

### Description

The HSP120N08 is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

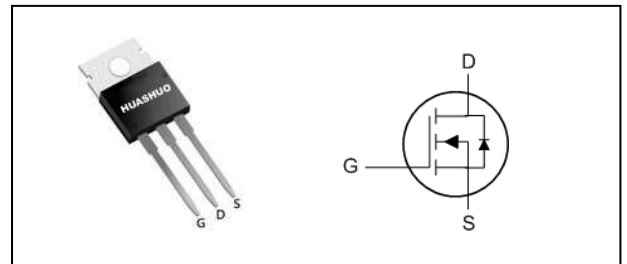
The HSP120N08 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Motor Drives
- SR(Synchronous rectification)
- DC/DC Converter
- Advanced high cell density Trench technology

### Product Summary

$V_{DS}$	80	V
$R_{DS(ON),TYP}$	4.7	m $\Omega$
$I_D$	120	A

### TO-220 Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	80	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	120	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	100	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	480	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	560	mJ
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	220	W
$T_{STG}$	Storage Temperature Range	-55 to 175	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 175	$^\circ C$

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	60	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	0.7	$^\circ C/W$



**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

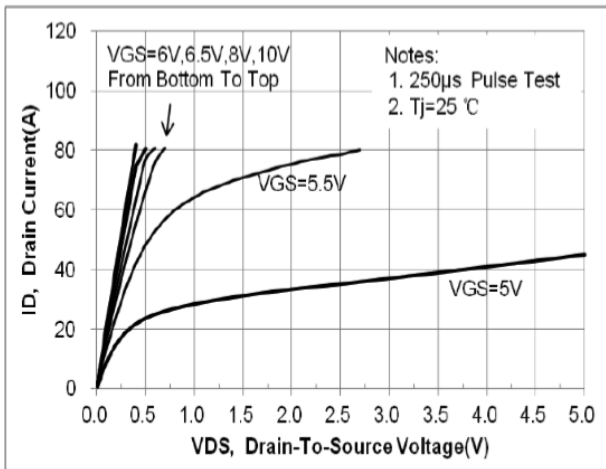
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
B <sub>VDS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	80	92	---	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =50A	---	4.7	5.7	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	2	3	4	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =64V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	100	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =30A	---	80	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.6	---	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DD</sub> =40V, V <sub>GS</sub> =10V, I <sub>D</sub> =25A	---	66	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	25	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	14	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =40V, V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω, I <sub>D</sub> =25A	---	20	---	ns
T <sub>r</sub>	Rise Time		---	39	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	44	---	
T <sub>f</sub>	Fall Time		---	22	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, f=1MHz	---	4033	---	pF
C <sub>oss</sub>	Output Capacitance		---	548	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	35	---	

**Diode Characteristics**

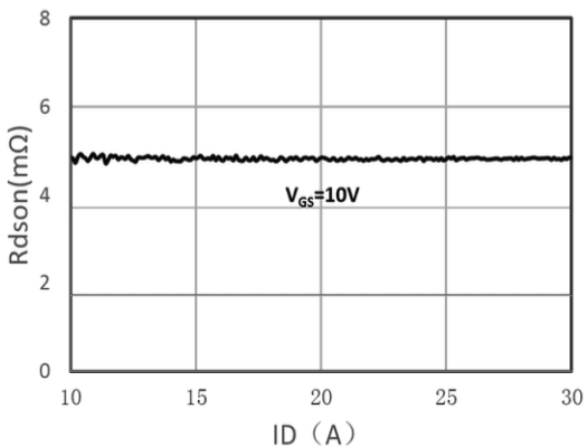
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	120	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =50A, T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=500A/μs, T <sub>J</sub> =25°C	---	60	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	340	---	nC



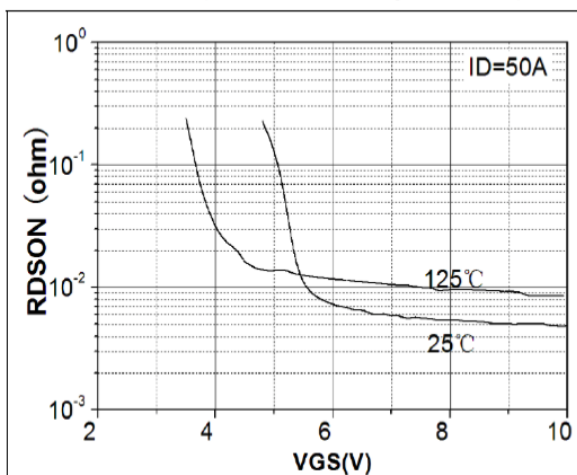
**Figure 1. Typ. Output Characteristics ( $T_j=25^\circ\text{C}$ )**



