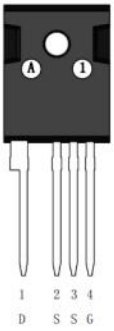
1700V N-Channel MOSFET

Description

Silicon Carbide (SiC) MOSFET use a completely new technology that provide superior switching performance and higher reliability compared to Silicon. In addition, the low ON resistance and compact chip size ensure low capacitance and gate charge. Consequently, system benefits include highest efficiency, faster operating frequency, increased power density, reduced EMI, and reduced system size.

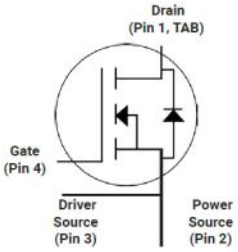
Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low RDS(on)
- Optimized package with separate driver source pin
- Easy to parallel and simple to drive
- ROHS Compliant, Halogen free



Application

- EV motor drive
- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Solar inverters
- EV charging



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Ordering Information

Part Number	Marking	Package	Packaging
JX4S0070R170M	JX4S0070R170M	TO-247-4	Tube

Absolute Maximum Ratings(Tc=25℃)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	1700	V
I_D	Drain Current(continuous)at Tc=25℃	40	A
I_D	Drain Current(continuous)at Tc=100℃	28	A
I_{DM}	Drain Current (pulsed)	118	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation T_C = 25°C	242	W
T_J, Tstg	Junction and Storage Temperature Range	-55 to +175	℃

Electrical Characteristics(T_J = 25℃ unless otherwise specified)

Typical Performance-Static

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{DS}	Drain-source Breakdown Voltage	I_D=250uA,V_{GS}=0V	1700			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =1700V, V_{GS} =0V, T_J=25°C		5	100	uA
I_{GSS}	Gate-body Leakage Current	V_{DS} =0V ; V_{GS} =-10 to 20V		10	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D=10mA	2	3	4	V
V_{GSon}	Recommended turn-on Voltage	Static		18		V
V_{GSoff}	Recommended turn-off Voltage			-5		V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS}=18V, I_D=20A		72	88	mΩ
		V_{GS}=18V, I_D=20A T_J=175℃		130		mΩ

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Typical Performance-Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance	V_{DS}=1000V,f=1MHz, V_{AC}=25mV		1550		pF
C_{oss}	Output Capacitance			138		pF
C_{rss}	Reverse Transfer Capacitance			20		pF
g_{fs}	Transconductance	V_{DS}=20V , I_D=20A		22		S
E_{OSS}	C_{OSS} Stored Energy	V_{DS}=1000V,f=1MHz		60		μJ
E_{ON}	Turn-On Energy（Body Diode）	V_{DS}=1000V, V_{GS}=-5/18V，I_D=25A，L=150uH T_J=175℃		650		uJ
E_{OFF}	Turn-Off Energy（Body Diode）			162		uJ
Q_g	Total Gate Charge	V_{DS}=1000V, V_{GS}=-5V/18V, I_D = 25 A		100		nC
Q_{gs}	Gate-source Charge			45		nC
Q_{gd}	Gate-Drain Charge			22		nC
$R_{G(int)}$	Internal Gate Resistance	f=1MHz,V_{AC}=25mV		5.6		Ω
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=1000V, V_{GS}=-5V/18V, I_D =25A, L=150μH Rext=4.7Ω		16		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-off Delay Time			38		ns
t_f	Fall Time			15		ns

Typical Performance-Reverse Diode(T_J = 25℃ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{FSD}	Forward Voltage	V_{GS}=0V,I_F=20A,T_J=25°C		3.9	6	V
		V_{GS}=0V,I_F=20A,T_J=175°C		3.6	6	V
Is	Continuous Diode Forward Current	V_{GS}=0V，T_C=25°C		30.5		A
t_{rr}	Reverse Recovery Time	V_{GS}=-5 V, I_F=20 A, V_R=1000 V, di/dt=1000A/μs，T_J=175°C		36		nS
Q_{rr}	Reverse Recovery Charge			160		nC
I_{rrm}	Peak Reverse Recovery Current			10.5		A

