

N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** 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.

Application

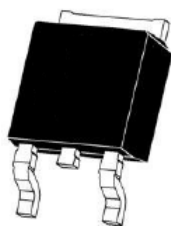
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 100V, I_D = 135A$
 $R_{DS(on)} = 3.4m\Omega$, typical @ $V_{GS} = 10V, I_D = 1A$
 $R_{DS(on)} = 3.9m\Omega$, typical @ $V_{GS} = 10V, I_D = 20A$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔV_{ds} TESTED!

TO-252

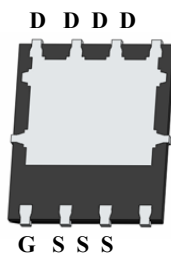


top view

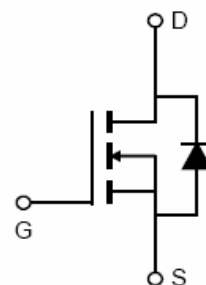
DFN5X6-8L



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HMS135N10K	HMS135N10K	TO-252	-	-	-
HMS135N10G	HMS135N10G	DFN5X6-8L	-	-	-

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	135	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	95	A
Pulsed Drain Current	I_{DM}	405	A
Maximum Power Dissipation	P_D	200	W
Derating factor		1.33	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	1050	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	0.75	$^{\circ}\text{C/W}$
--	-----------------	------	----------------------

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	100		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =100V, 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	2.0	3.0	4.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =1A	-	3.4	4.8	mΩ
		V _{GS} =10V, I _D =20A		3.9	5.0	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =70A		90	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =40V, V _{GS} =0V, F=1.0MHz	-	4950	-	PF
Output Capacitance	C _{oss}		-	850	-	PF
Reverse Transfer Capacitance	C _{rss}		-	40	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =40V, I _D =70A V _{GS} =10V, R _G =1.6Ω	-	18	-	nS
Turn-on Rise Time	t _r		-	11	-	nS
Turn-Off Delay Time	t _{d(off)}		-	38	-	nS
Turn-Off Fall Time	t _f		-	9	-	nS
Total Gate Charge	Q _g	V _{DS} =40V, I _D =70A, V _{GS} =10V	-	88	-	nC
Gate-Source Charge	Q _{gs}		-	22		nC
Gate-Drain Charge	Q _{gd}		-	25		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =70A	-		1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	135	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 70A di/dt = 100A/μs ^(Note3)	-	72	-	nS
Reverse Recovery Charge	Q _{rr}		-	102	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

