

## Description

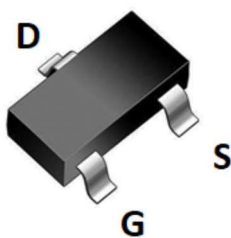
### PECJ N-channel Enhancement Mode Power MOSFET

#### Features

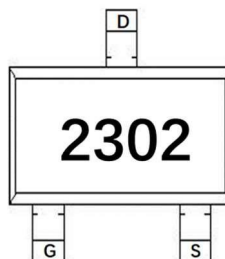
- 20V, 4A  
 $R_{DS(ON)} < 27m\Omega$  @  $V_{GS} = 4.5V$   
 $R_{DS(ON)} < 44m\Omega$  @  $V_{GS} = 2.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

#### Application

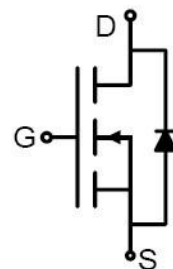
- Load Switch
- PWM Application
- Power management



SOT-23 top view



Marking and pin Assignment



Schematic Diagram

## Package Marking and Ordering Information

| Device Marking | Device    | OUTLINE | Device Package | Reel Size | Reel (PCS) | Per Carton (PCS) |
|----------------|-----------|---------|----------------|-----------|------------|------------------|
| 2302           | PECJ2302A | TAPING  | SOT-23         | 7inch     | 3000       | 180000           |

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol          | Parameter                               |                           | Max.        | Units              |
|-----------------|-----------------------------------------|---------------------------|-------------|--------------------|
| $V_{DSS}$       | Drain-Source Voltage                    |                           | 20          | V                  |
| $V_{GSS}$       | Gate-Source Voltage                     |                           | $\pm 12$    | V                  |
| $I_D$           | Continuous Drain Current                | $T_A = 25^\circ\text{C}$  | 4           | A                  |
|                 |                                         | $T_A = 100^\circ\text{C}$ | 2.6         | A                  |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>   |                           | 16          | A                  |
| $P_D$           | Power Dissipation                       | $T_A = 25^\circ\text{C}$  | 0.7         | W                  |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Case    |                           | 179         | $^\circ\text{C/W}$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range |                           | -55 to +150 | $^\circ\text{C}$   |

## Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

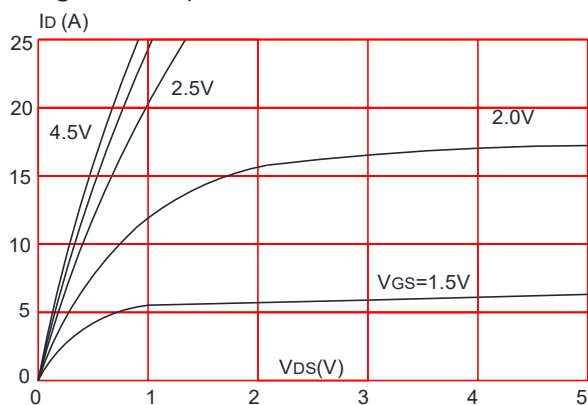
| Symbol                                                 | Parameter                                                 | Test Condition                                                                              | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                             |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                  | 20   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V,                                                  | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                                  | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                             |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                    | 0.5  | 0.85 | 1.2  | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note2</small> | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                                                   | -    | 21   | 27   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A                                                   | -    | 29   | 44   |       |
| Dynamic Characteristics                                |                                                           |                                                                                             |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                      | -    | 595  | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                             | -    | 106  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                             | -    | 59   | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> =10V, I <sub>D</sub> =4A,<br>V <sub>GS</sub> =4.5V                          | -    | 6.6  | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                             | -    | 0.9  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                             | -    | 1.4  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                             |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DS</sub> =10V,<br>I <sub>D</sub> =4A, R <sub>GEN</sub> =3Ω,<br>V <sub>GS</sub> =4.5V | -    | 13   | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                             | -    | 55   | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                             | -    | 18   | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                             | -    | 10   | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                             |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                             | -    | -    | 4    | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                             | -    | -    | 16   | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> =4A                                                     | -    | -    | 1.2  | V     |