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.62	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	°C/W

The values are based on the junction-to case thermal impedance which is measured with the device mounted to a large heat sink assuming maximum junction temperature of Tj(max)=175℃

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Electrical Characteristics

Fig1. Output characteristics (T_J = 25 °C)

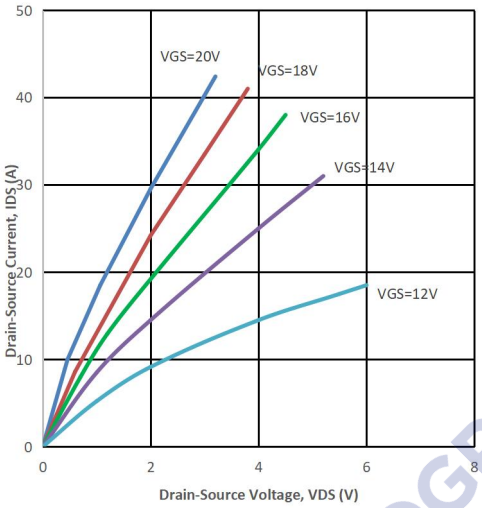

Fig2. Output characteristics (T_J = 175 °C)

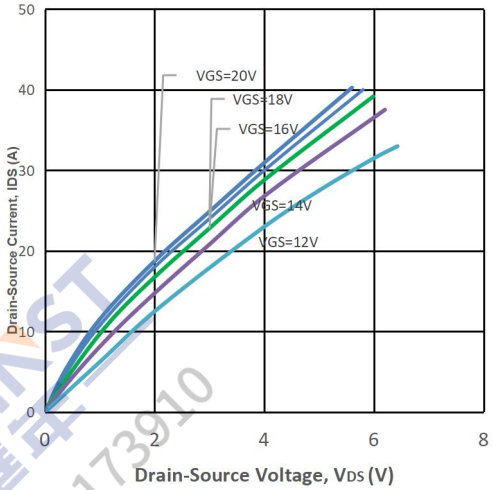

Fig3.Normalized On-Resistance vs. Temperature

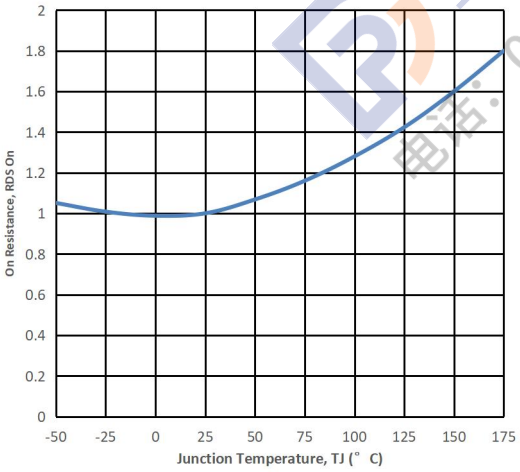

Fig4. On-Resistance vs.Temperature

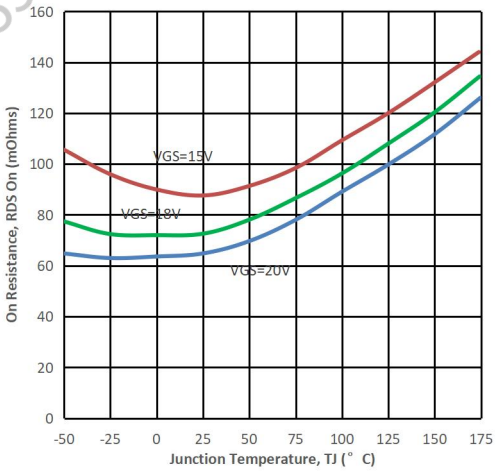

Fig5.Transfer Characteristic

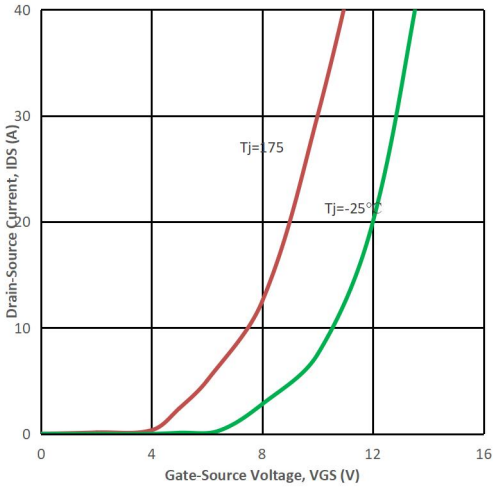

Fig6. Body Diode Characteristic at 25 °C

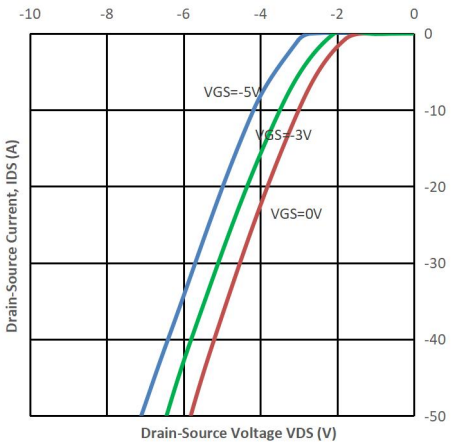

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Fig7.Threshold Voltage vs. Temperature