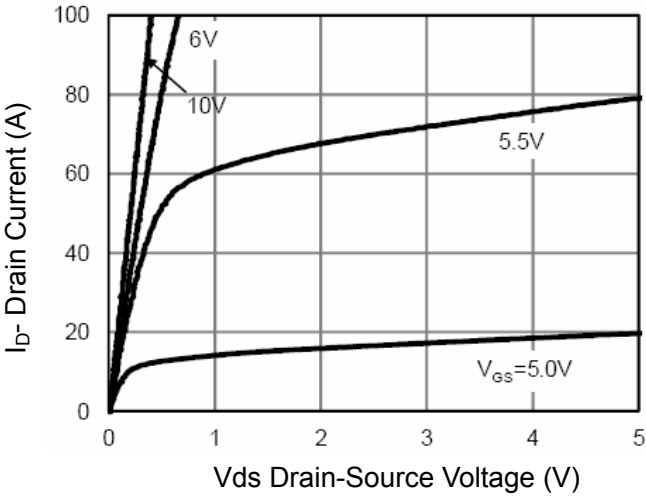


Figure 1 Output Characteristics

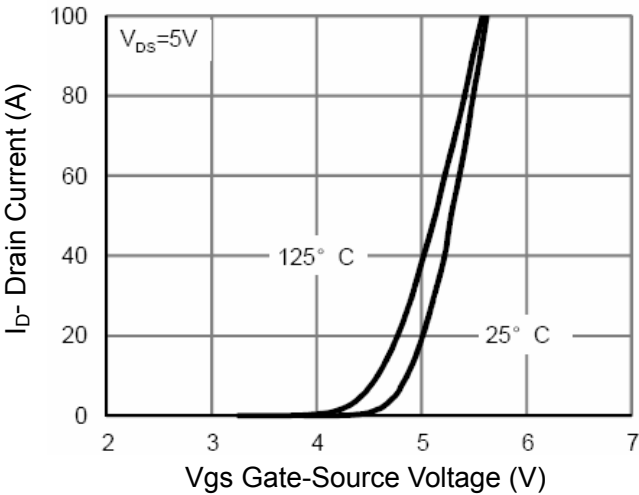


Figure 2 Transfer Characteristics

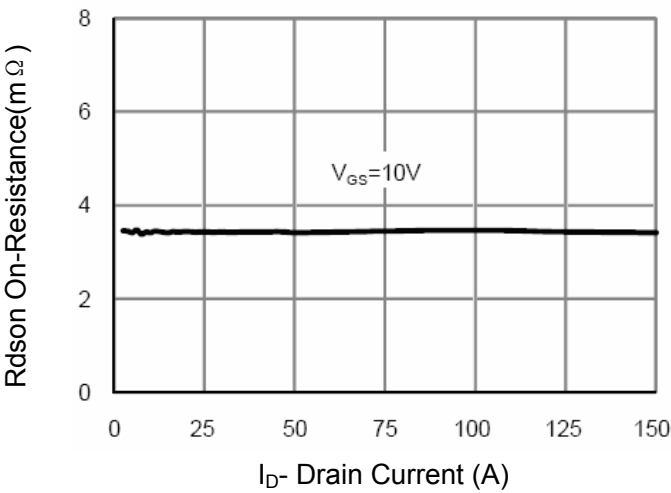


Figure 3 Rdson- Drain Current

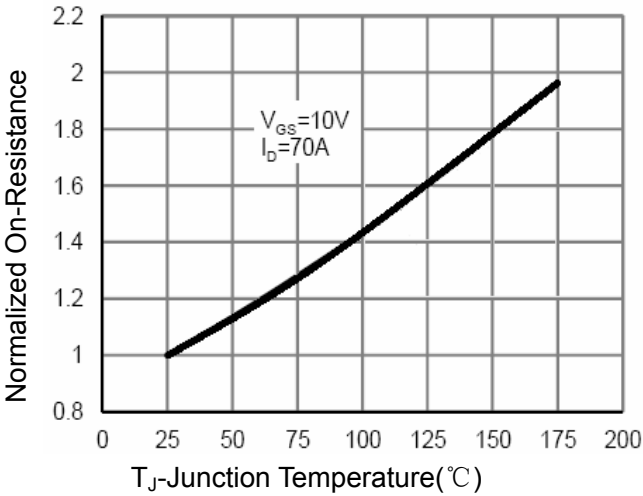


