NCE N-Channel Super Trench Power MOSFET

Description

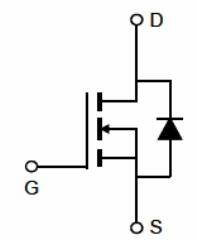
The NCEP60T20LL uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g. This device is ideal for high-frequency switching and synchronous rectification.

General Features

- V_{DS} =60V,I_D =300A
  $R_{DS(ON)}$=1.2mΩ (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

TOLL top view

100% UIS TESTED!
100% ΔVds TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP60T20LL	NCEP60T20LL	TOLL	-	-	-

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	300	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	225	A
Pulsed Drain Current	I_{DM}	1200	A
Maximum Power Dissipation	P_D	350	W
Derating factor		2.33	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)	$R_{\theta JC}$	0.43	℃/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

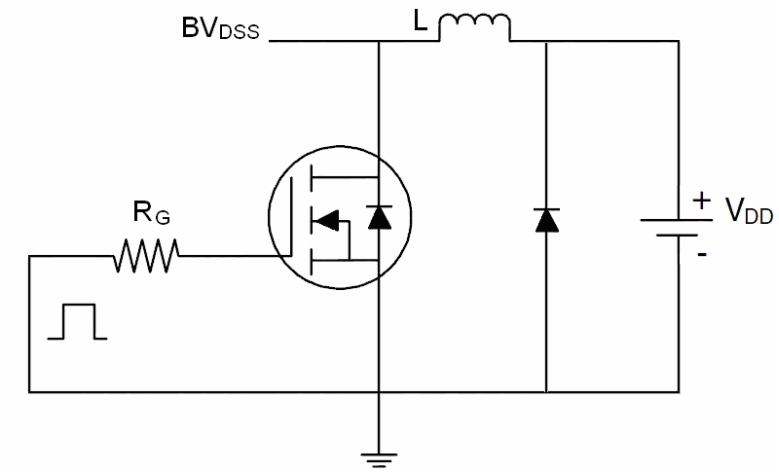
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2.2	2.7	3.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=150A	-	1.2	1.5	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=150A	-	60	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	8600	-	PF
Output Capacitance	C_{oss}		-	1800	-	PF
Reverse Transfer Capacitance	C_{rss}		-	54	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V,I_D=150A V_{GS}=10V,R_G=4.7Ω	-	19	-	nS
Turn-on Rise Time	t_r		-	31	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	58	-	nS
Turn-Off Fall Time	t_f		-	23	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=150A, V_{GS}=10V	-	129		nC
Gate-Source Charge	Q_{gs}		-	40.6		nC
Gate-Drain Charge	Q_{gd}		-	23.9		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=300A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	300	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =150A di/dt = 100A/μs (Note3)	-	67		nS
Reverse Recovery Charge	Qrr		-	112		nC

Notes:

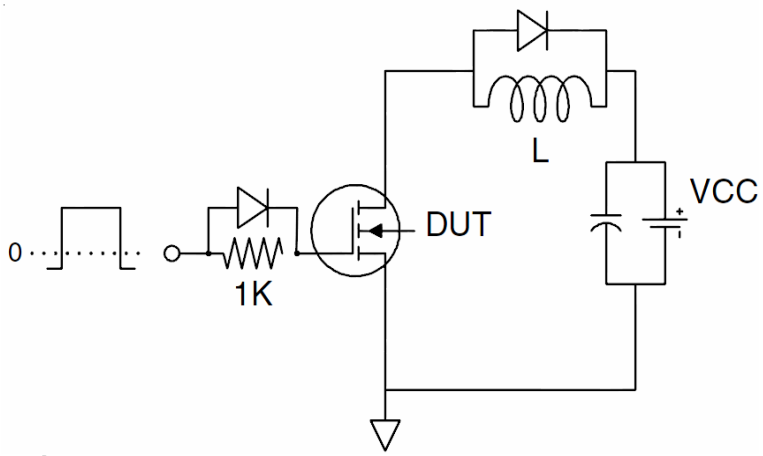
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω