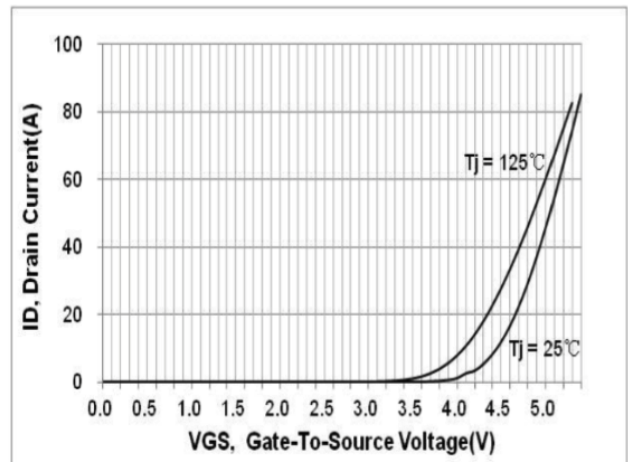
**Figure 3. On-Resistance vs. Drain Current and Gate Voltage Figure**



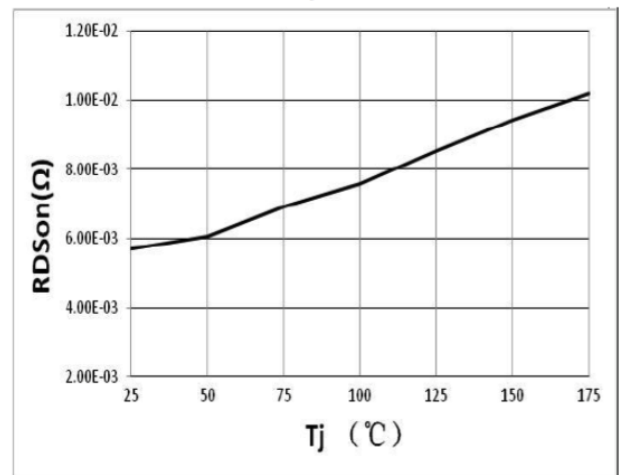
**Figure 5. On-Resistance vs. Gate-Source Voltage (Junction Temperature)**



