

N-Channel Enhancement Mode MOSFET

1. Product Information

1.1 Features

- ☑ Surface-mounted package
- ☑ Advanced trench cell design

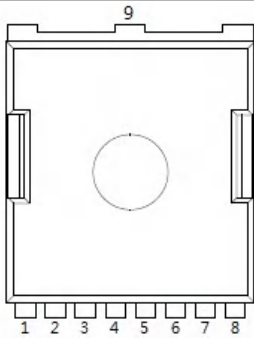
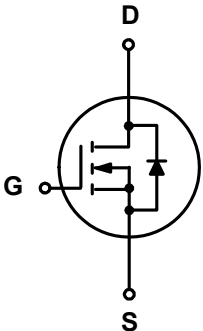
1.2 Applications

- ☑ LCD TV appliances
- ☑ LCDM appliances
- ☑ High power inverter system

1.3 Quick reference

- ☑ $BV \geq 40\text{ V}$
- ☑ $P_{tot} \leq 300\text{ W}$
- ☑ $I_D \leq 400\text{ A}$
- ☑ $R_{DS(ON)} \leq 0.50\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- ☑ $R_{DS(ON)} \leq 0.80\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$

2. Pin Description

Pin	Description	Simplified Outline	Symbol
1	Gate(G)	 Top View TOLL	
2,3,4,5,6,7,8	Source(S)		
9	Drain(D)		

3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	40	V
V_{GS}	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	± 20	V
$I_{D^{***}}$	Drain Current (DC)	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	400	A
		$T_C = 100\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	371	A
I_{DM}^*	Drain Current (Pulsed)	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	1600	A
P_{tot}	Drain power dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	-	300	W
T_{stg}	Storage Temperature		-55	175	$^{\circ}\text{C}$
T_J	Junction Temperature		-	175	$^{\circ}\text{C}$
I_S	Continuous-Source Current	$T_C = 25\text{ }^{\circ}\text{C}$	-	400	A
E_{AS}	Single Pulsed Avalanche Energy	$V_{DD}=40\text{ V}, L=1.0\text{ mH}$	-	2312	mJ
$R_{\theta JA}^{**}$	Thermal Resistance- Junction to Ambient		-	47	$^{\circ}\text{C/W}$
$R_{\theta JC}^{**}$	Thermal Resistance- Junction to Case		-	0.5	

Notes :

- * Pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
- ** Surface Mounted on 1 in^2 pad area, $t \leq 10\text{ sec}$
- *** Limited by bonding wire

4. Marking Information

Product Name	Marking
UP004N04CTL	

5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
UP004N04CTL	TOLL-8L			2000	

6. Electrical Characteristics (T_A = 25 °C Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _{DS} = 250 μA	40	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250 μA	1	-	2.5	V
I _{DSS}	Drain Leakage Current	V _{DS} = 32 V, V _{GS} = 0 V	-	-	1	μA
I _{GSS}	Gate Leakage Current	V _{GS} = 0 V, V _{GS} = ± 20 V	-	-	±100	nA
R _{DS(ON)} ^a	On-State Resistance	V _{GS} = 10 V, I _{DS} = 50 A	-	0.45	0.50	m Ω
		V _{GS} = 4.5 V, I _{DS} = 30 A	-	0.75	0.80	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = 50 A, V _{GS} = 0 V	-	-	1.3	V
t _{rr}	Reverse Recovery Time	I _{DS} = 50 A, V _{GS} = 0 V dI _{SD} /dt = 100 A/μs	-	63	-	nS
Q _{rr}	Reverse Recovery Charge		-	72	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 20 V Frequency = 1 MHz	-	10505	-	pF
C _{oss}	Output Capacitance		-	3829	-	
C _{rss}	Reverse Transfer Capacitance		-	80	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 20 V, V _{GEN} = 10 V, R _G = 3.9 Ω, R _L = 0.4 Ω, I _{DS} = 50 A	-	18	-	nS
t _r	Turn-on Rise Time		-	112	-	
t _{d(off)}	Turn-off Delay Time		-	195	-	
t _f	Turn-off Fall Time		-	160	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} = 20 V, V _{GS} = 10 V, I _{DS} = 50 A	-	200	-	nC
Q _{gs}	Gate-Source Charge		-	39	-	
Q _{gd}	Gate-Drain Charge		-	41	-	