Test Circuit

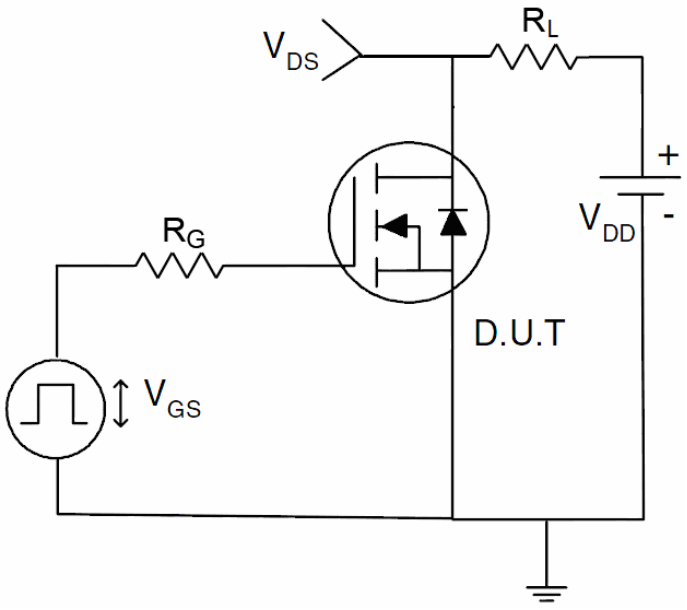
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

