NCE N-Channel Super Trench Power MOSFET

Description

The NCEP60T20T uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g. This device is ideal for high-frequency switching and synchronous rectification.
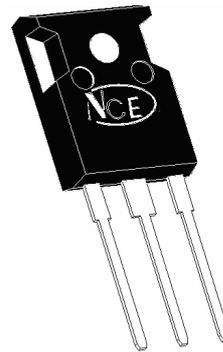
General Features

● V_{DS} =60V, I_D =200A

  $R_{DS(ON)}$=1.8mΩ (typical) @ V_{GS}=10V

● Excellent gate charge x $R_{DS(on)}$ product

● Very low on-resistance $R_{DS(on)}$

● 175 °C operating temperature

● Pb-free lead plating

● 100% UIS tested

Application

● DC/DC Converter

● Ideal for high-frequency switching and synchronous rectification
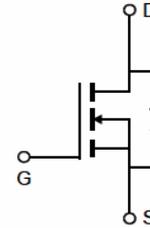
Schematic diagram

TO-247 top view

100% UIS TESTED!

100% ΔVds TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP60T20T	NCEP60T20T	TO-247	-	-	-

Absolute Maximum Ratings (T$_C$=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous (Silicon Limited)	I_D	200	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	150	A
Pulsed Drain Current	I_{DM}	800	A
Maximum Power Dissipation	P_D	255	W
Derating factor		1.7	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	2000	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case[Note 2]	$R_{θJC}$	0.59	℃/W

Electrical Characteristics (T$_C$=25℃ unless otherwise noted)

| Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=250µA	60		-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=60V,V$_{GS}$=0V	-	-	1	µA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±20V,V$_{DS}$=0V	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=250µA	2.2	2.7	3.5	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=10V, I$_D$=100A	-	1.8	2.2	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=10V,I$_D$=100A	-	60	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C$_{Iss}$	V$_{DS}$=30V,V$_{GS}$=0V, F=1.0MHz	-	9200	-	PF
Output Capacitance	C$_{oss}$		-	1900	-	PF
Reverse Transfer Capacitance	C$_{rss}$		-	61	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=30V,I$_D$=100A V$_{GS}$=10V,R$_G$=4.7Ω	-	23	-	nS
Turn-on Rise Time	t$_r$		-	19	-	nS
Turn-Off Delay Time	t$_{d(off)}$		-	58	-	nS
Turn-Off Fall Time	t$_f$		-	14	-	nS
Total Gate Charge	Q$_g$	V$_{DS}$=30V,I$_D$=100A, V$_{GS}$=10V	-	130		nC
Gate-Source Charge	Q$_{gs}$		-	31.5		nC
Gate-Drain Charge	Q$_{gd}$		-	10.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V$_{SD}$	V$_{GS}$=0V,I$_S$=200A	-		1.2	V
Diode Forward Current [Note 2]	I$_S$		-	-	200	A
Reverse Recovery Time	t$_{rr}$	T$_J$ = 25°C, I$_F$ = I$_S$ di/dt = 100A/µs [Note3]	-	67		nS
Reverse Recovery Charge	Qrr		-	112		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,V$_{DD}$=30V,V$_G$=10V,L=0.5mH,Rg=25Ω