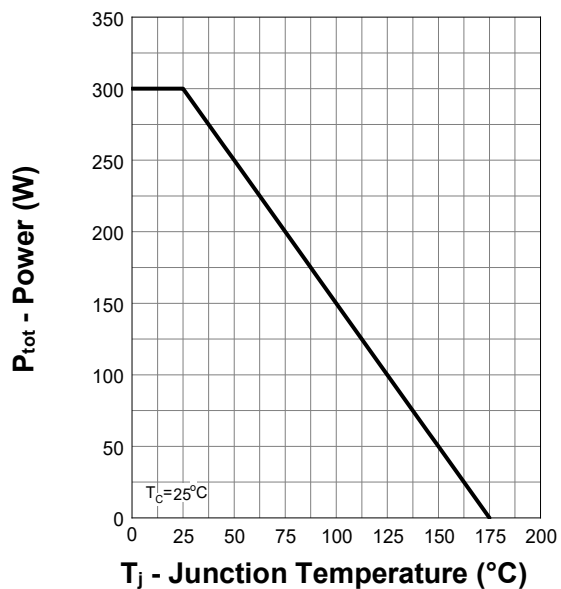
Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2%

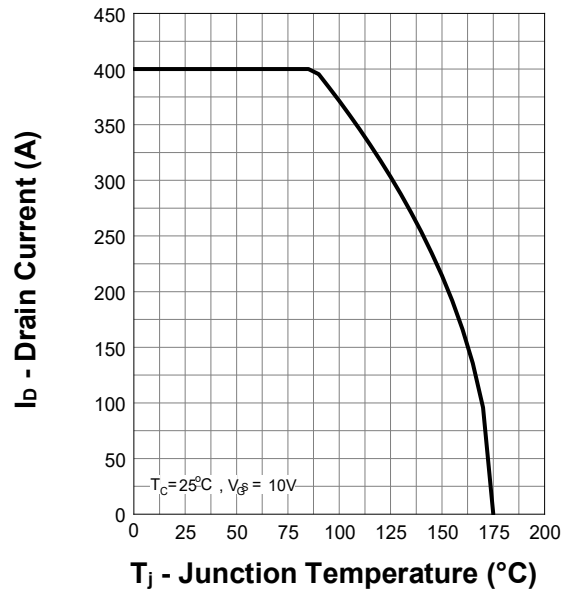
b : Guaranteed by design, not subject to production testing