Figure 4 Rdson-Junction Temperature

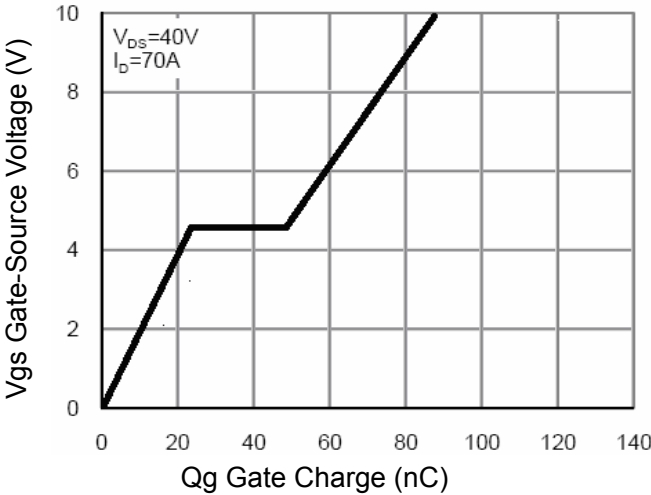


Figure 5 Gate Charge

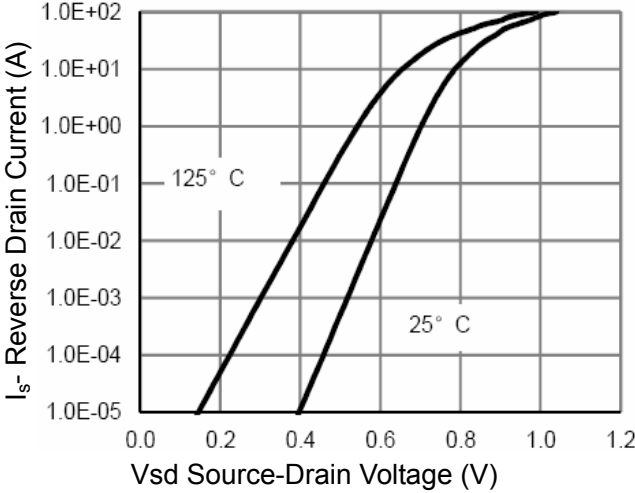


Figure 6 Source- Drain Diode Forward

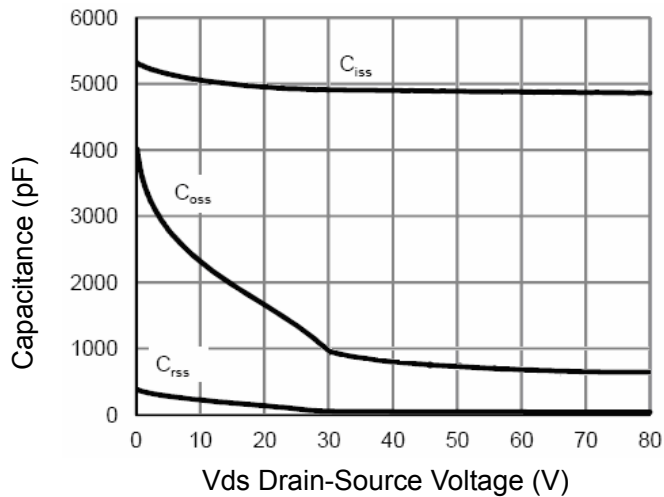


Figure 7 Capacitance vs Vds

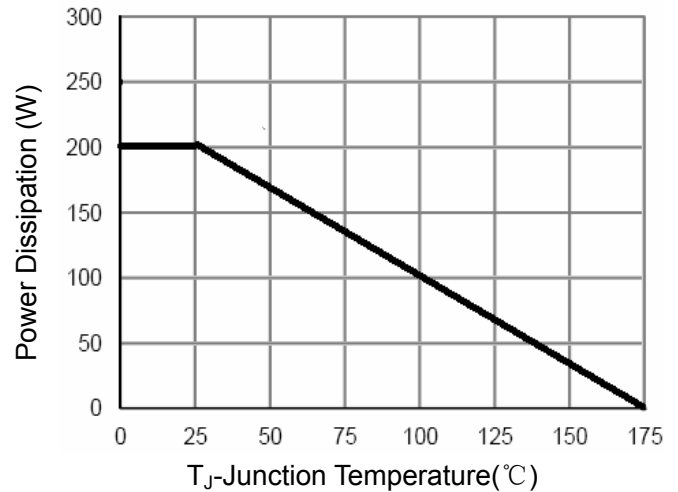


