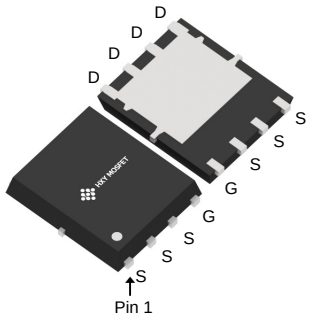
DMTH4014SPSW-13

N-Channel Enhancement Mode MOSFET

Description

The DMTH4014SPSW-13 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



DFN5X6-8L

General Features

V_{DS} = 40V I_D = 40A

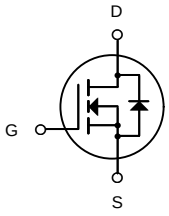
$R_{DS(ON)}$ < 14mΩ V_{GS}=10V

Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
DMTH4014SPSW-13	DFN5X6-8L	HXY MOSFET	5000

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	±20	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	40	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	28	A
I_{DM}	Pulsed Drain Current[2]	160	A
EAS	Single Pulse Avalanche Energy[3]	50	mJ
T_{STG}	Storage Temperature Range	-55 to 175	℃
T_J	Operating Junction Temperature Range	-55 to 175	℃

Electrical Characteristics (T_C=25℃unless otherwise noted)

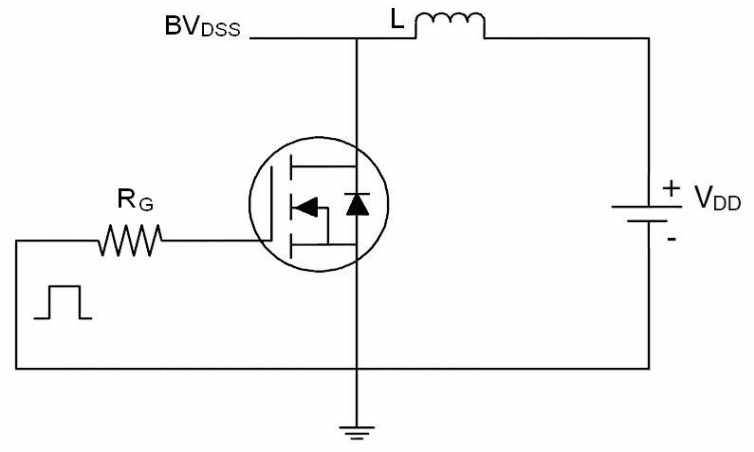
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=30A	-	11	14	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	30	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=25V,V_{GS}=0V, F=1.0MHz	-	1540	-	PF
Output Capacitance	C_{oss}		-	171	-	PF
Reverse Transfer Capacitance	C_{rss}		-	115	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,I_D=20A,R_L=1Ω V_{GS}=10V,R_{GEN}=3Ω	-	5.0	-	nS
Turn-on Rise Time	t_r		-	24	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=30A, V_{GS}=10V	-	24	-	nC
Gate-Source Charge	Q_{gs}		-	5.9	-	nC
Gate-Drain Charge	Q_{gd}		-	3.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=30A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	40	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =30A di/dt = 100A/μs (Note3)	-	9		nS
Reverse Recovery Charge	Qrr		-	15		nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

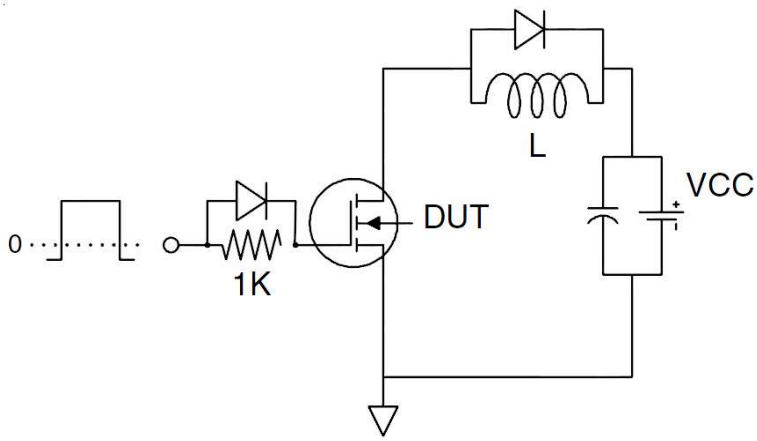
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω

Test circuit

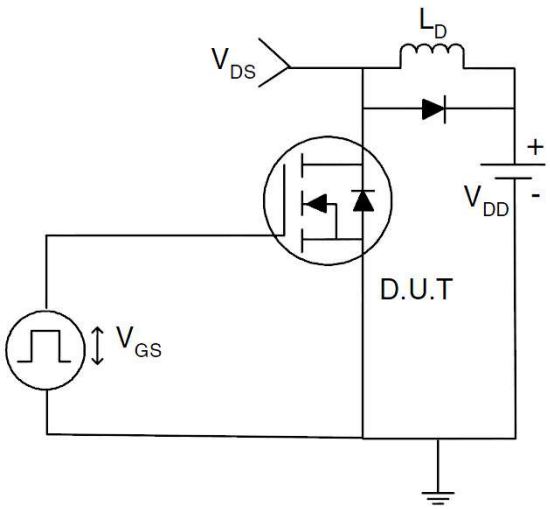
1) E_{AS} test Circuits



2) Gate charge test Circuit

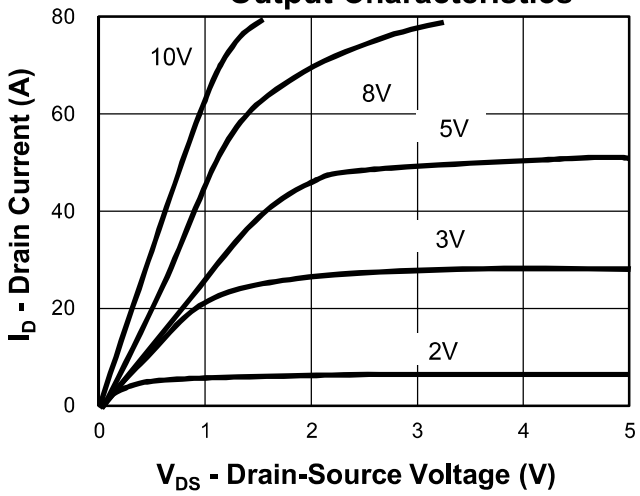


3) Switch Time Test Circuit

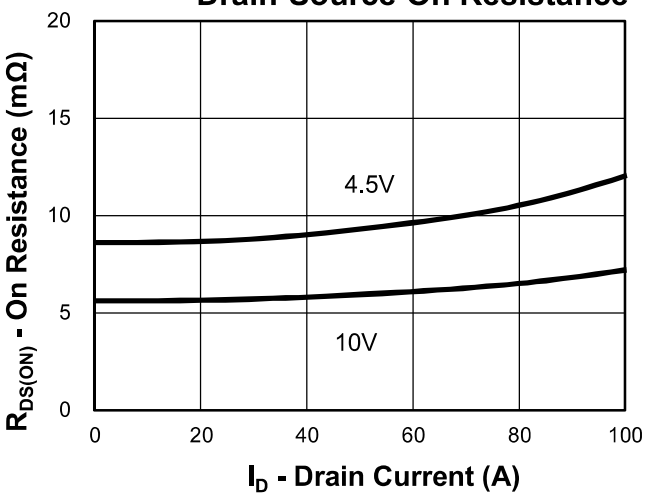