7. Typical Characteristics

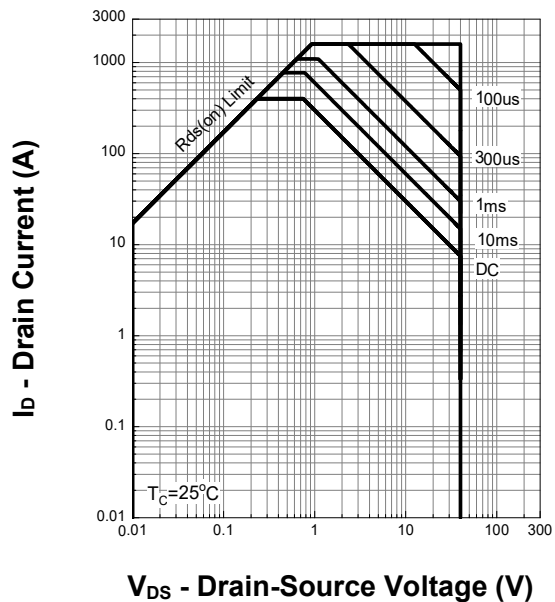
Power Capability



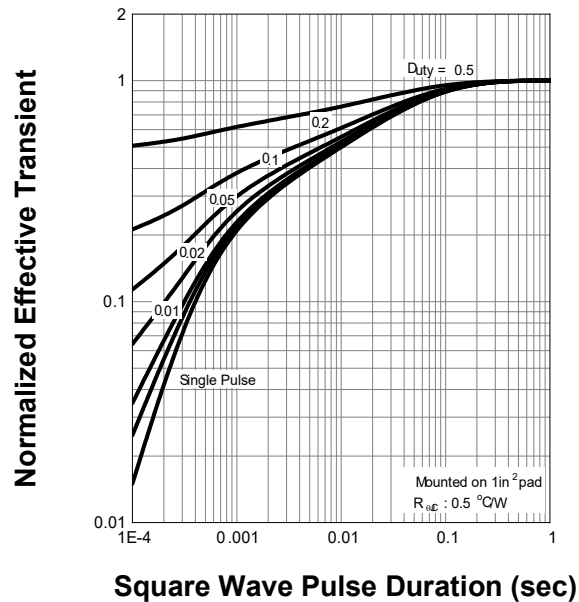
Current Capability



Safe Operating Area

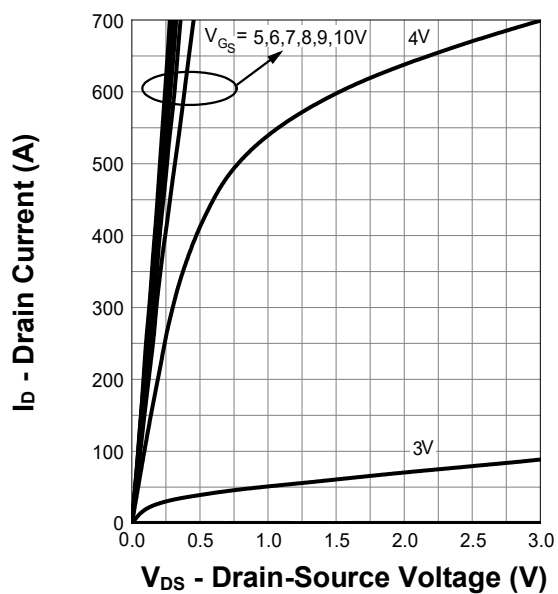


