

## Features

- Uses PingWei advanced PerfectMOS technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Excellent Low Ciss
- Qualified according to JEDEC criteria

## Benefits

- High robustness and reliability
- Increases maximum current capability
- Low power loss, high power density
- Easy paralleling

## Applications

- Synchronous Rectification for AC/DC Quick Charger
- Battery management
- UPS (Uninterruptible Power Supplies)

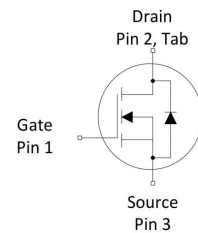
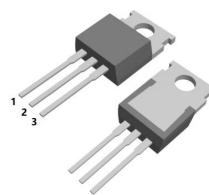


**100% DVDS Tested**  
**100% Avalanche Tested**

## Product Summary

$V_{DS}$	120V
$R_{DS(on)}@10V$ typ	3.9mΩ
$I_D$	144A

TO-220CB-3L



## Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PW047N12CS	PW047N12CS	TO-220CB-3L	Tube	N/A	N/A	50pcs

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	120	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 25^\circ\text{C}$ (Package limit) $T_C = 100^\circ\text{C}$ (Silicon limit) $T_a = 25^\circ\text{C}$	$I_D$	144 160 91 14	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ )	$I_{D\ pulse}$	575	A
Avalanche energy, single pulse (L=0.5mH)	$E_{AS}$	233	mJ
Gate-Source voltage	$V_{GS}$	±20	V
Power dissipation $T_C = 25^\circ\text{C}$ $T_a = 25^\circ\text{C}$	$P_{tot}$	189 1.8	W
Operating junction and storage temperature	$T_J, T_{stg}$	-55...+150	°C
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	$T_{sold}$	260	°C

## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	RthJC	-	-	0.7	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	RthJA	-	-	71	°C/W	-

## Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

## Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	120	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	-	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	-	1	$\mu A$	$V_{DS}=120V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=150^\circ C$
Gate-source leakage current	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.9	4.7	mΩ	$V_{GS}=10V, I_D=50A$
Transconductance	$g_{fs}$	-	87	-	S	$V_{DS}=5V, I_D=50A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	5640	-	pF	$V_{GS}=0V, V_{DS}=60V,$ $f=300KHz$
Output Capacitance	$C_{oss}$	-	835	-		
Reverse Transfer Capacitance	$C_{rss}$	-	13	-		
Gate Total Charge	$Q_G$	-	83	-	nC	$V_{DS}=60V, I_D=50A,$ $V_{GS}=10V$
Gate-Source charge	$Q_{gs}$	-	29	-		
Gate-Drain charge	$Q_{gd}$	-	17	-		
Turn-on delay time	$t_{d(on)}$	-	22	-	ns	$V_{GS}=10V, V_{DD}=60V,$ $R_{G\_ext}=1.6\Omega, I_D=12A$
Rise time	$t_r$	-	21	-		
Turn-off delay time	$t_{d(off)}$	-	40	-		
Fall time	$t_f$	-	17	-		
Gate resistance	$R_G$	-	0.5	-	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$



## Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	-	1.2	V	$V_{GS}=0V, I_{SD}=50A$
Body Diode Continuous Forward Current	$I_S$	-	-	144	A	TC = 25°C
Body Diode Pulsed Current	$I_S$ pulse	-	-	575	A	TC = 25°C
Body Diode Reverse Recovery Time	$t_{rr}$	-	-	-	ns	$I_F=50A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	-	-	nC	

