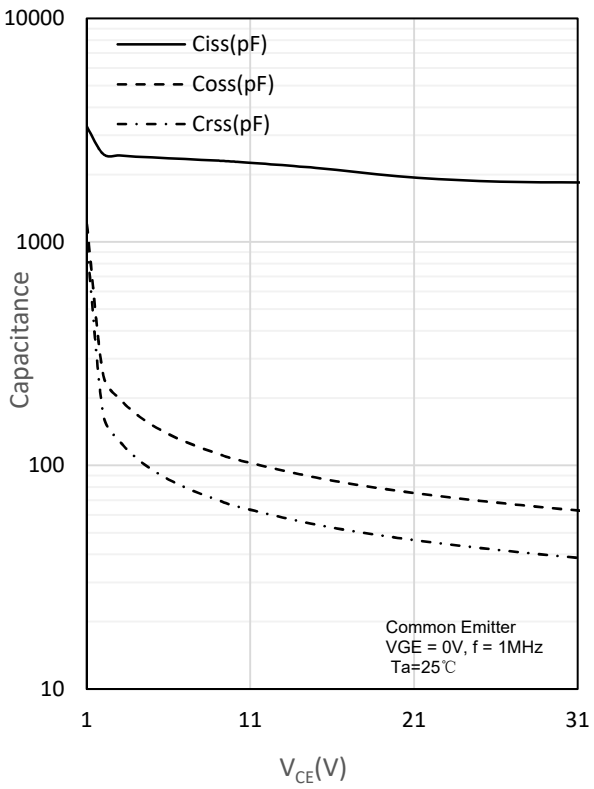


Fig. 10 Capacitance characteristics



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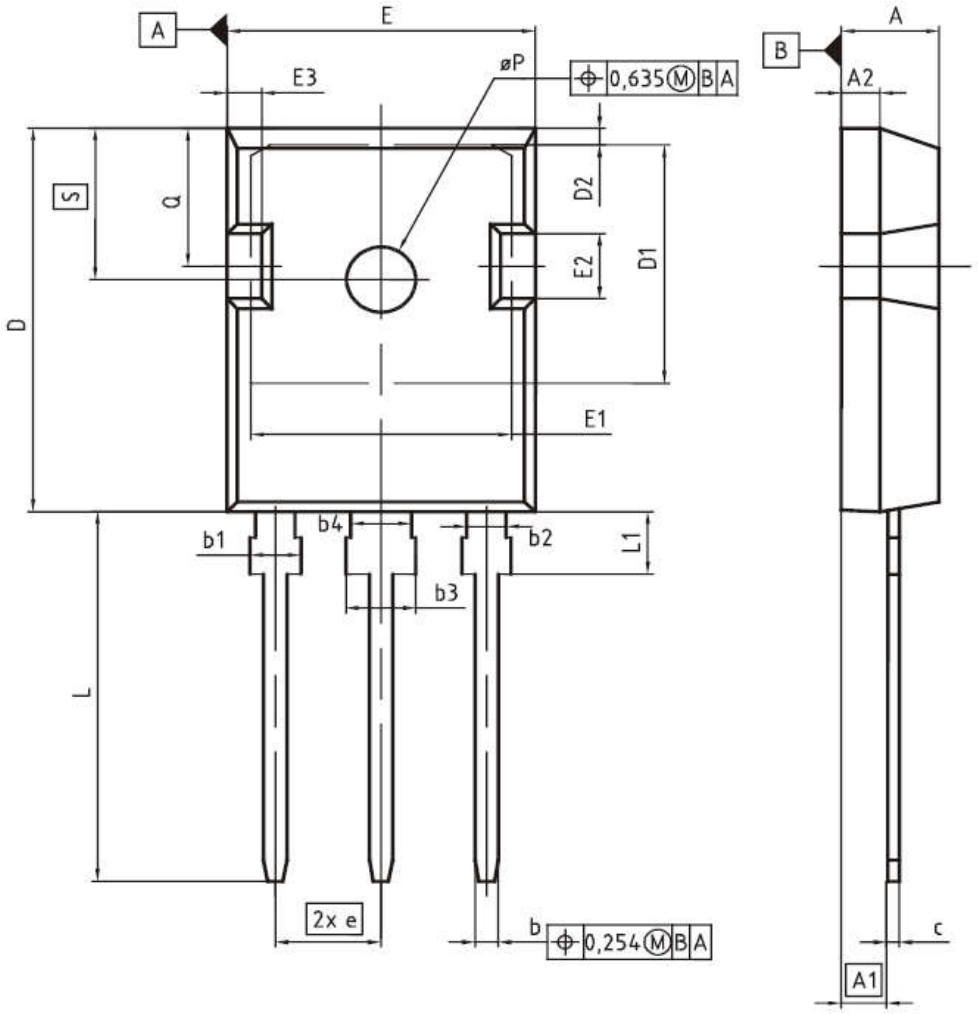

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248