Figure 9 Power De-rating

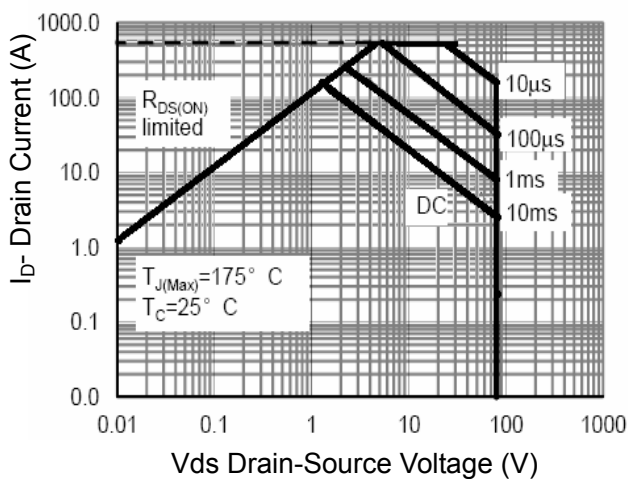


Figure 8 Safe Operation Area

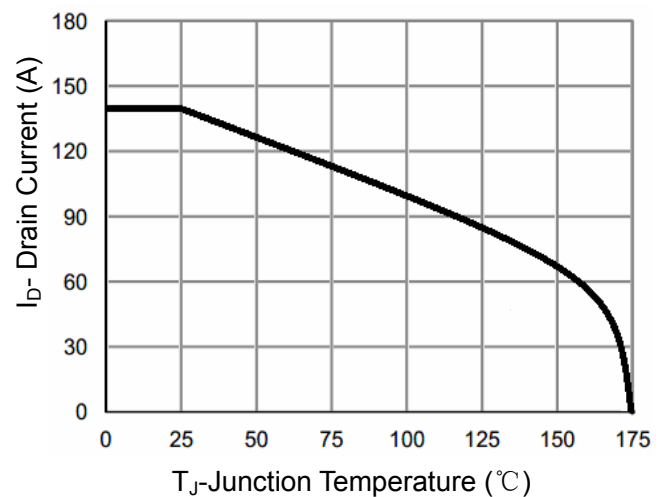


Figure 10 Current De-rating

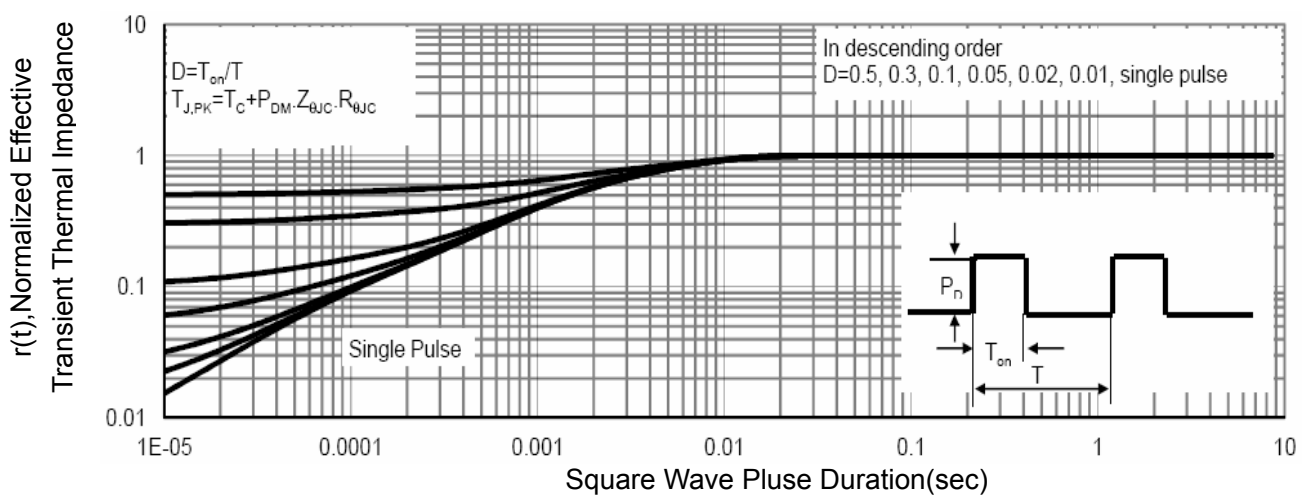
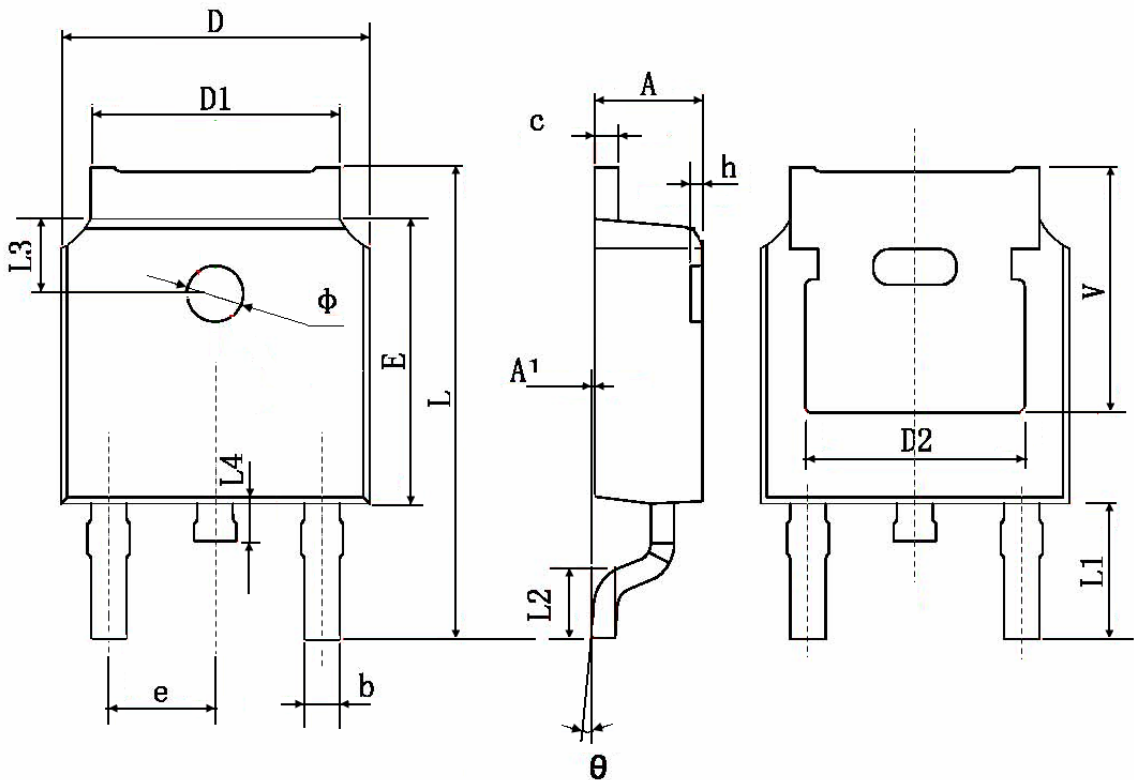