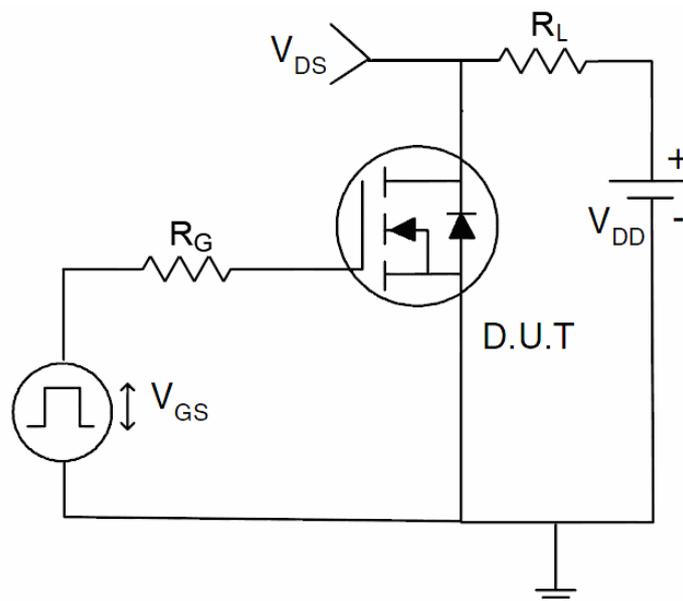## Test Circuit

1) E_{AS} test Circuit
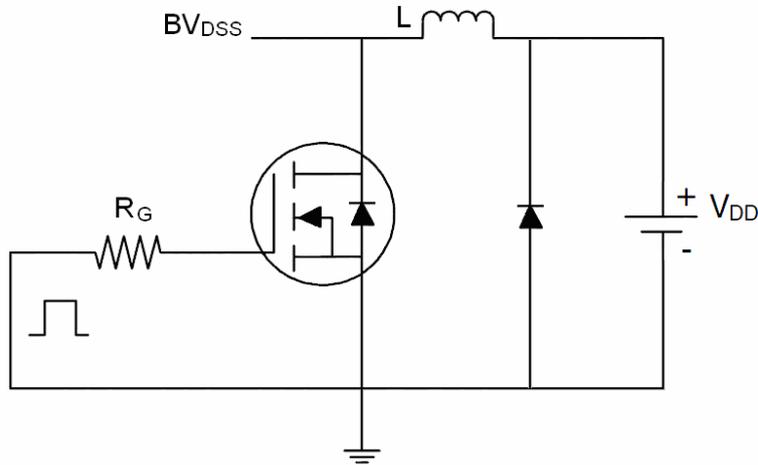
2) Gate charge test Circuit
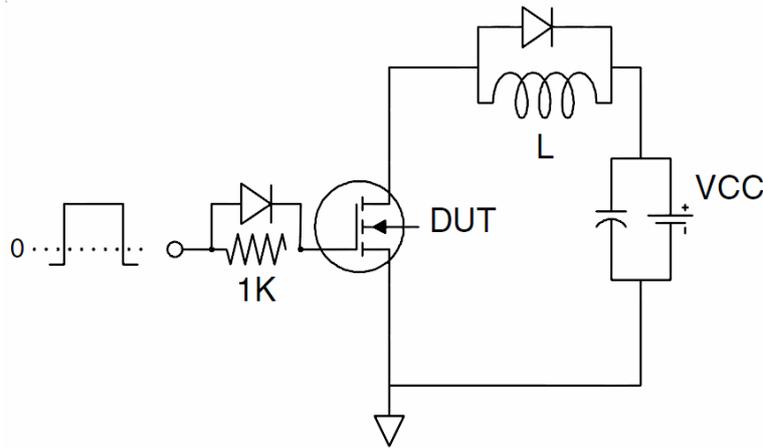
3) Switch Time Test Circuit

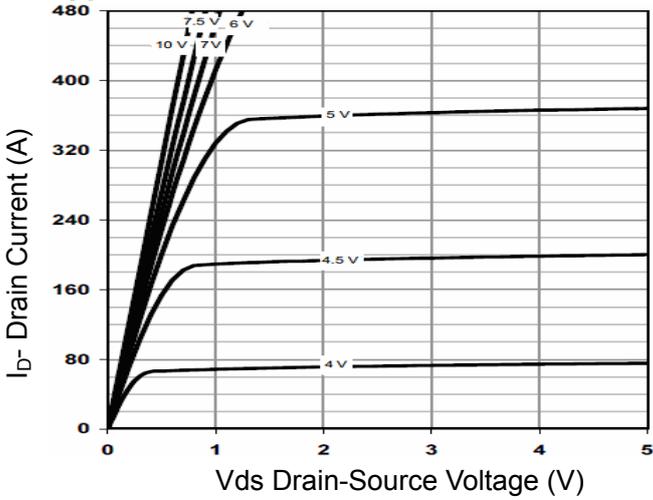## Typical Electrical and Thermal Characteristics
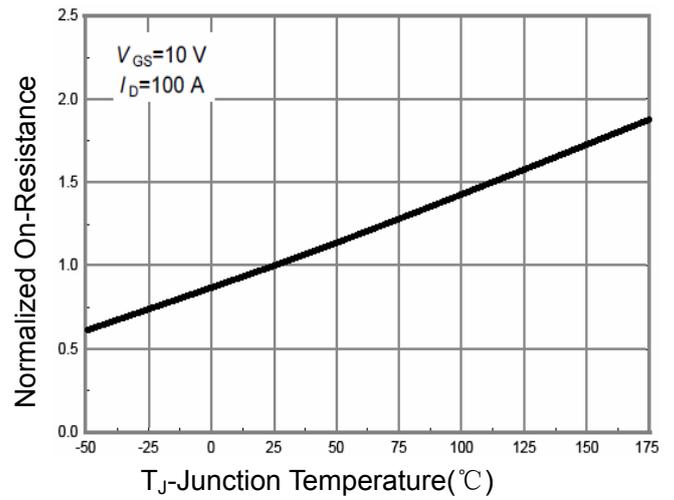