## Typical Performance Characteristics

Fig 1: Output Characteristics

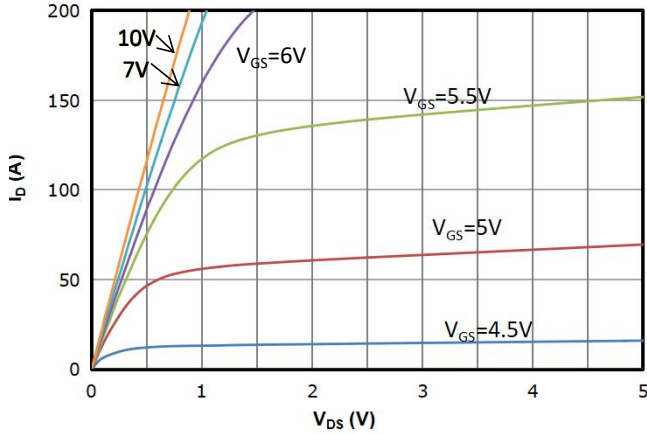


Fig 2: Transfer Characteristics

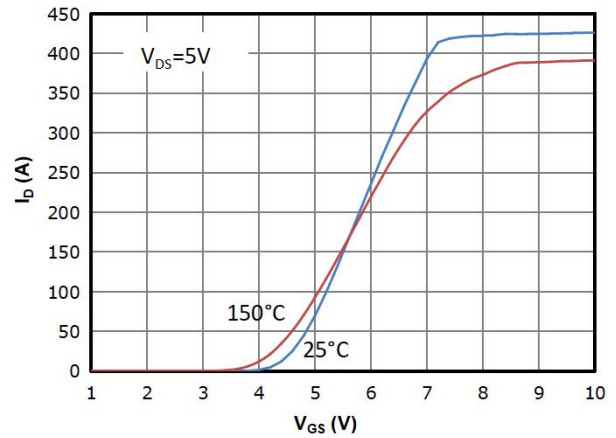


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

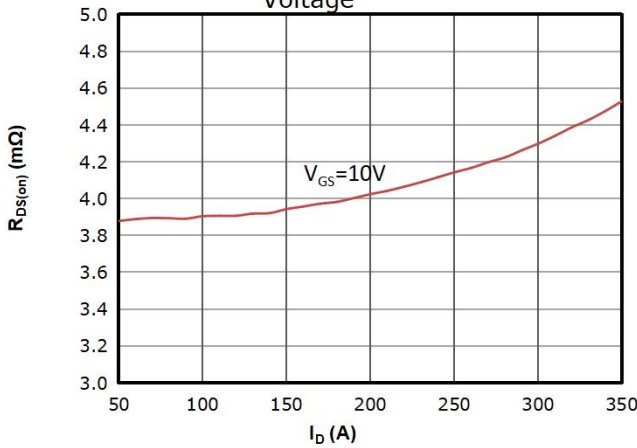