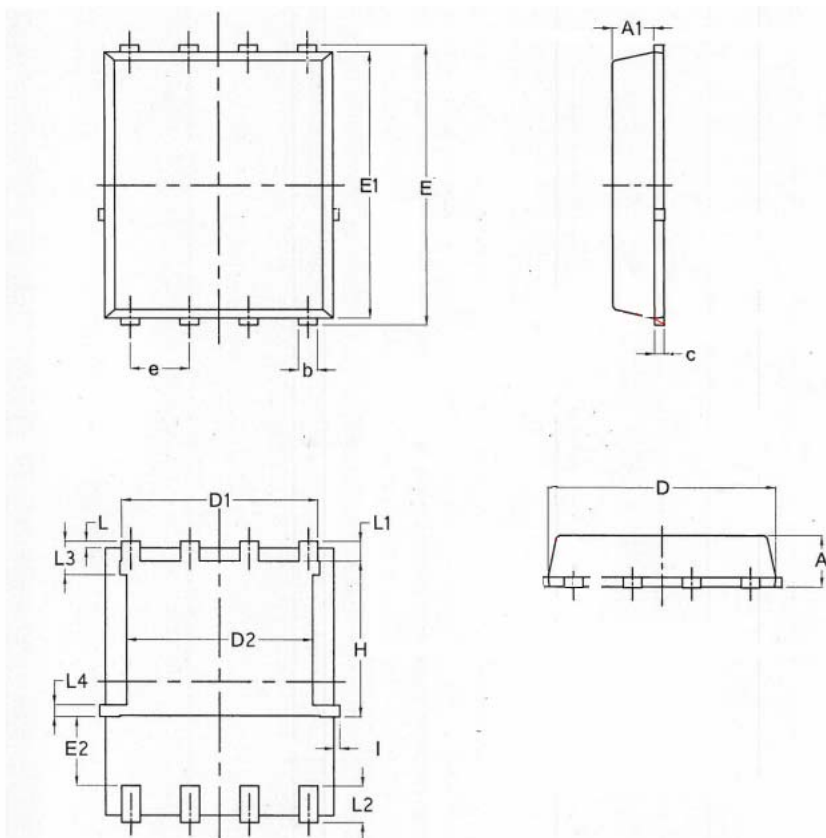
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.90	1.10	1.17	0.0354	0.0433	0.0461
A1	0.824	0.897	0.97	0.0324	0.0353	0.0382
b	0.33	0.41	0.50	0.0130	0.0161	0.0197
C	0.150	0.20	0.250	0.0059	0.0079	0.0098
D	4.80	4.90	5.00	0.1890	0.1929	0.1969
D1	3.91	4.22	4.36	0.1539	0.1661	0.1717
D2	3.85	4.00	4.15	0.1516	0.1575	0.1634
E	5.90	60.5	6.15	0.2323	0.2382	0.2421
E1	5.65	5.76	5.85	0.2224	0.2268	0.2303
E2	1.10	/	/	0.0433	/	/
e	1.27 BSC			0.050 BSC		
L	0.05	0.15	0.25	0.0020	0.0059	0.0098
L1	0.38	0.425	0.50	0.0150	0.0167	0.0197
L2	0.51	0.785	0.86	0.0201	0.0309	0.0339
L3	0.55	0.70	0.85	0.0217	0.0276	0.0335
L4	0.10	0.25	0.40	0.0039	0.0098	0.0157
H	3.25	3.35	3.58	0.1280	0.1319	0.1409
I	0	/	0.18	0	/	0.0071