**Figure 2. Transfer Characteristics (Junction Temperature)**



**Figure 4. On-Resistance vs. Junction Temperature**



**Figure 6. Body-Diode Characteristics (Junction Temperature)**

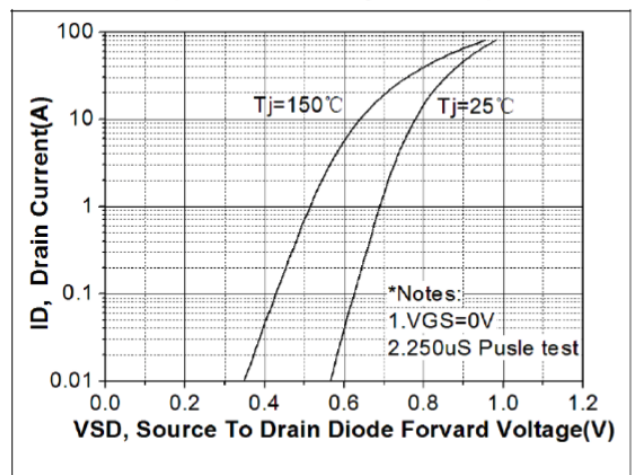




Figure 7. Gate-Charge Characteristics

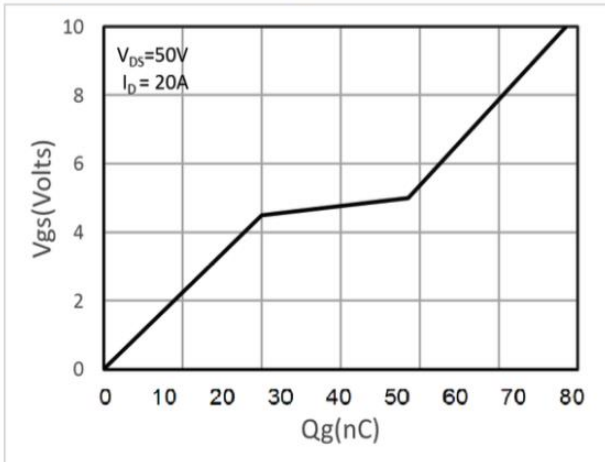


Figure 8. Capacitance Characteristics

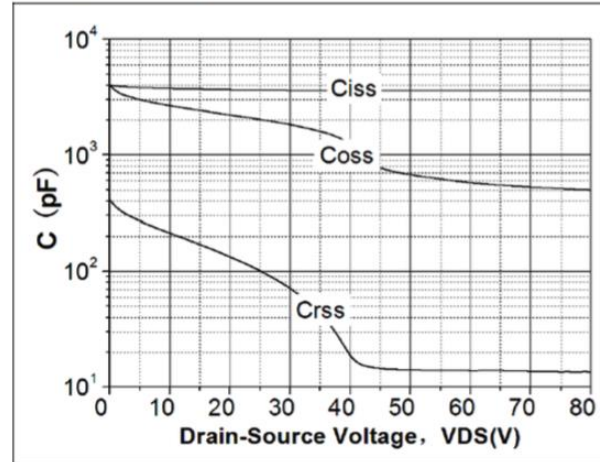


Figure 9: Normalized Maximum Transient Thermal Impedance ( $R_{thJC}$ )

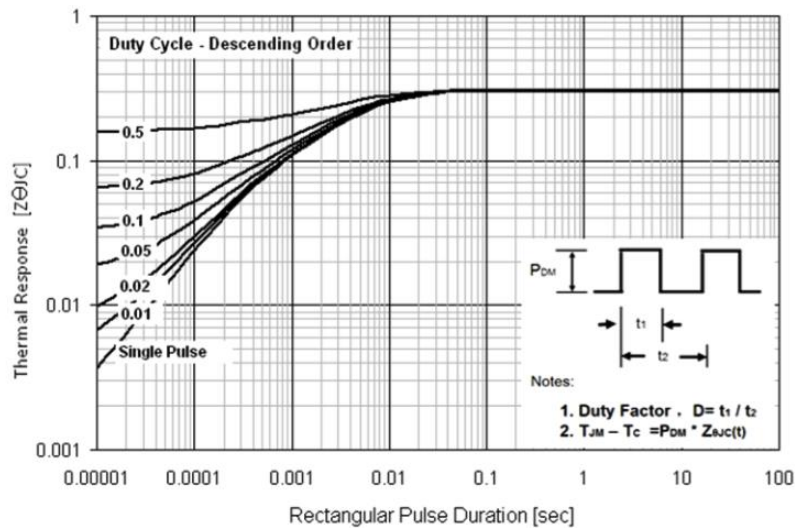
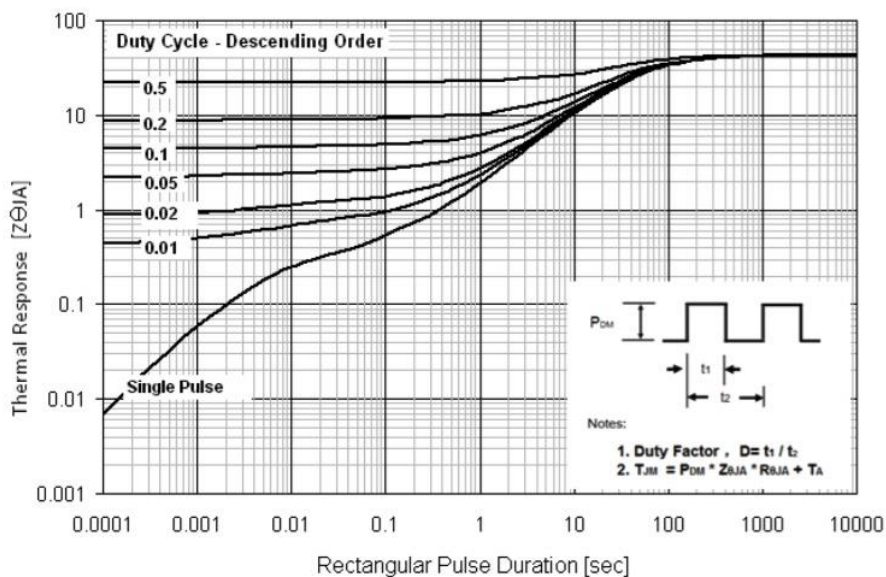