Typical Performance Characteristics

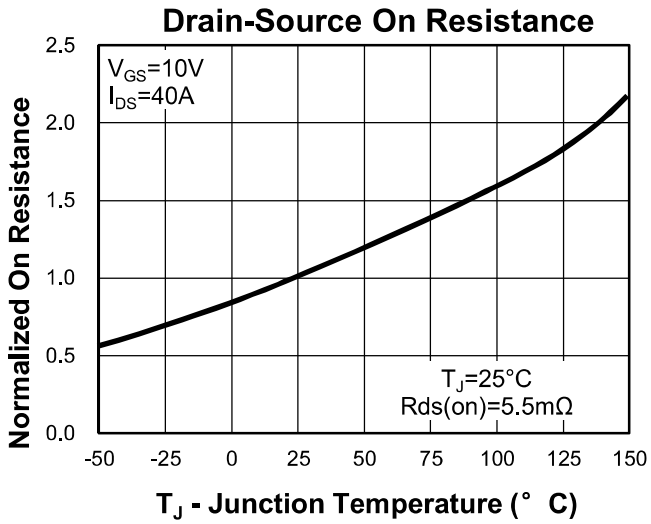
Output Characteristics



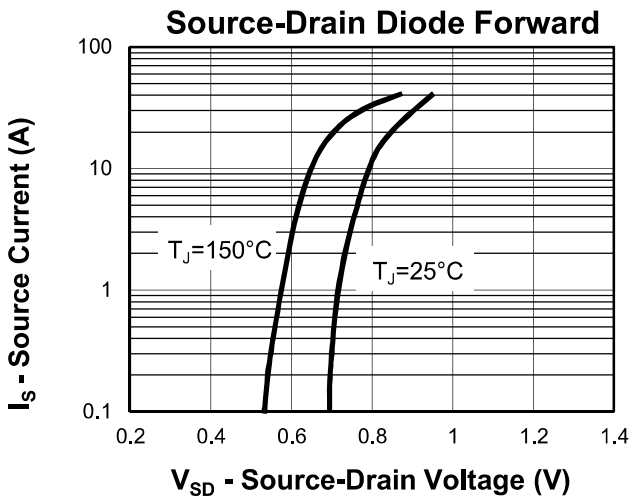
Drain-Source On Resistance



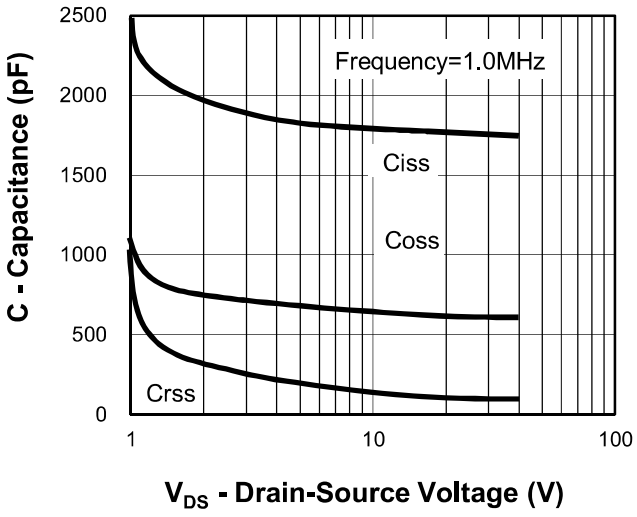