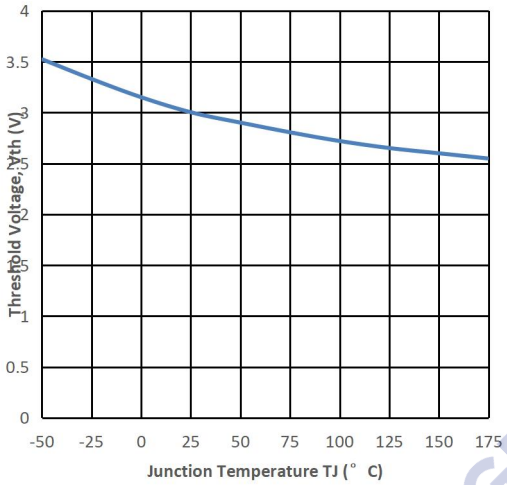

Fig8. Gate Charge Characteristics

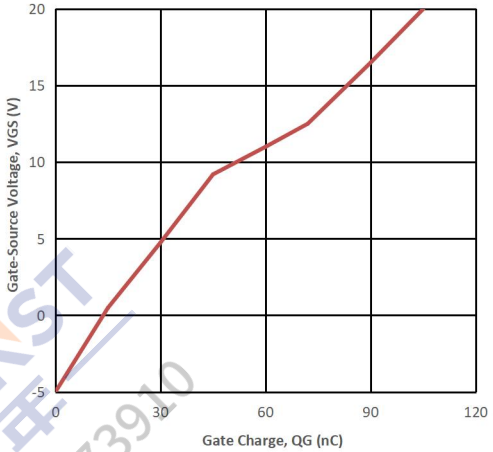

Fig9. 3rd Quadrant Characteristic at 25 °C

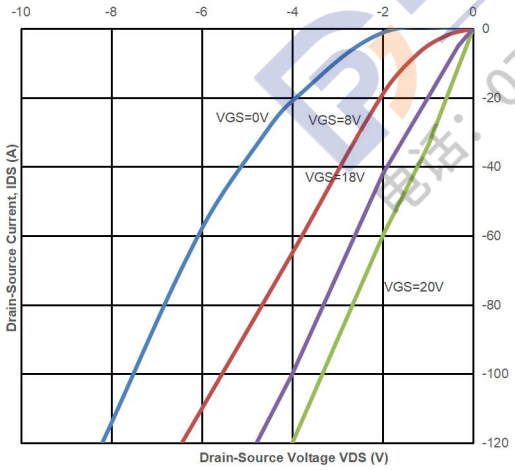

Fig10. Output Capacitor Stored Energy

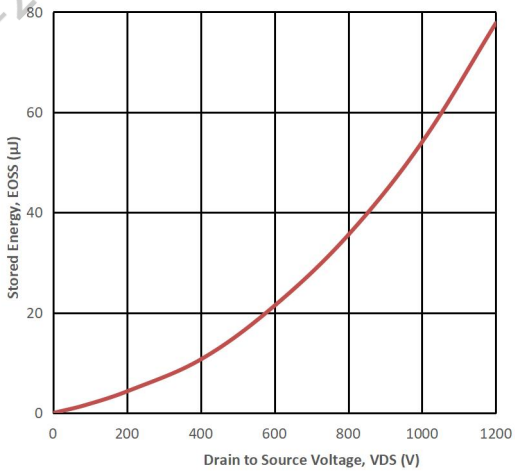

Fig11. Capacitances vs. Drain-Source

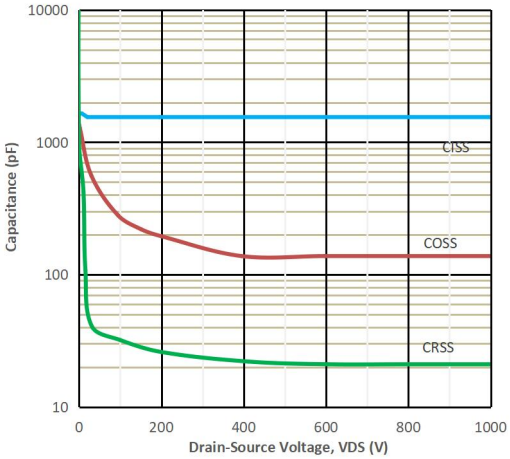

Fig12. Max Power Dissipation Derating Vs Tc

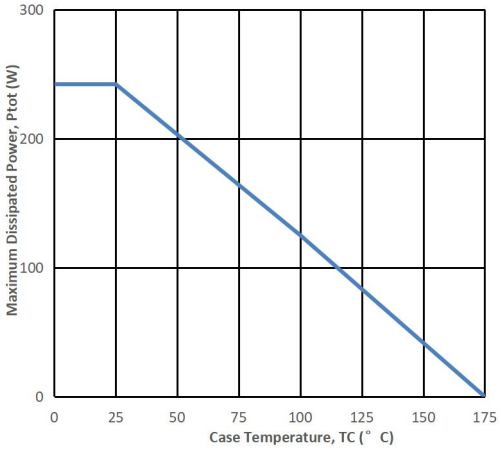

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Fig13. Switching Energy vs. Drain Current