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

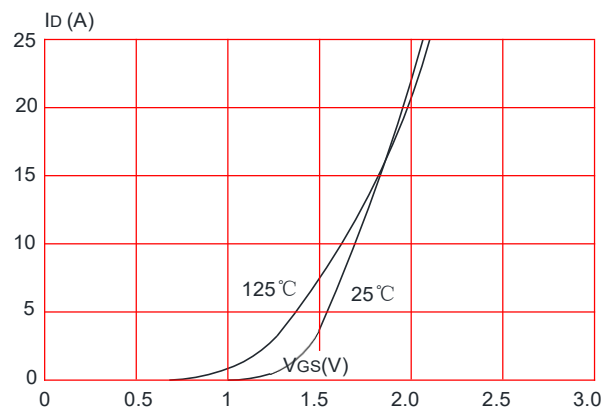
2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Performance Characteristics

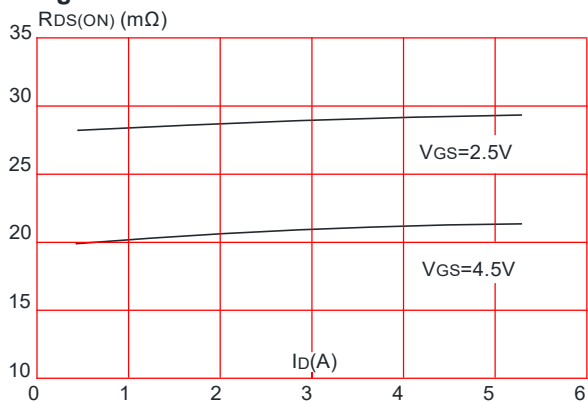
**Figure 1: Output Characteristics**



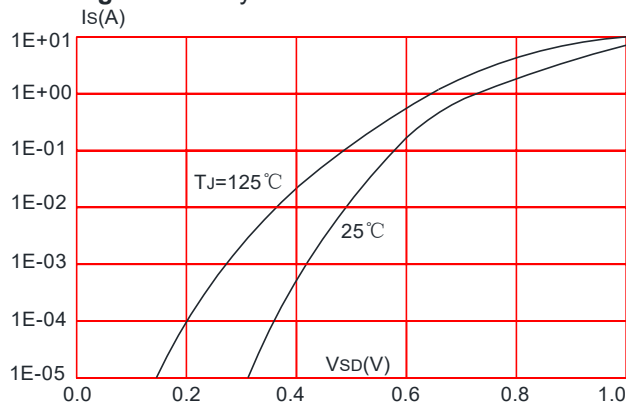
**Figure 2: Typical Transfer Characteristics**



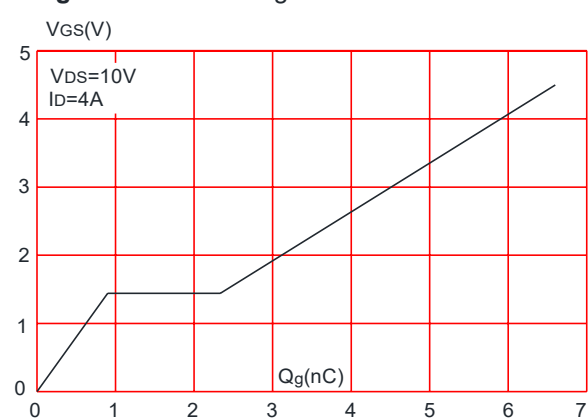
**Figure 3: On-resistance vs. Drain Current**



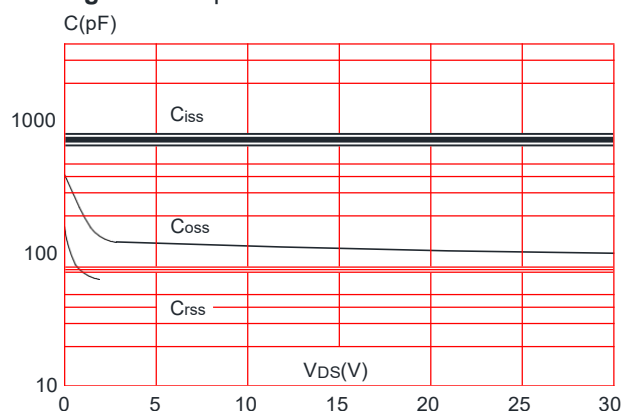
**Figure 4: Body Diode Characteristics**