Transient Thermal Impedance

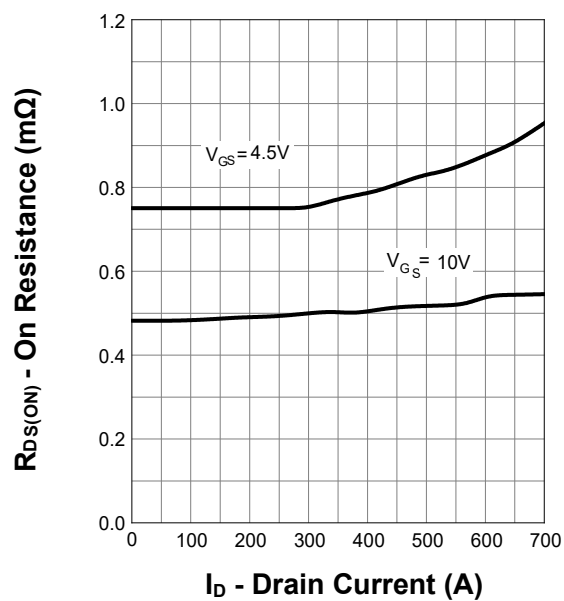


7. Typical Characteristics (cont.)

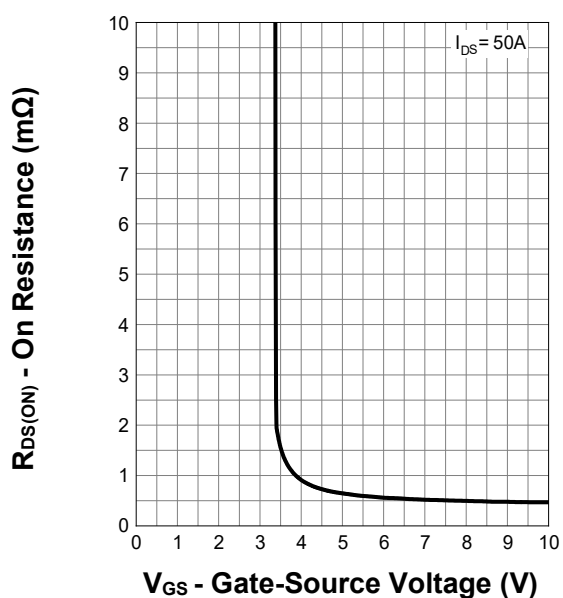
Output Characteristics



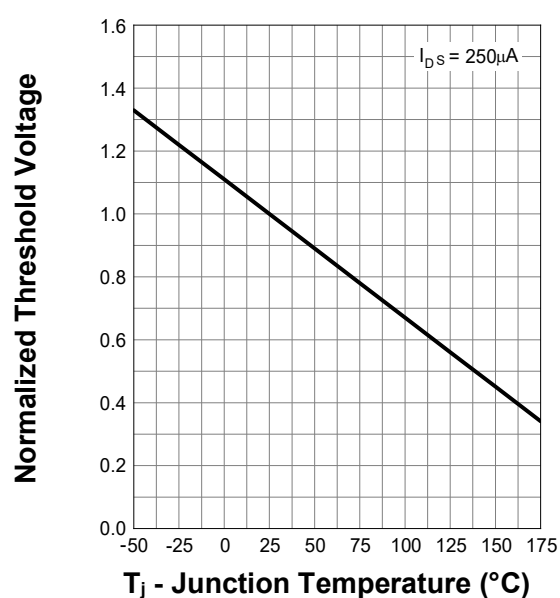