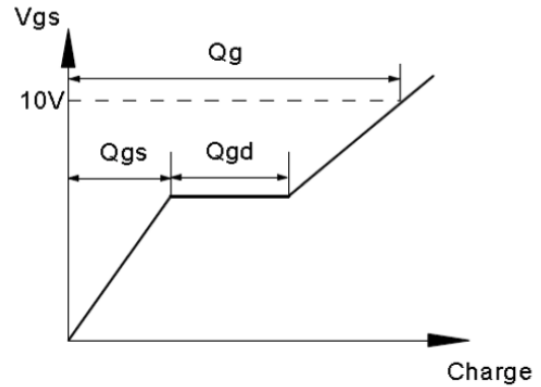
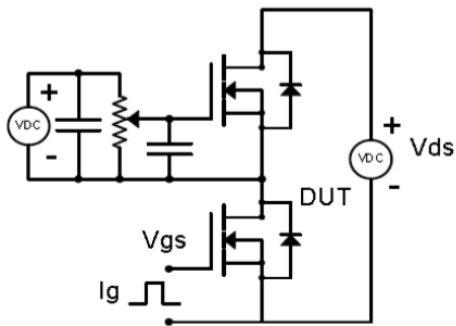
Figure 10: Normalized Maximum Transient Thermal Impedance ( $R_{thJA}$ )



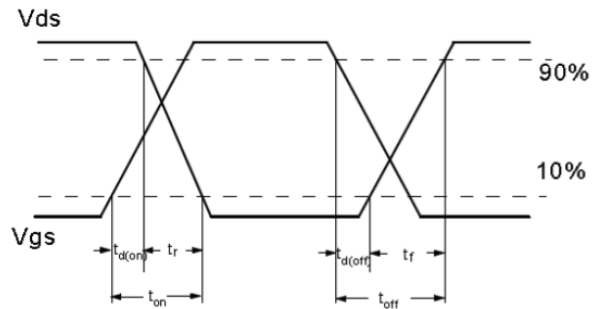
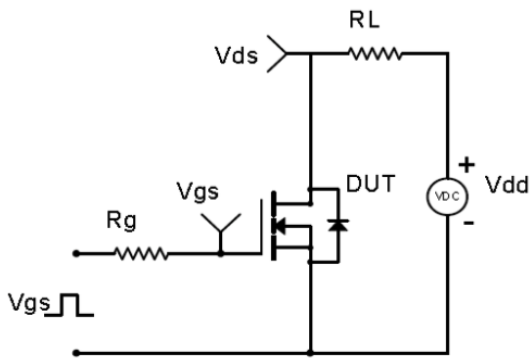


**Test Circuit & Waveform**

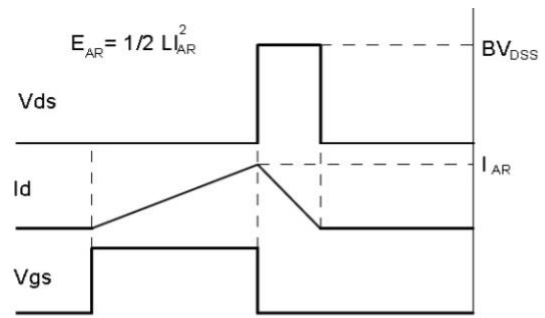
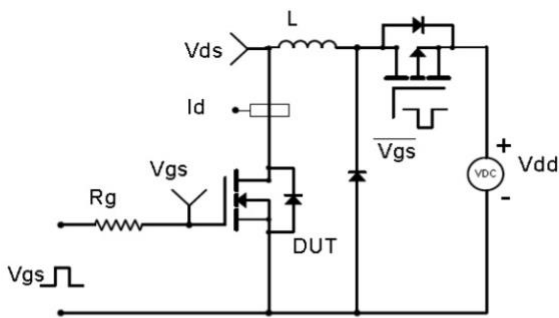
Gate Charge Test Circuit & Waveform