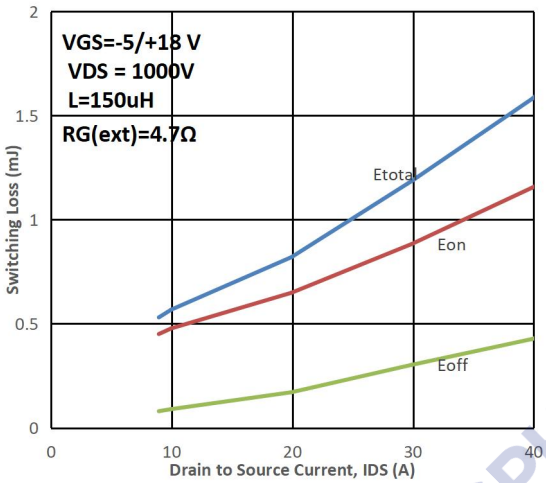


Fig14. Switching Energy vs. RG(ext）

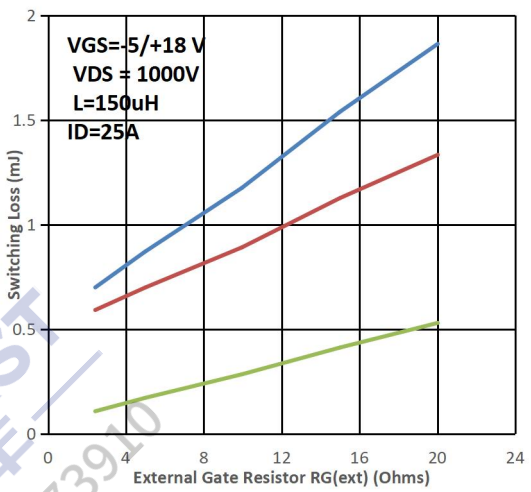


Fig15. Switching Energy vs. Temperature

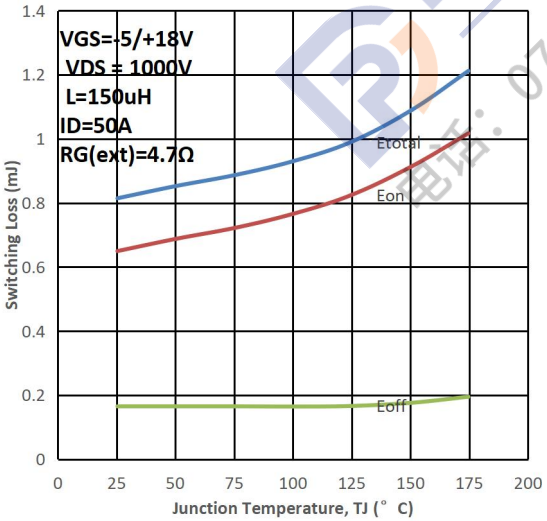