On Resistance



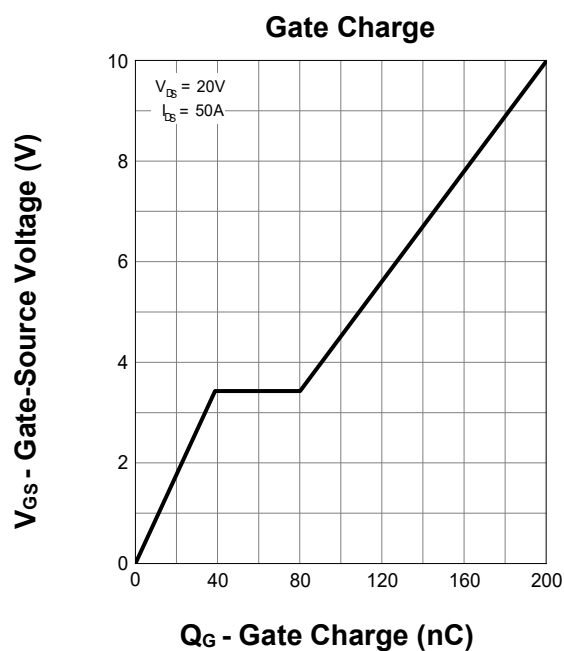
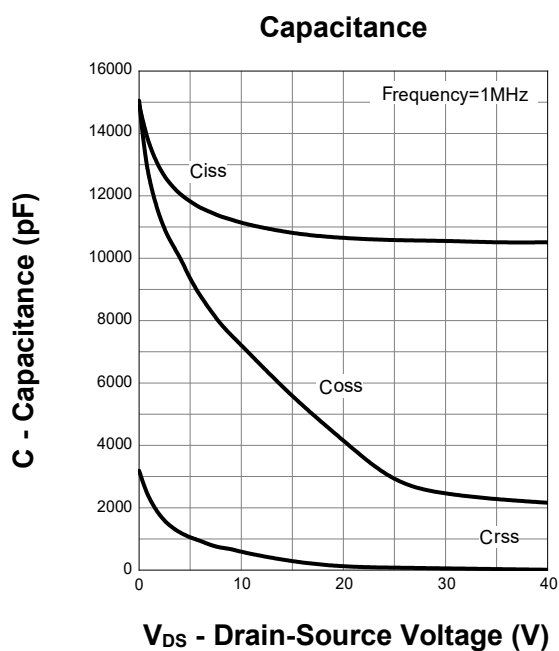
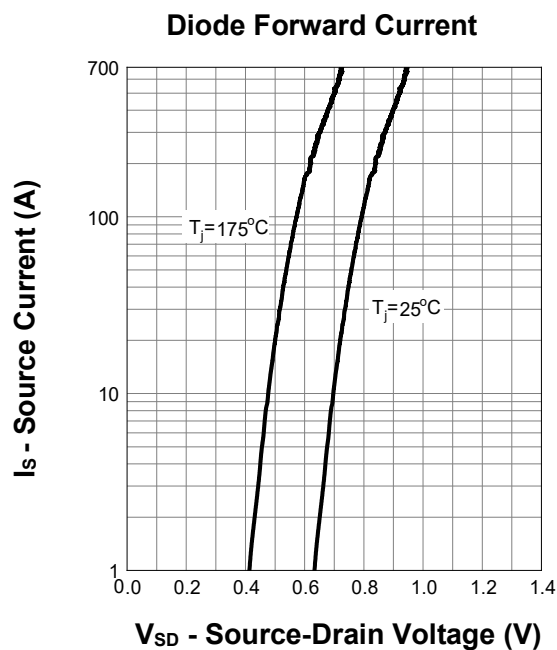
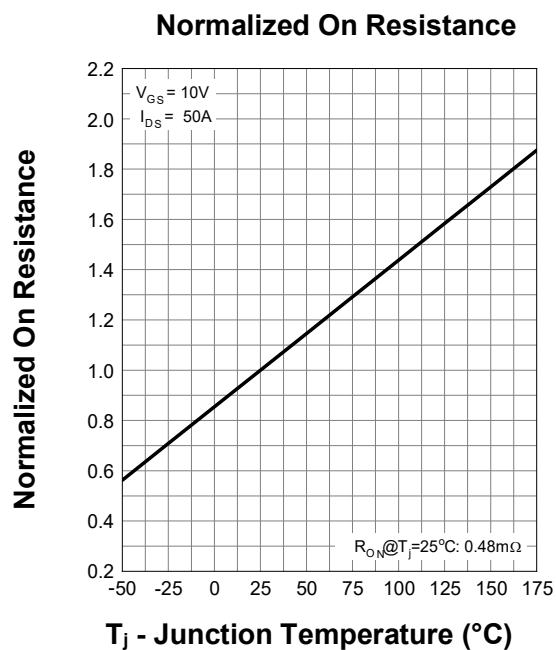
Transfer Characteristics