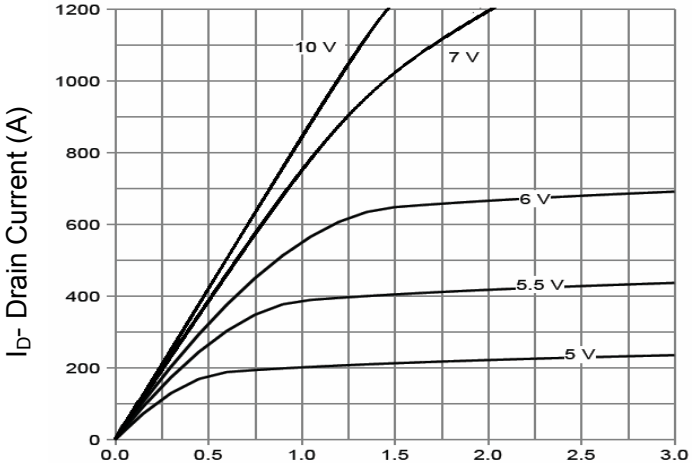


Figure 1 Output Characteristics

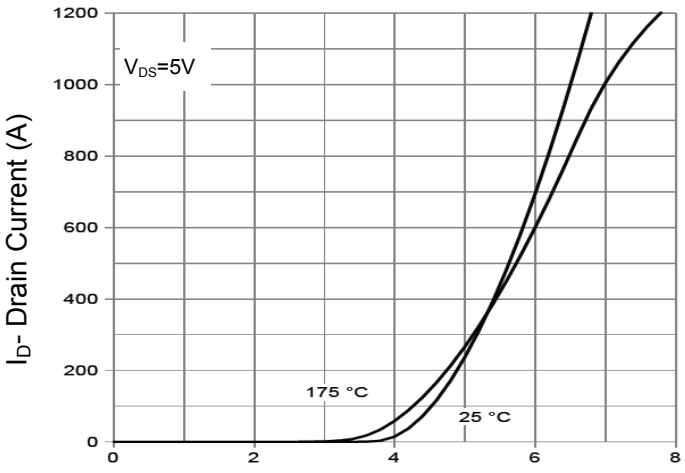


Figure 2 Transfer Characteristics

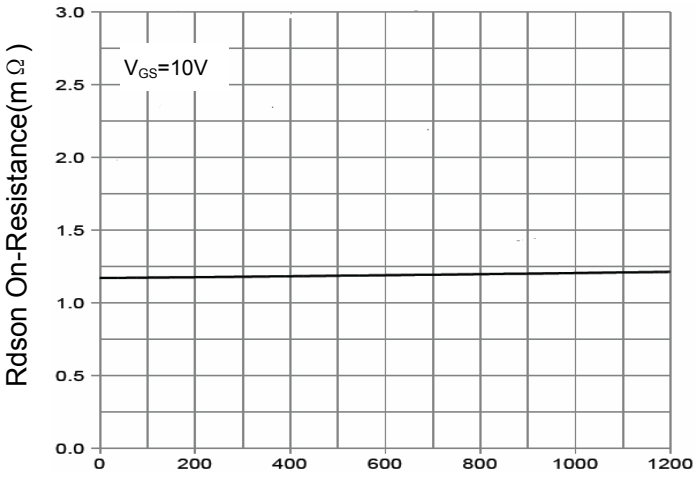


Figure 3 Rdson- Drain Current

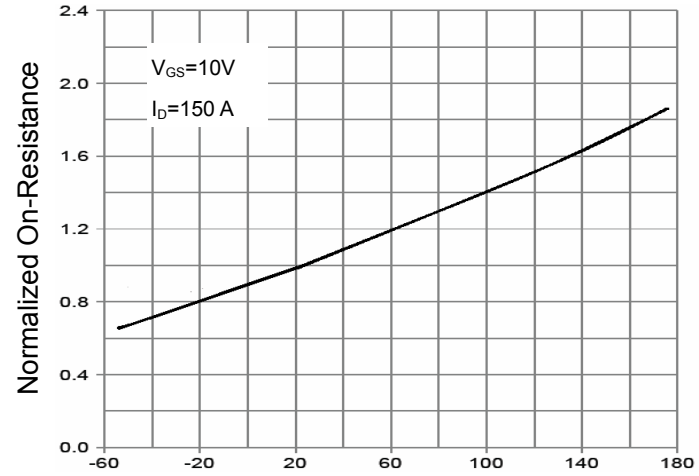


Figure 4 Rdson-JunctionTemperature

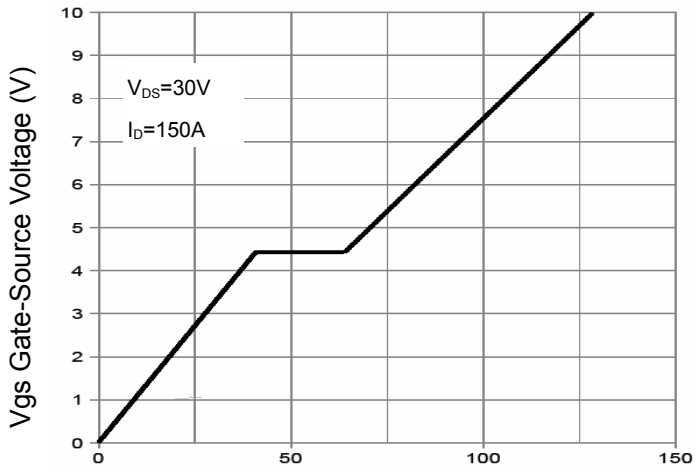


Figure 5 Gate Charge

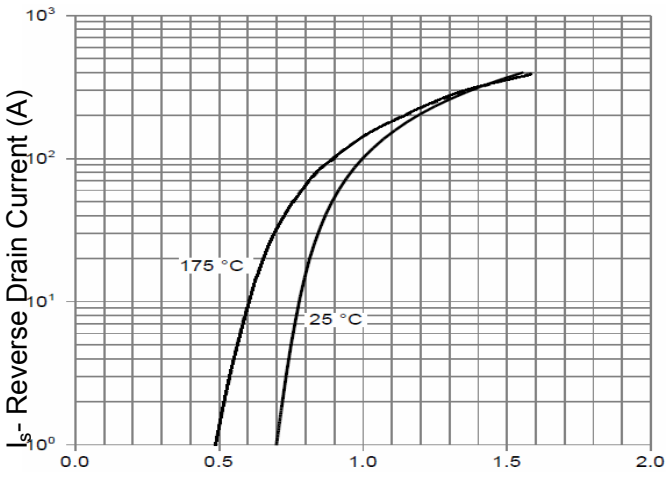


Figure 6 Source- Drain Diode Forward