Figure 1 Output Characteristics

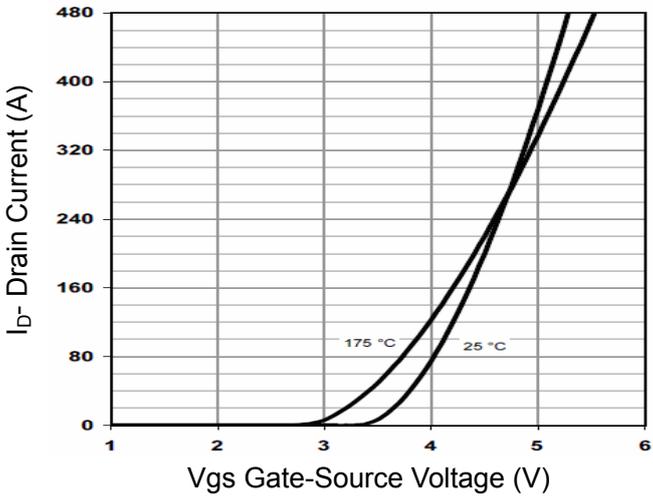**Figure 4 Rdson-JunctionTemperature**
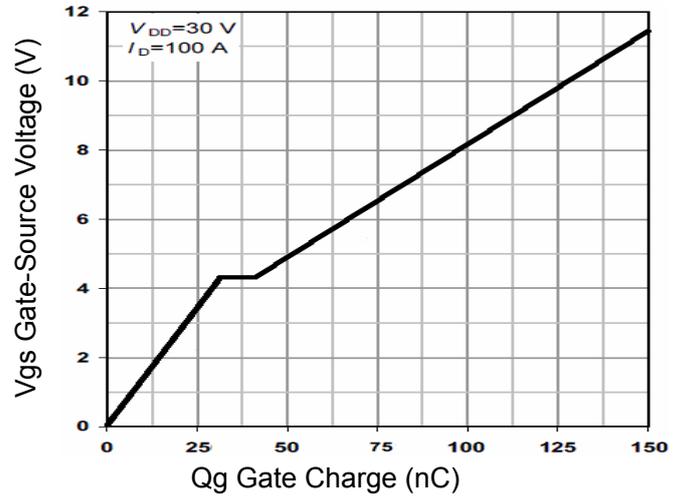