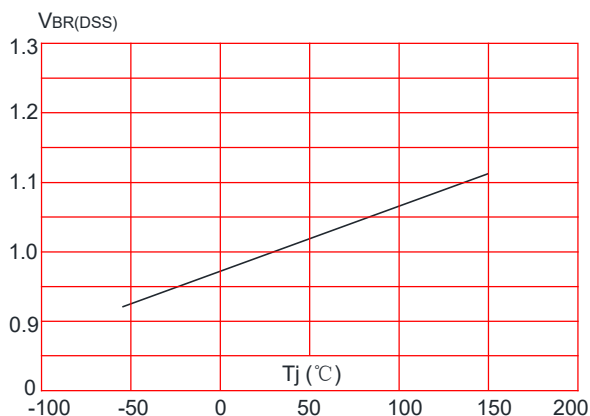
**Figure 5: Gate Charge Characteristics**



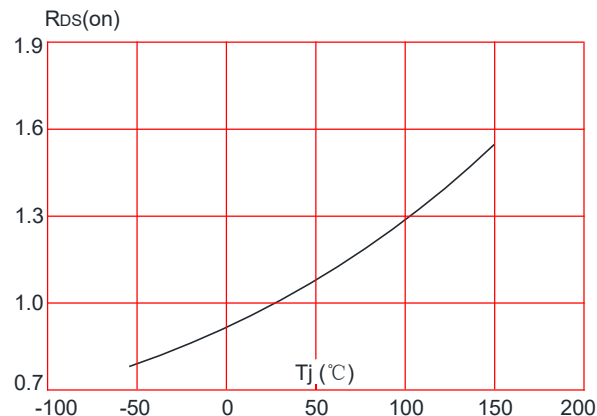
**Figure 6: Capacitance Characteristics**



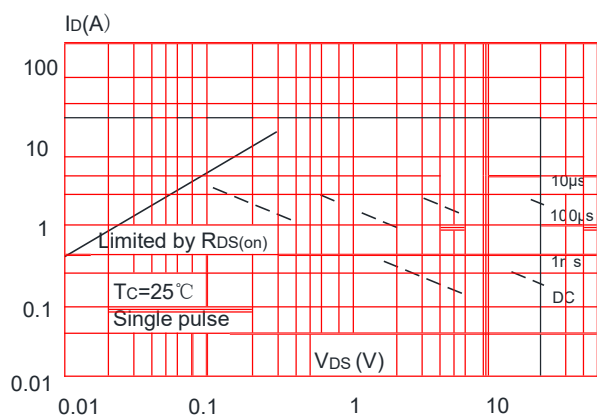
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



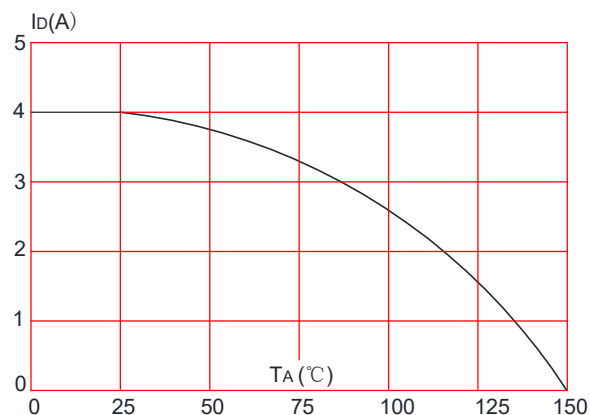
**Figure 8:** Normalized on Resistance vs. Junction Temperature



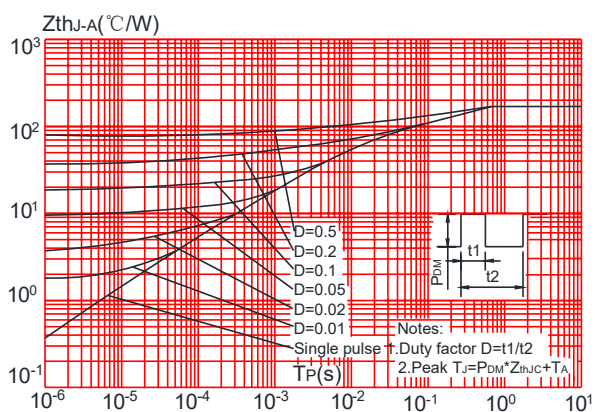
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