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

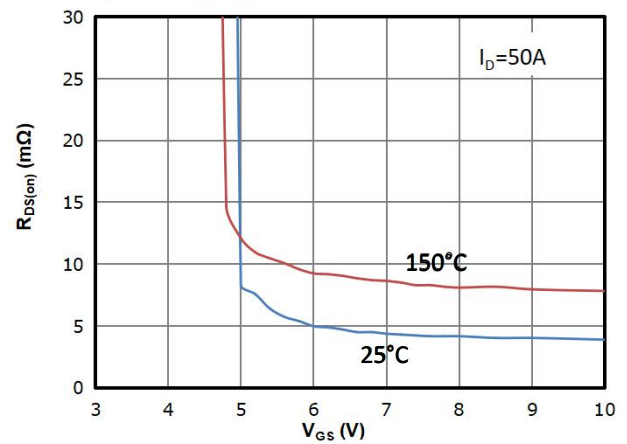


Fig 5:  $R_{DS(on)}$  vs. Temperature

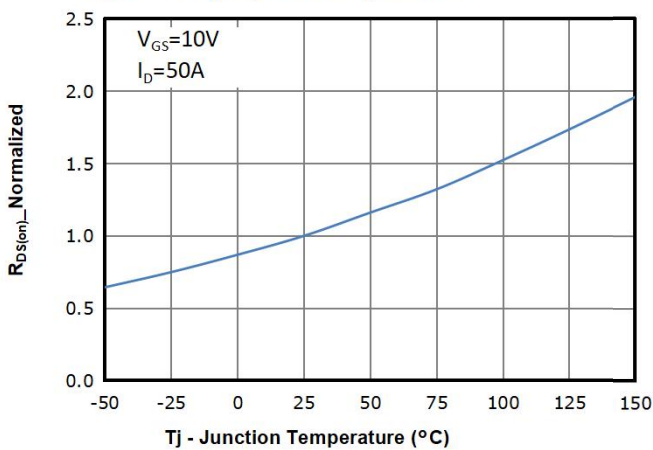


Fig 6:  $V_{GS(th)}$  vs. Temperature

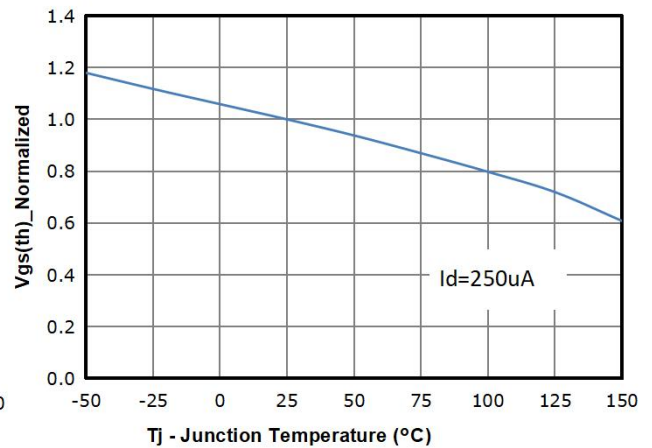