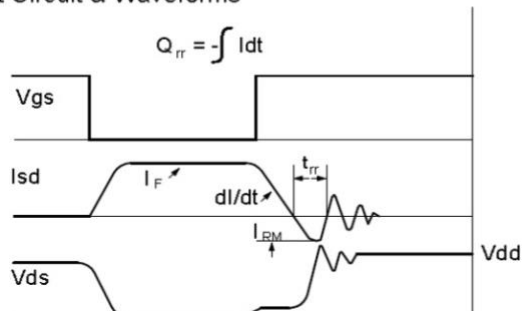
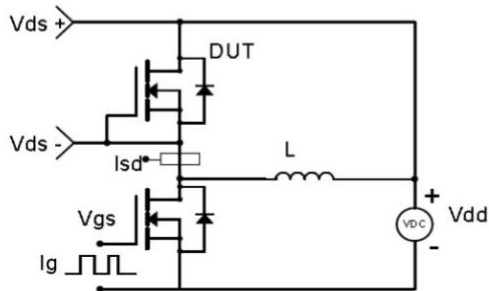
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

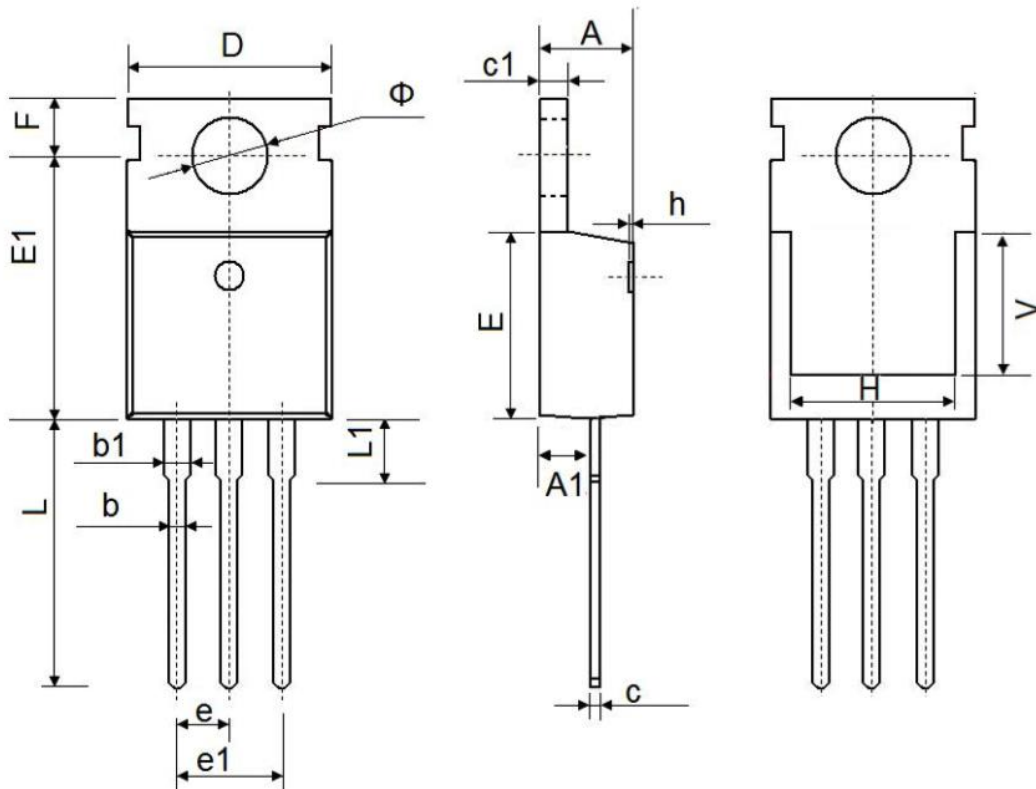


Diode Recovery Test Circuit & Waveforms





**TO-220 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	2.200	2.600	0.087	0.102
b	0.700	0.950	0.028	0.037
b1	1.170	1.410	0.046	0.056
c	0.450	0.650	0.018	0.026
c1	1.200	1.400	0.047	0.055
D	9.600	10.400	0.378	0.409
E	8.8500	9.750	0.348	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.750	14.300	0.502	0.563
L1	2.850	3.950	0.112	0.156
V	7.500 REF.		0.295 REF.	
$\Phi$	3.400	4.000	0.134	0.157