## Test Circuit

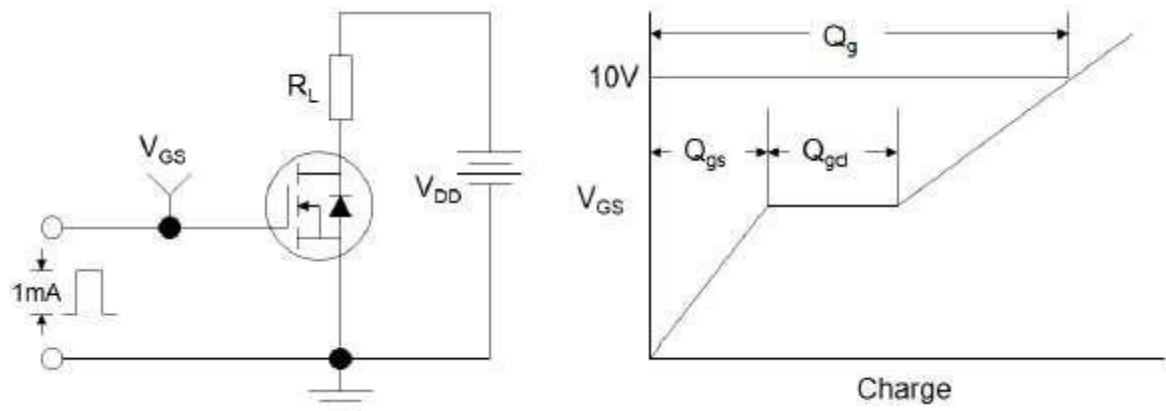


Figure1:Gate Charge Test Circuit & Waveform

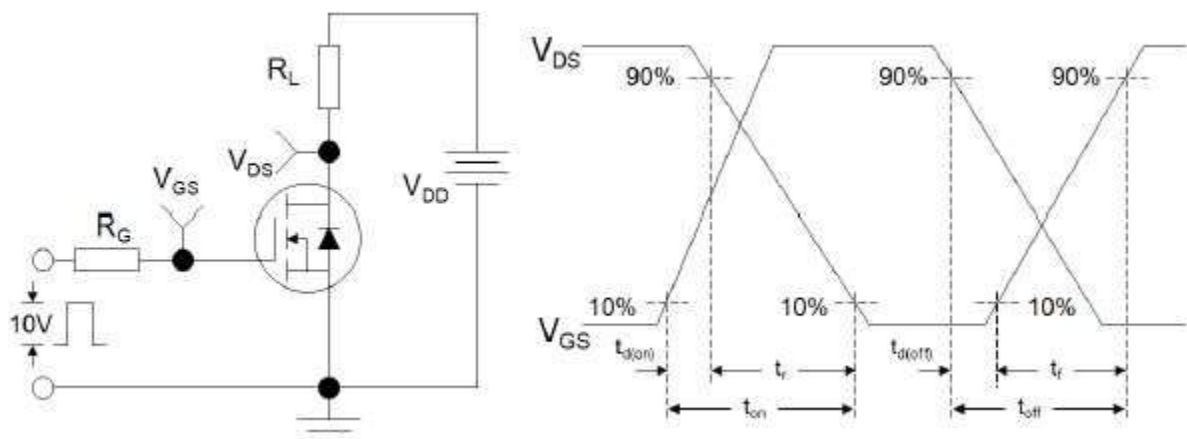


Figure 2: Resistive Switching Test Circuit & Waveforms

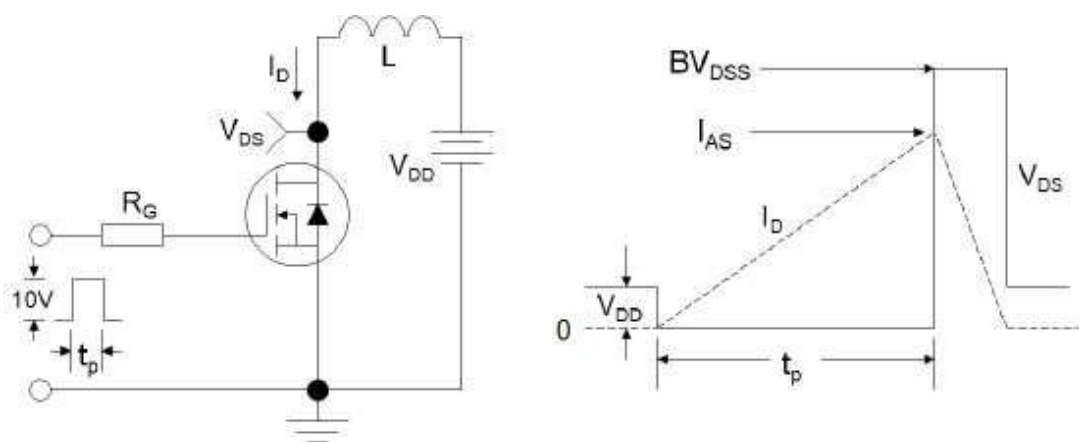
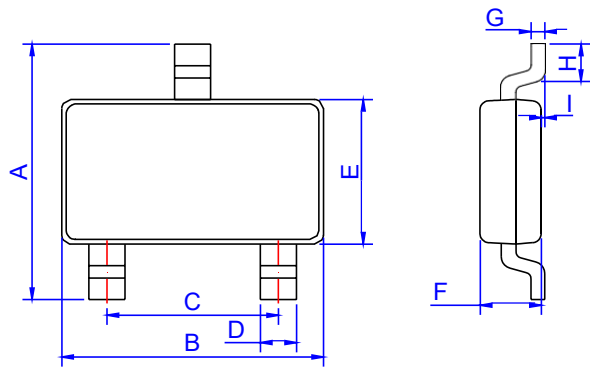