Fig16. Switching Times vs. RG(ext)

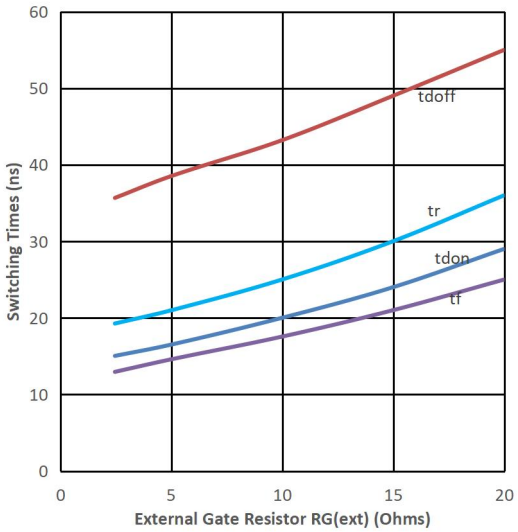


Fig17.Transient Thermal Impedance

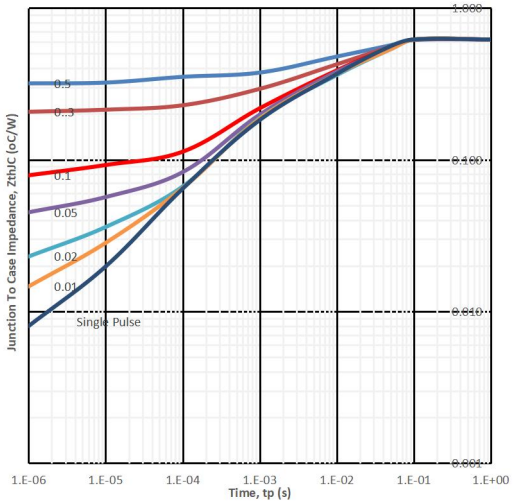
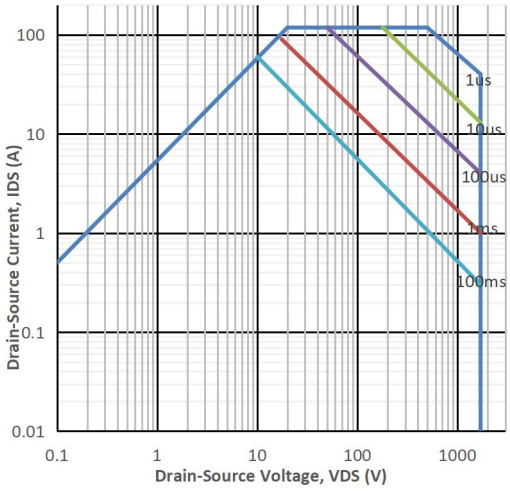