Fig 7: BVdss vs. Temperature

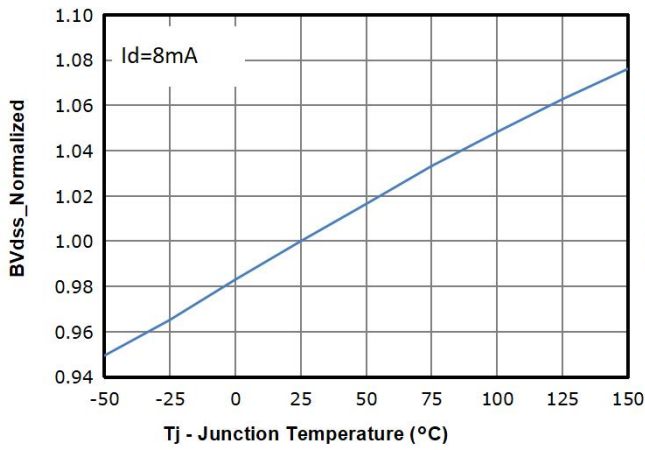


Fig 8: Capacitance Characteristics

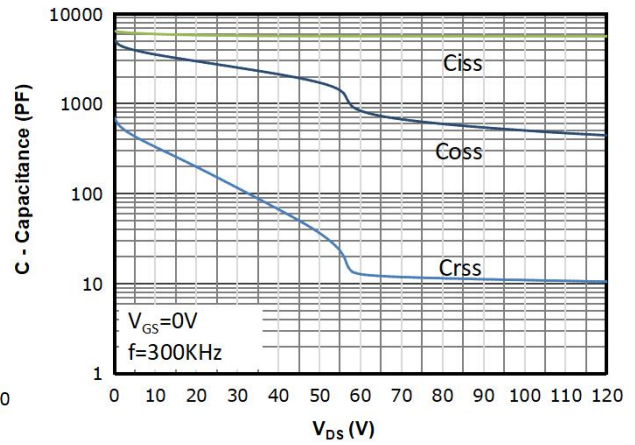


Fig 9: Gate Charge Characteristics

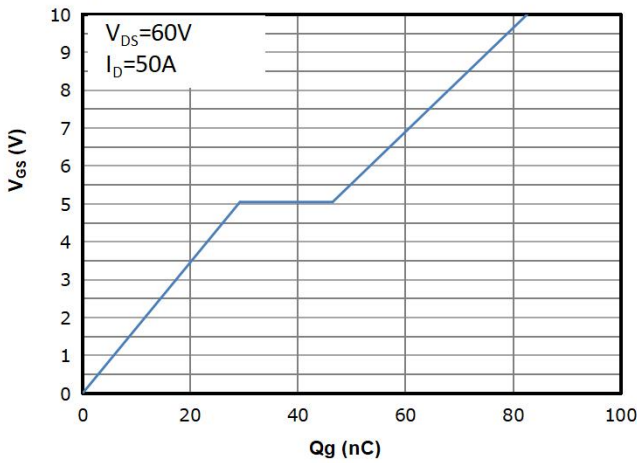


Fig 10: Body-diode Forward Characteristics