Drain-Source On Resistance



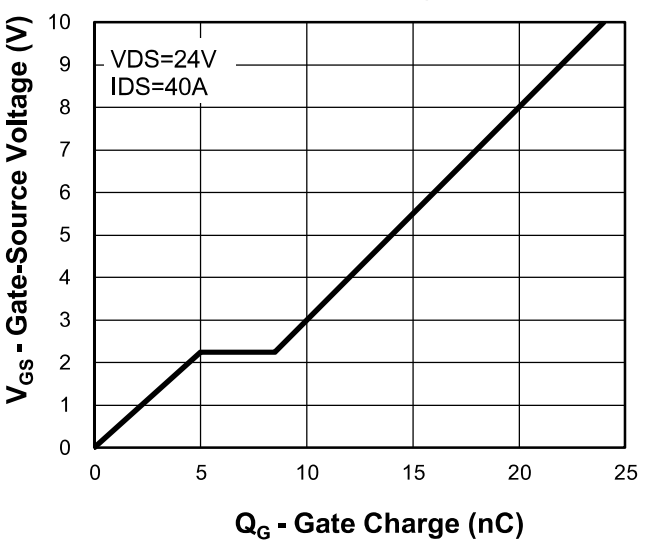
Source-Drain Diode Forward

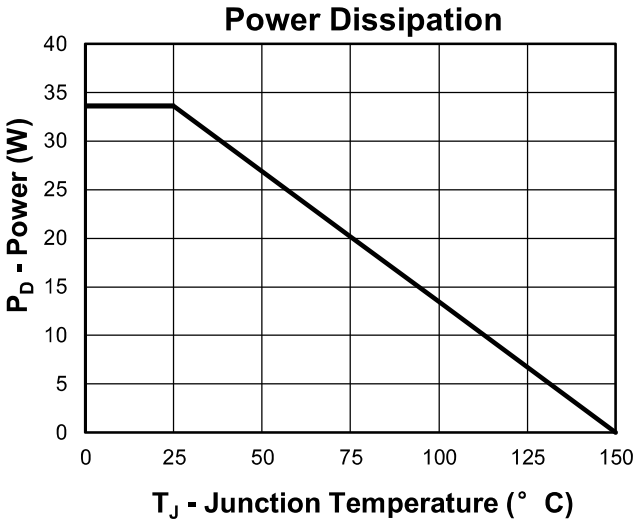


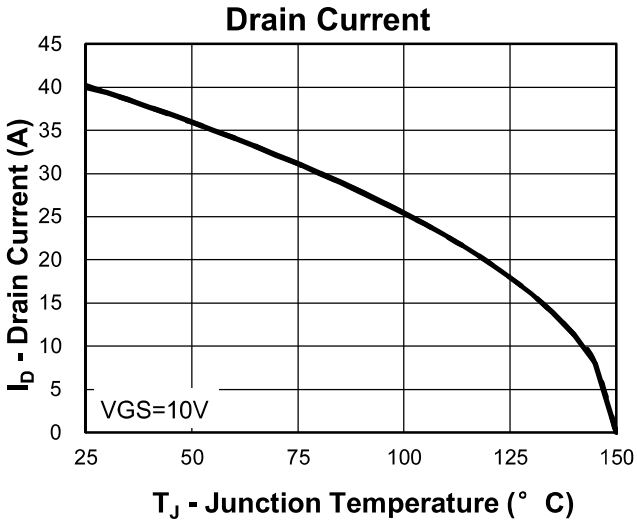
Capacitance

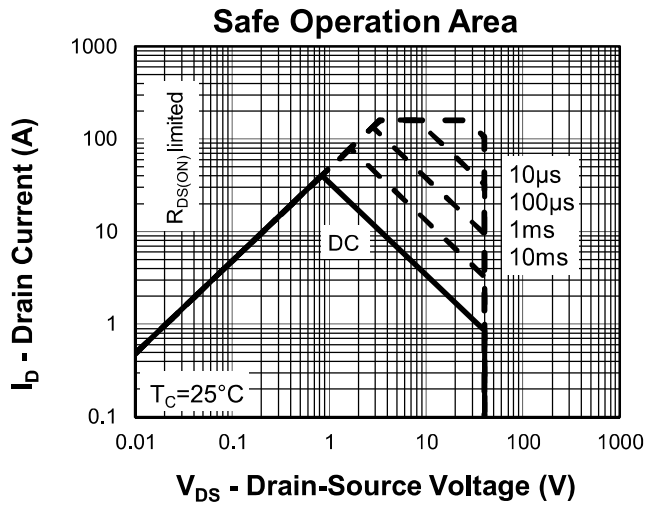