Fig18. Safe Operating Area



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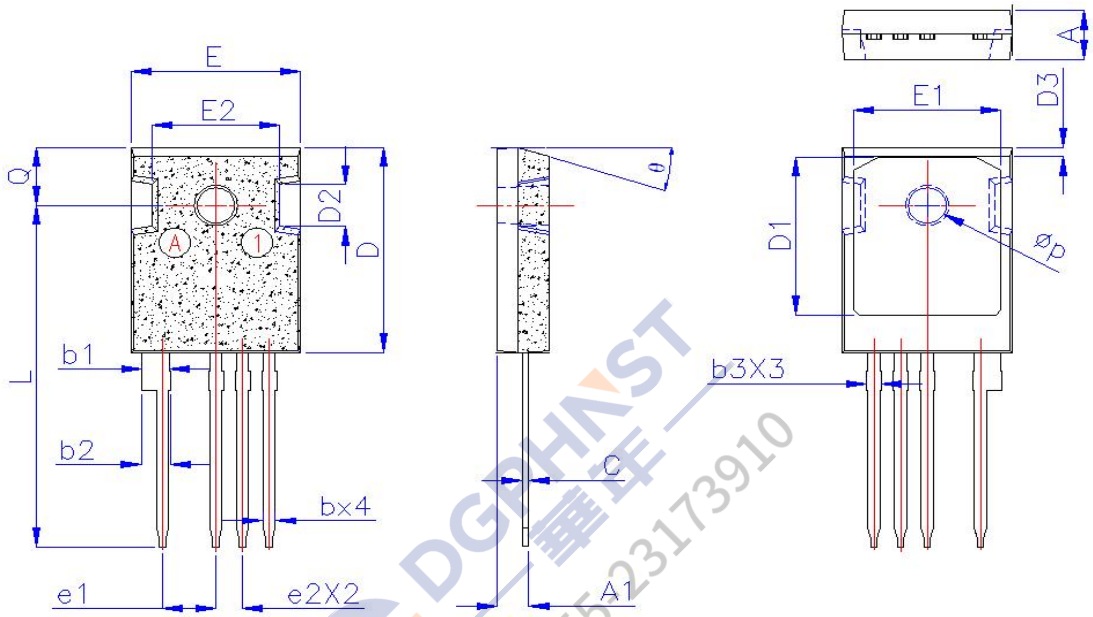
Package Drawing:



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Dimensions(UNIT:mm)

SYMBDLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	TYPE	MAX	MIN	TYPE	MAX
A	4.80	5.00	5.20	0.189	0.197	0.205
A1	2.85	3.00	3.15	0.112	0.118	0.124
b	1.15	1.20	1.25	0.045	0.047	0.049
b1	2.40	2.50	2.60	0.094	0.098	0.102
b2	2.61	2.76	2.91	0.103	0.109	0.115
b3	1.30	1.42	1.57	0.051	0.056	0.062
C	0.55	0.60	0.65	0.022	0.024	0.026
D	20.80	21.00	21.20	0.819	0.827	0.835
D1	15.94	16.24	16.54	0.628	0.639	0.651
D2	4.3TYPE			0.169TYPE		
e1	4.93	5.08	5.23	0.194	0.200	0.206
e2	2.39	2.54	2.69	0.094	0.100	0.106
E	15.95	16.15	16.35	0.628	0.636	0.644
E1	13.82	14.02	14.26	0.544	0.552	0.561
E2	12.00	12.20	12.40	0.472	0.480	0.488
L	34.65	35.05	35.45	1.364	1.380	1.396
Q	5.85	5.95	6.05	0.230	0.234	0.238
⌀P	3.45	3.60	3.75	0.136	0.142	0.148
θ	17.5°			0.689°		