Figure 2 Transfer Characteristics
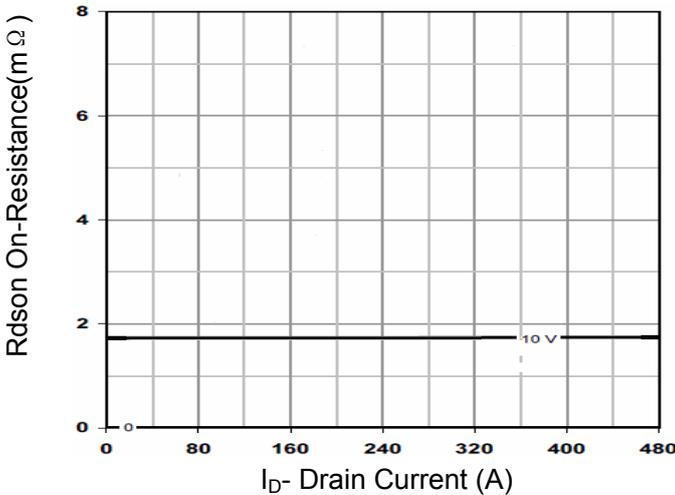

Figure 5 Gate Charge

Figure 3 Rdson- Drain Current

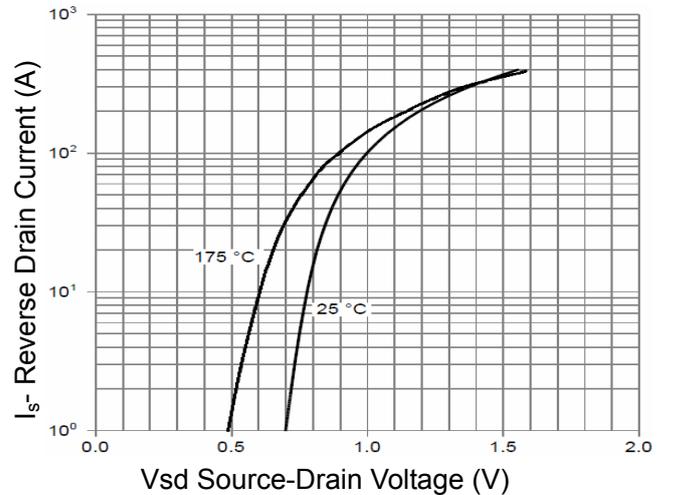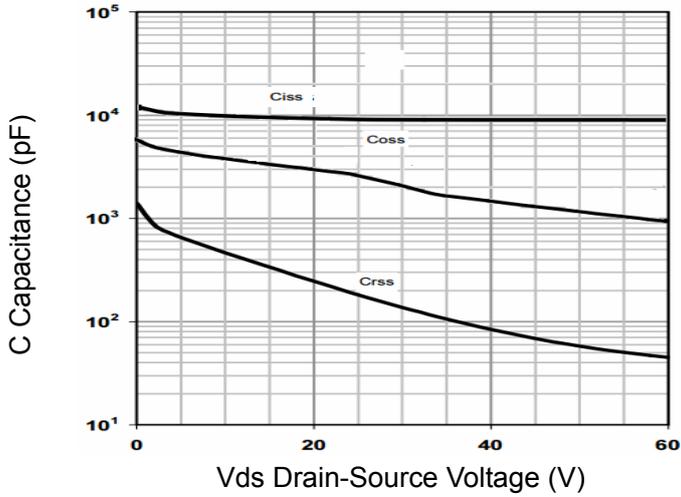**Figure 6 Source- Drain Diode Forward**

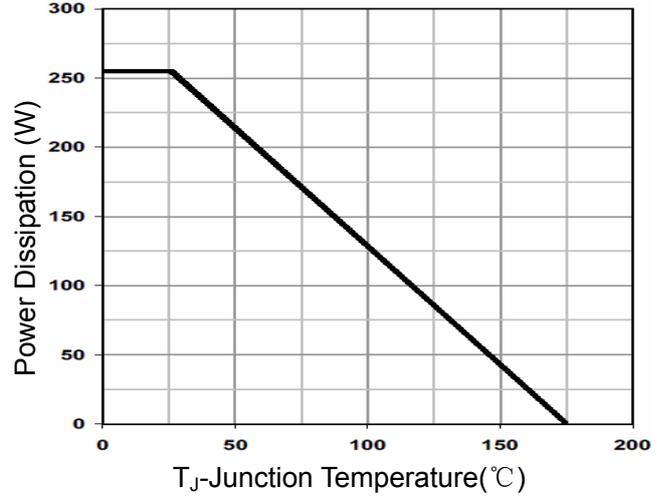**Figure 7 Capacitance vs Vds**
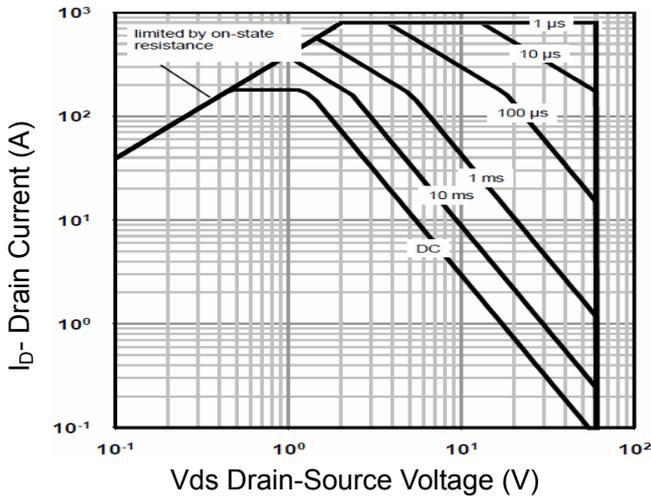