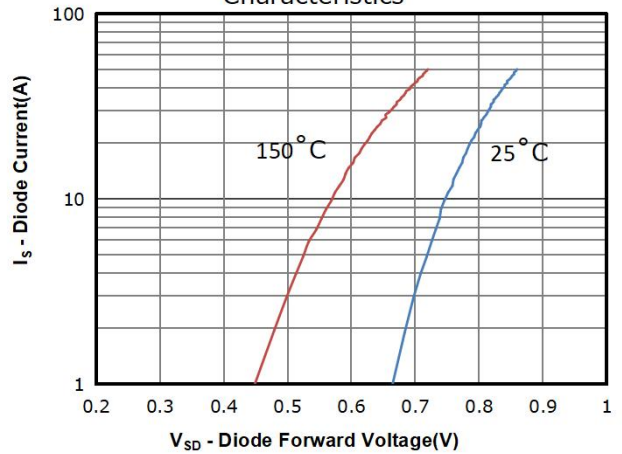


Fig 11: Power Dissipation

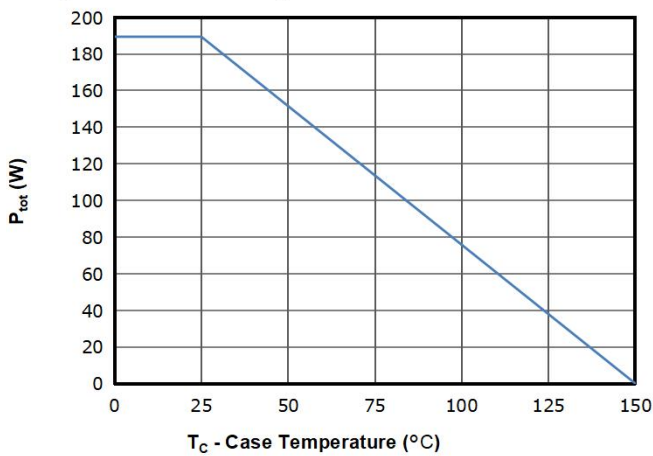


Fig 12: Drain Current Derating

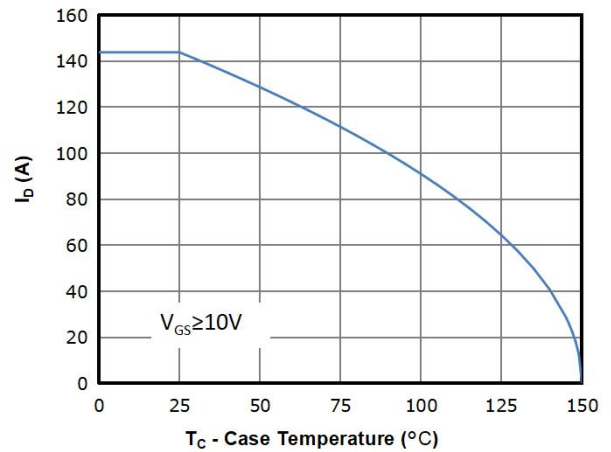


Fig 13: Safe Operating Area

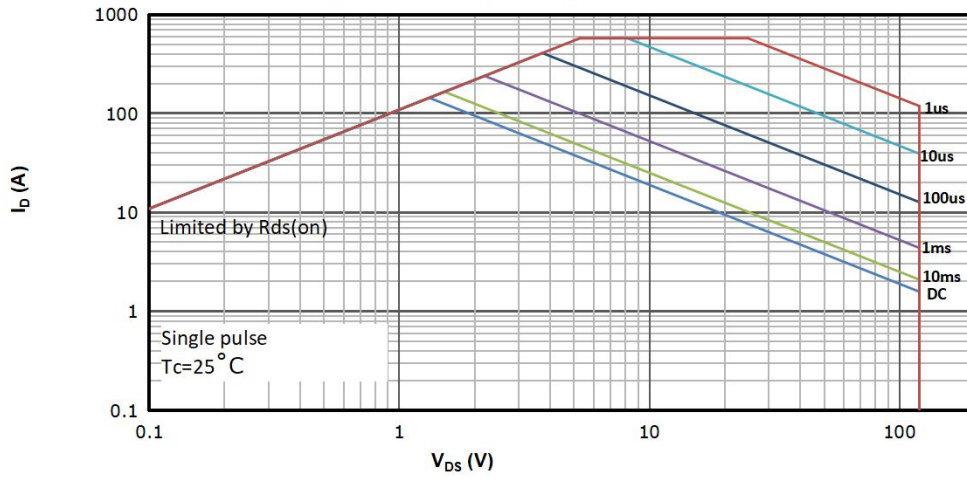
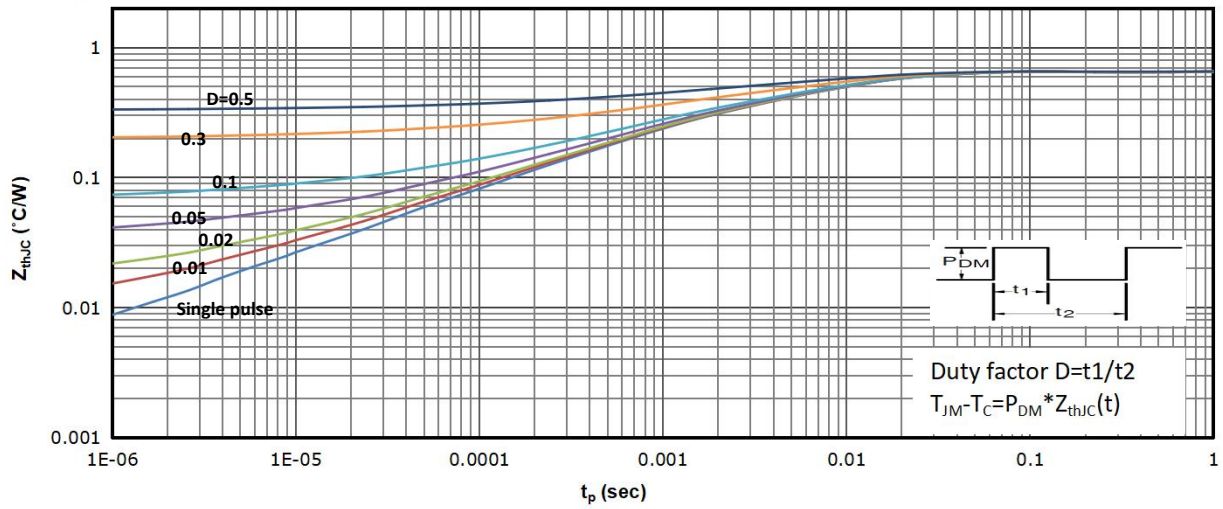