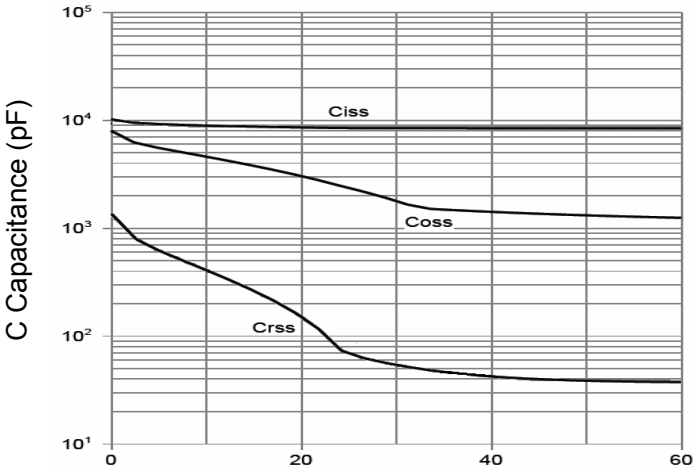


Figure 7 Capacitance vs Vds

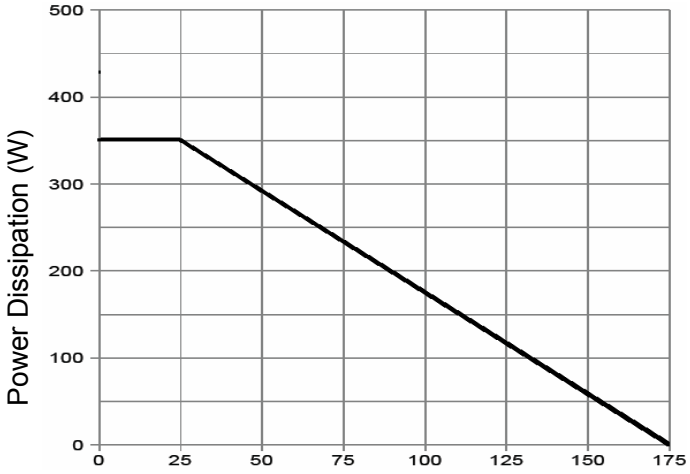


Figure 9 Power De-rating

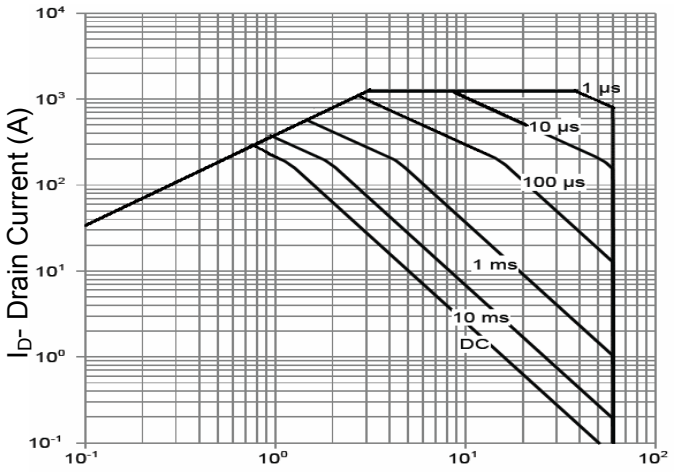


Figure 8 Safe Operation Area

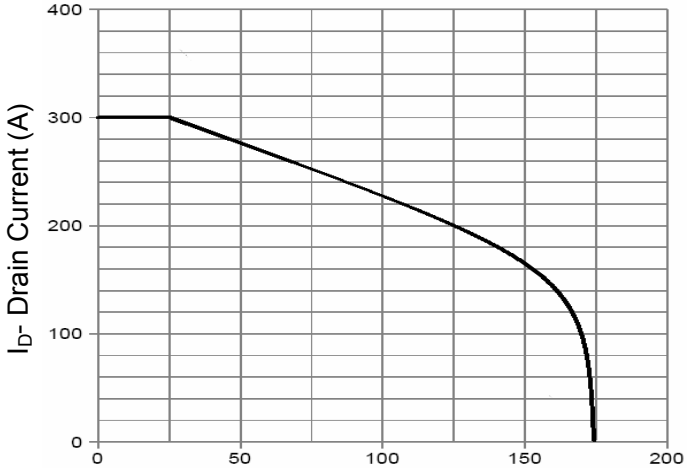


Figure 10 Current De-rating

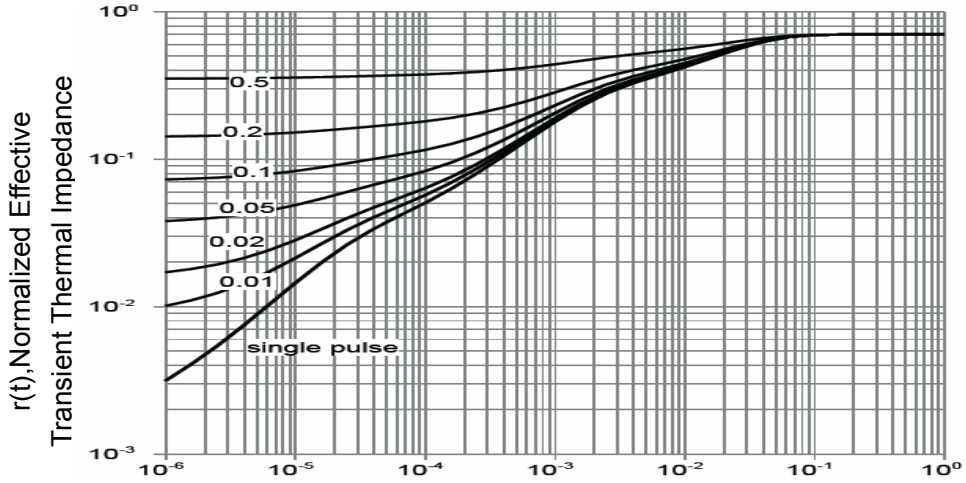
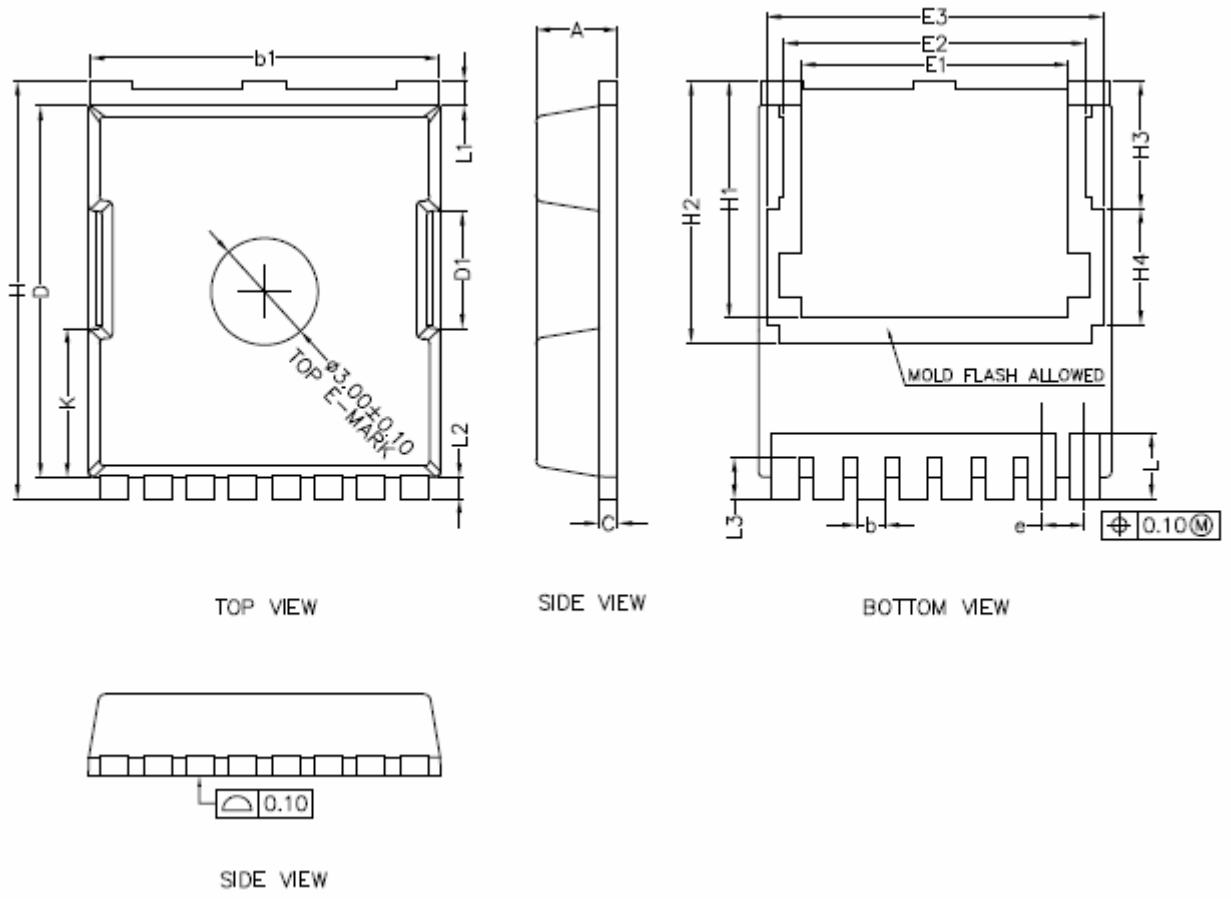


Figure 11 Normalized Maximum Transient Thermal Impedance

TOLL Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
c	0.40	0.50	0.60
D	10.28	10.43	10.58
D1	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	7.35	7.50	7.65
E2	8.35	8.50	8.65
E3	9.31	9.46	9.61
e	1.10	1.20	1.30
H	11.48	11.73	11.88
H1	6.55	6.65	6.75
H2	7.20	7.35	7.50
H3	3.44	3.59	3.74
H4	3.11	3.26	3.41
K	4.03	4.18	4.33
L	1.60	1.85	2.10
L1	0.55	0.70	0.85
L2	0.45	0.60	0.75
L3	1.00	1.15	1.30

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