Figure 9 Power De-rating

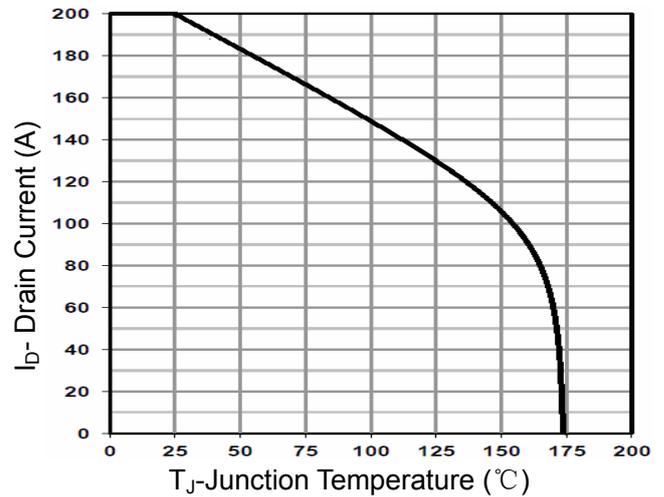**Figure 8 Safe Operation Area**

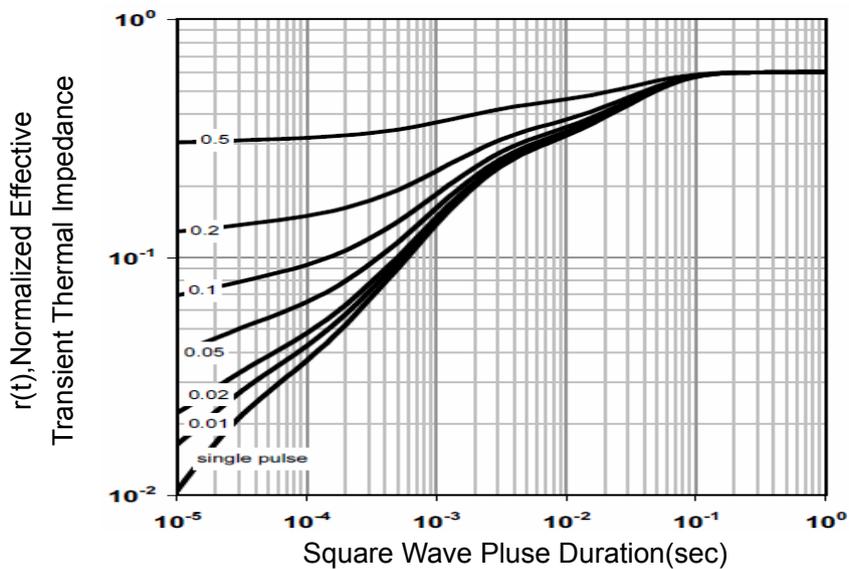

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance

TO-247 Package Information
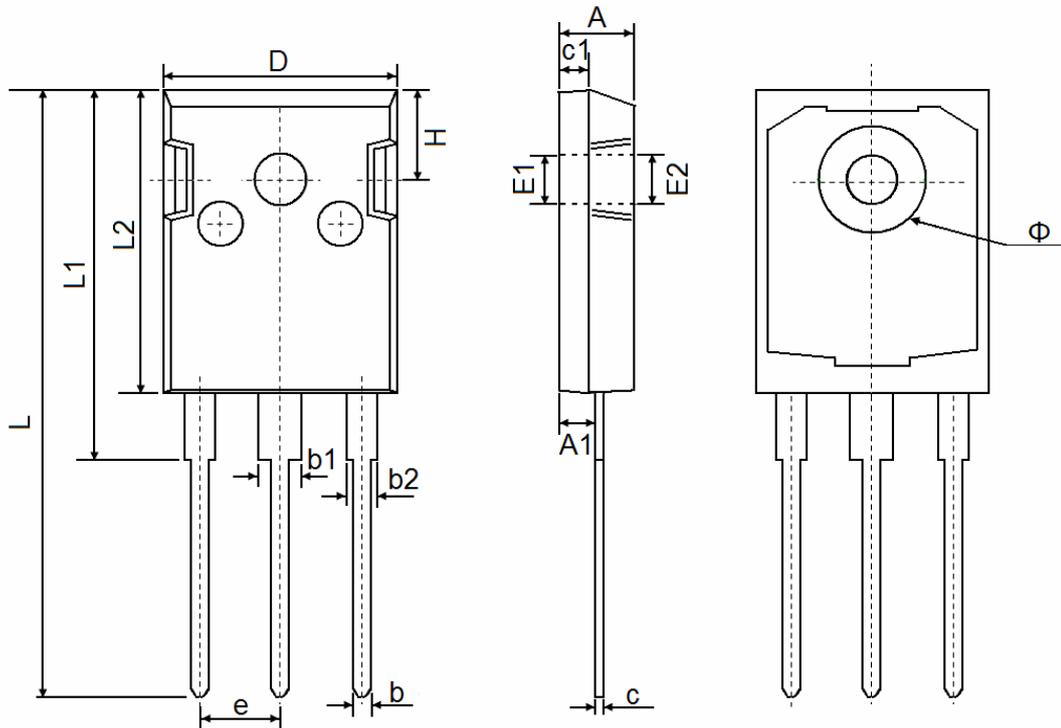
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

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