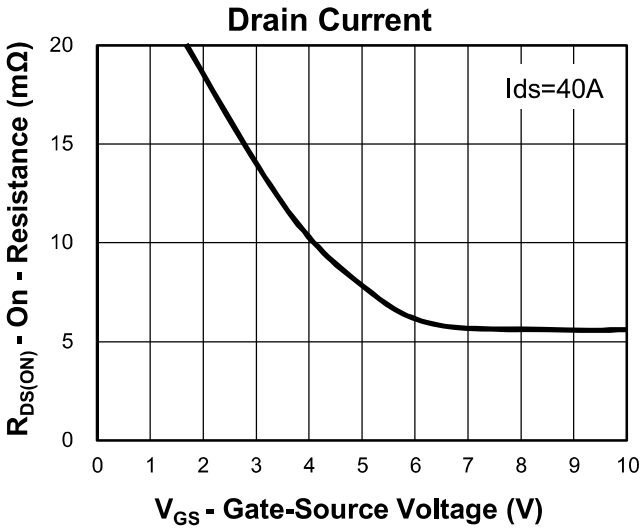
Gate Charge

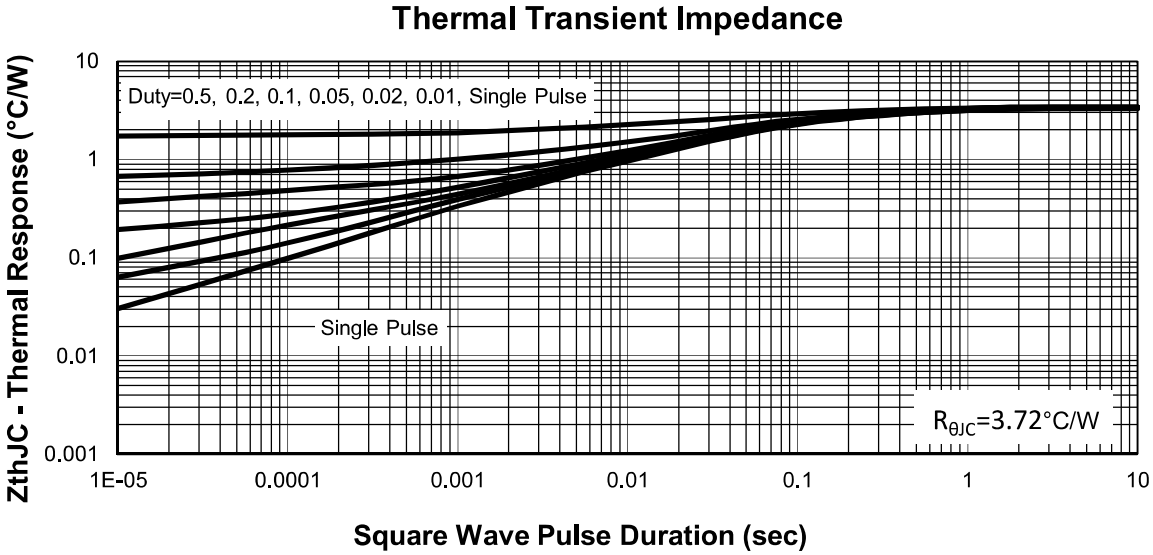



Power Dissipation
P_D - Power (W)
40
35
30
25
20
15
10
5
0
0
25
50
75
100
125
150
T_J - Junction Temperature (° C)