Fig 14: Max. Transient Thermal Impedance

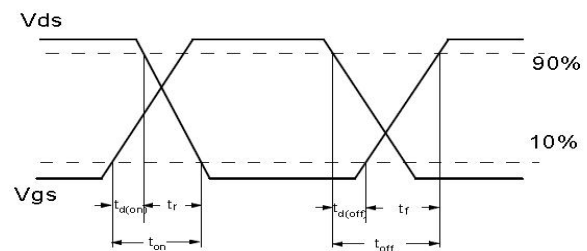


## Test Circuit & Waveform

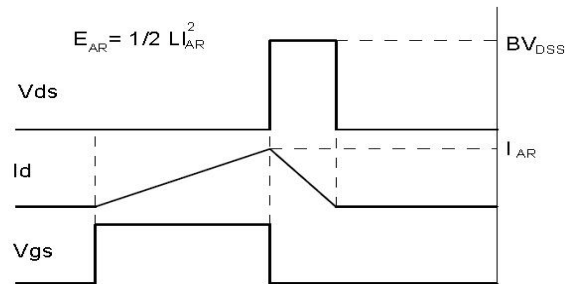
Gate Charge Test Circuit & Waveform



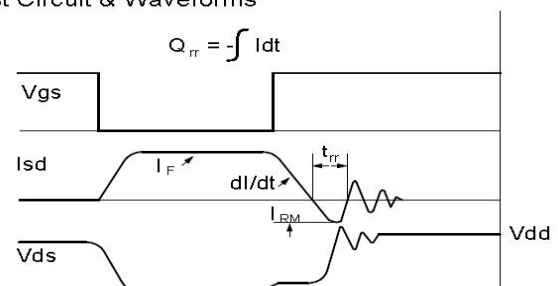
Resistive Switching Test Circuit & Waveforms



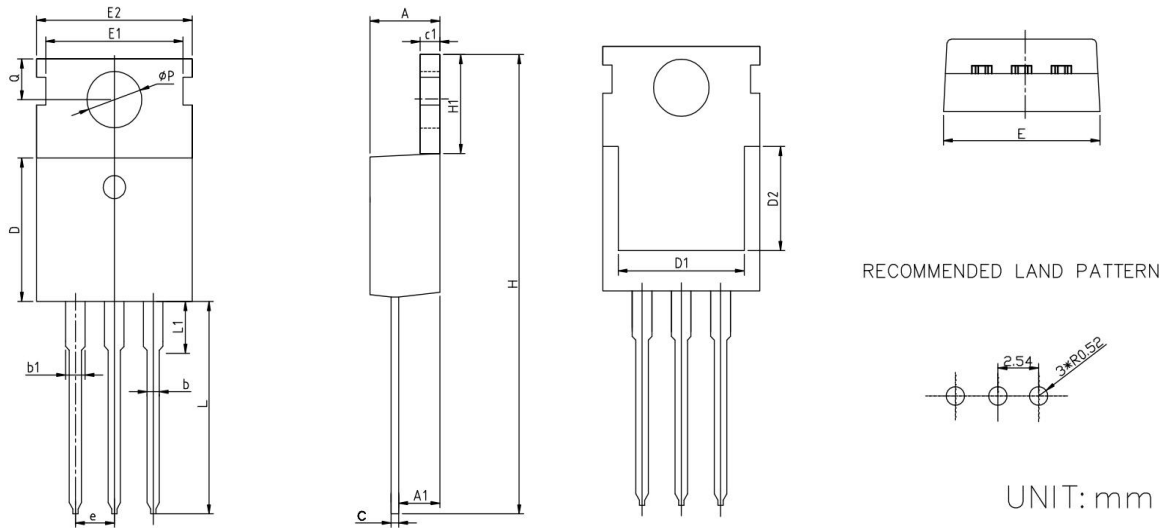
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: TO-220CB-3L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.80	0.173	0.189
A1	2.25	2.55	0.089	0.100
b	0.72	0.92	0.028	0.036
b1	1.12	1.42	0.044	0.056
c	0.40	0.60	0.016	0.024
c1	1.20	1.40	0.047	0.055
D	8.80	9.40	0.346	0.370
D1	7.75	8.15	0.305	0.321
D2	6.55	6.95	0.258	0.274
e	2.54		0.100	
E	9.65	10.35	0.380	0.407
E1	8.70		0.343	
E2	9.70	10.30	0.382	0.406
H	28.70	29.70	1.130	1.169
H1	6.25	6.85	0.246	0.270
L	13.20	13.80	0.520	0.543
L1	2.80	3.40	0.110	0.134
Q	2.60	3.00	0.102	0.118
φP	3.45	3.75	0.136	0.148





## Revision History

Revision	Date	Major changes
1.0	2023/9/8	Release of Formal Version.

## Disclaimer

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