Normalized Threshold Voltage

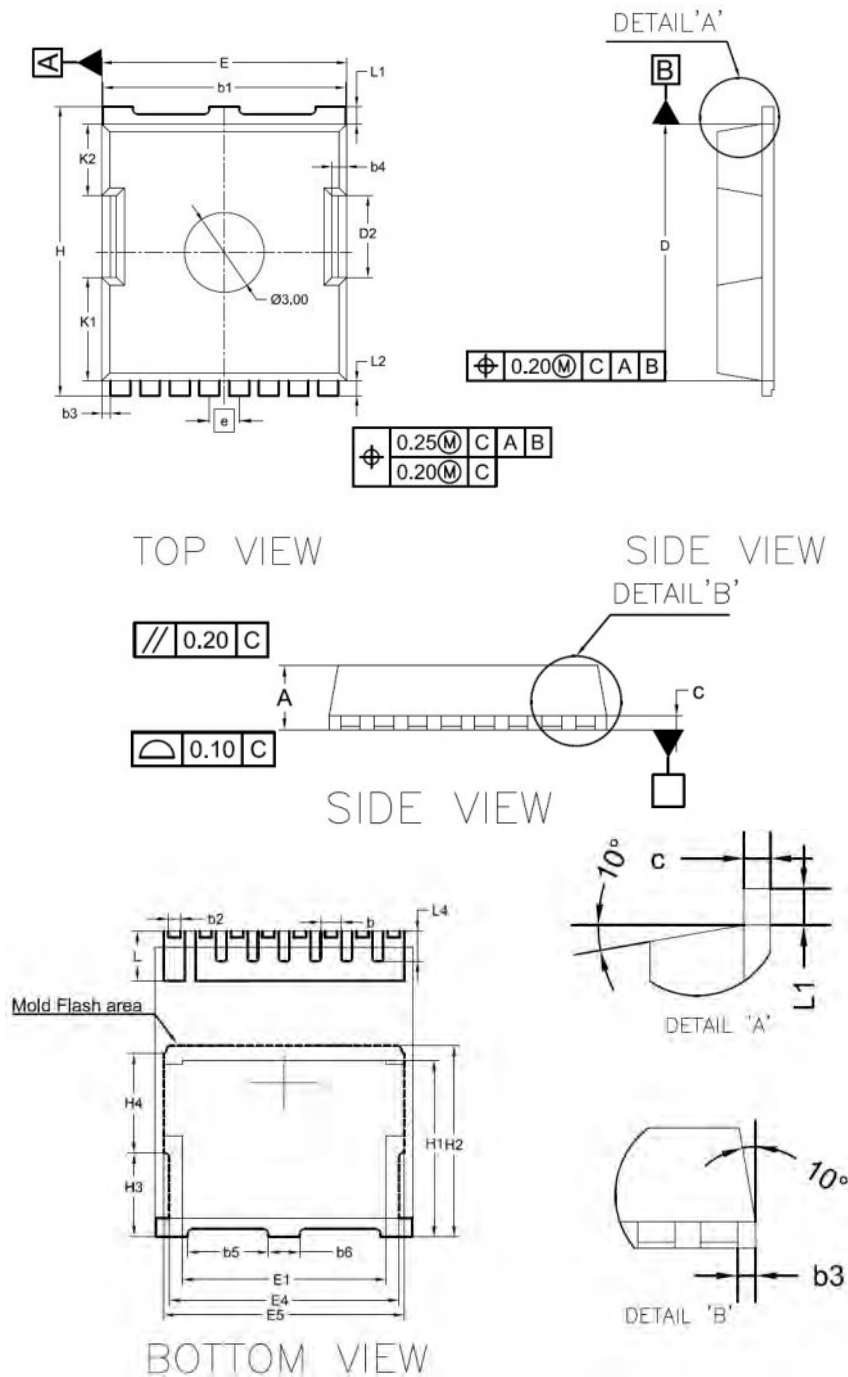


7. Typical Characteristics (cont.)



8. Package Dimensions

TOLL-8L Package



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TOLL-8L Package

Symbol	Dimensions In Millimeters			Dimensions In INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.200	2.300	2.400	0.087	0.091	0.094
c	0.492	0.500	0.508	0.019	0.020	0.021
D	10.280	10.380	10.480	0.405	0.409	0.413
E	9.800	9.900	10.000	0.386	0.390	0.394
e	1.20 BSC			0.047 BSC		
H	11.580	11.680	11.780	0.456	0.460	0.464
H1	6.650	6.750	6.850	0.262	0.266	0.270
H2	7.300			0.287		
H3	3.200			0.126		
H4	3.800			0.150		
K1	4.180			0.165		
K2	2.900			0.114		
D2	3.300			0.130		
b	0.700	0.800	0.900	0.028	0.031	0.035
b1	9.700	9.800	9.900	0.382	0.386	0.390
b2	0.420	0.460	0.500	0.017	0.018	0.020
b3	0.350			0.014		
b4	0.600			0.024		
b5	3.100			0.122		
b6	1.200			0.047		
L	1.700	1.900	2.100	0.067	0.075	0.083
L1	0.700			0.028		
L2	0.600			0.024		
L4	1.050	1.150	1.250	0.041	0.045	0.049
L5	0.500	0.600	0.700	0.020	0.024	0.028
E1	7.800			0.310		
E4	8.800			0.350		
E5	9.200			0.360		