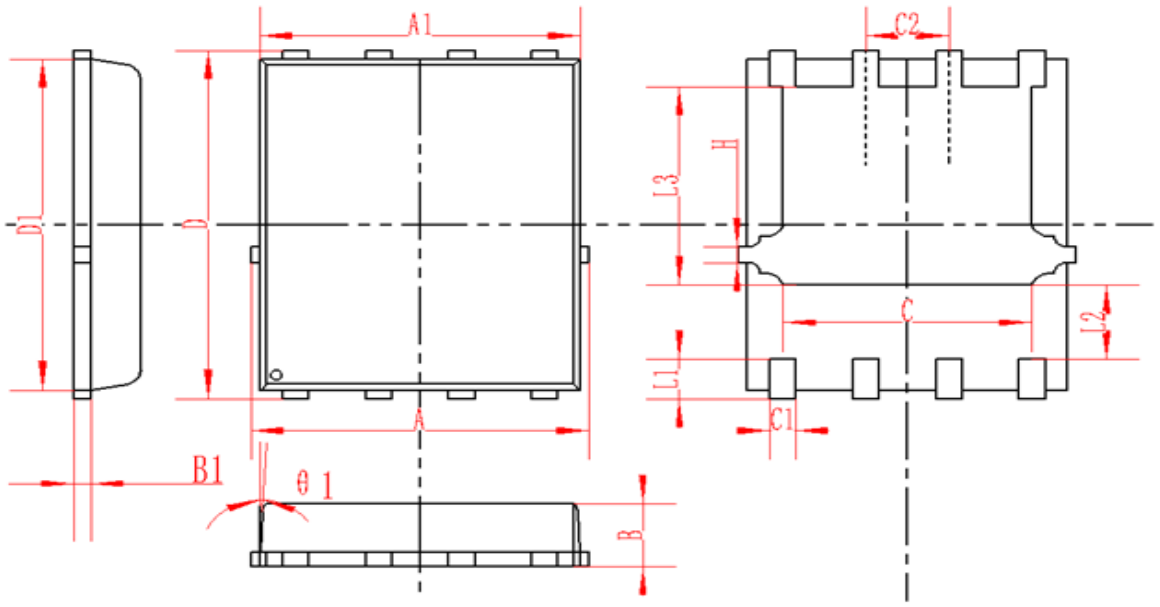

Drain Current
I_D - Drain Current (A)
45
40
35
30
25
20
15
10
5
0
VGS=10V
25
50
75
100
125
150
T_J - Junction Temperature (° C)


Safe Operation Area
I_D - Drain Current (A)
1000
100
10
1
0.1
$R_{DS(ON)}$ limited
DC
10μs
100μs
1ms
10ms
T_C=25°C
0.01
0.1
1
10
100
1000
V_{DS} - Drain-Source Voltage (V)


Drain Current
$R_{DS(ON)}$ - On - Resistance (mΩ)
20
15
10
5
0
Ids=40A
0
1
2
3
4
5
6
7
8
9
10
V_{GS} - Gate-Source Voltage (V)


Thermal Transient Impedance
ZthJC - Thermal Response (°C/W)
10
1
0.1
0.01
0.001
Duty=0.5, 0.2, 0.1, 0.05, 0.02, 0.01, Single Pulse
Single Pulse
$R_{\theta JC}$=3.72°C/W
1E-05
0.0001
0.001
0.01
0.1
1
10
Square Wave Pulse Duration (sec)

DFN5X6-8L Package Information



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.95	5	5.05	0.195	0.197	0.199
A1	4.82	4.9	4.98	0.190	0.193	0.196
D	5.98	6	6.02	0.235	0.236	0.237
D1	5.67	5.75	5.83	0.223	0.226	0.230
B	0.9	0.95	1	0.035	0.037	0.039
B1	0.254REF			0.010REF		
C	3.95	4	4.05	0.156	0.157	0.159
C1	0.35	0.4	0.45	0.014	0.016	0.018
C2	1.27TYP			0.5TYP		
θ1	8°	10°	12°	8°	10°	12°
L1	0.63	0.64	0.65	0.025	0.025	0.026
L2	1.2	1.3	1.4	0.047	0.051	0.055
L3	3.415	3.42	3.425	0.134	0.135	0.135
H	0.24	0.25	0.26	0.009	0.010	0.010

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