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

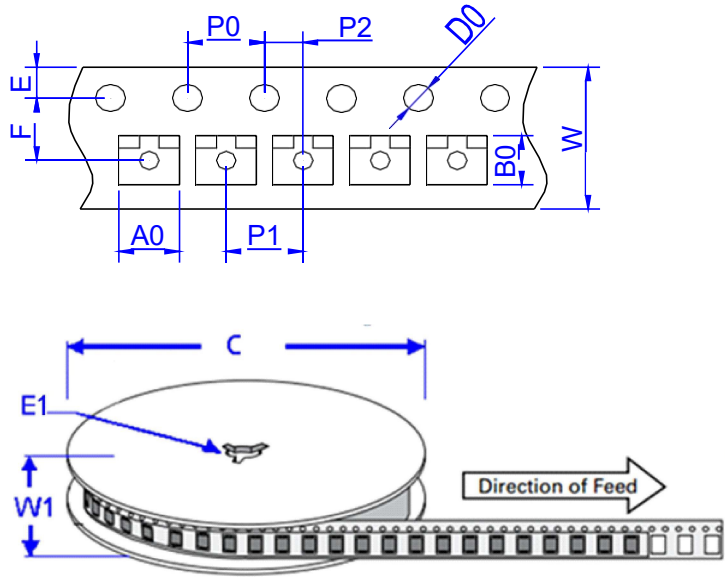
Package Mechanical Data-SOT-23



SOT-23

| Ref. | Dimensions  |      |      |           |       |       |
|------|-------------|------|------|-----------|-------|-------|
|      | Millimeters |      |      | Inches    |       |       |
|      | Min.        | Typ. | Max. | Min.      | Typ.  | Max.  |
| A    | 2.30        | 2.40 | 2.50 | 0.091     | 0.095 | 0.098 |
| B    | 2.80        | 2.90 | 3.00 | 0.110     | 0.114 | 0.118 |
| C    | 1.90 REF    |      |      | 0.075 REF |       |       |
| D    | 0.35        | 0.40 | 0.45 | 0.014     | 0.016 | 0.018 |
| E    | 1.20        | 1.30 | 1.40 | 0.047     | 0.051 | 0.055 |
| F    | 0.90        | 1.00 | 1.10 | 0.035     | 0.039 | 0.043 |
| G    |             | 0.10 | 0.15 |           | 0.004 | 0.006 |
| H    | 0.20        |      |      | 0.008     |       |       |
| I    | 0           |      | 0.10 | 0         |       | 0.004 |

Package Information-SOT-23



| Ref. | Dimensions  |               |
|------|-------------|---------------|
|      | Millimeters | Inches        |
| A0   | 3.15 ± 0.3  | 0.124 ± 0.012 |
| B0   | 2.77 ± 0.3  | 0.109 ± 0.012 |
| C    | 178         | 7.0           |
| D0   | 1.50±0.1    | 0.059 ± 0.004 |
| E    | 1.75 ± 0.2  | 0.069 ± 0.008 |
| E1   | 13.3±0.3    | 0.524± 0.012  |
| F    | 3.5 ± 0.2   | 0.138 ± 0.008 |
| P0   | 4.00 ± 0.2  | 0.157 ± 0.008 |
| P1   | 4.00 ± 0.2  | 0.157 ± 0.008 |
| P2   | 2.00 ± 0.2  | 0.079 ± 0.008 |
| W    | 8.00 ± 0.2  | 0.315 ± 0.008 |
| W1   | 11.5±1.0    | 0.453 ± 0.039 |