

## Complementary power transistors

### Features

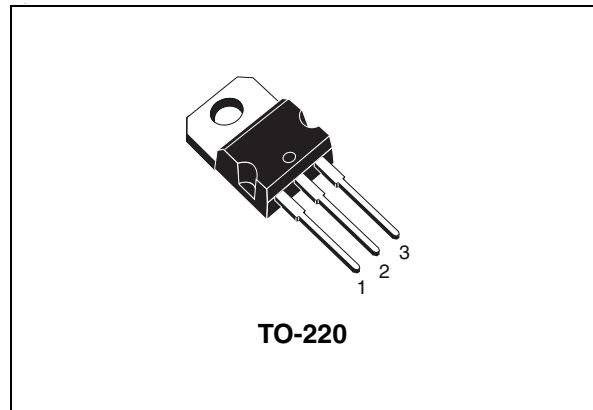
- Complementary PNP-NPN devices
- New enhanced series
- High switching speed
- $h_{FE}$  grouping
- $h_{FE}$  improved linearity

### Applications

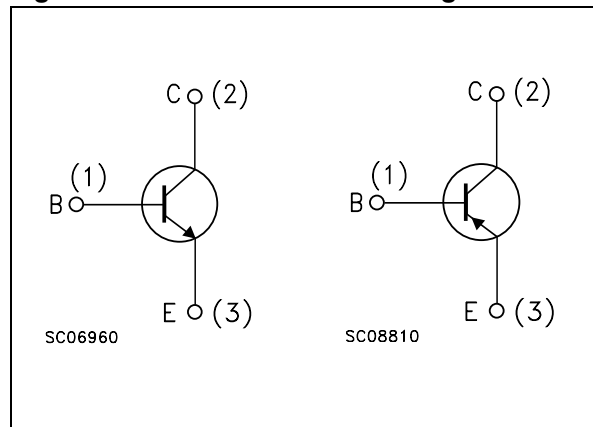
- General purpose circuits
- Audio amplifier
- Power linear and switching

### Description

The TIP41C is a base island technology NPN power transistor in TO-220 plastic package that make this device suitable for audio, power linear and switching applications. The complementary PNP type is TIP42C



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

| Order code                         | Marking                          | Package | Packaging |
|------------------------------------|----------------------------------|---------|-----------|
| TIP41C ( <i>Note 1 on page 4</i> ) | TIP41C R<br>TIP41C O<br>TIP41C Y | TO-220  | Tube      |
| TIP42C ( <i>Note 1 on page 4</i> ) | TIP42C R<br>TIP42C O<br>TIP42C Y | TO-220  | Tube      |

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# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                                    | Value      | Unit       |
|-----------|----------------------------------------------|------------|------------|
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )         | 100        | V          |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )      | 100        | V          |
| $V_{EBO}$ | Emitter-base voltage ( $I_C = 0$ )           | 5          | V          |
| $I_C$     | Collector current                            | 6          | A          |
| $I_{CM}$  | Collector peak current ( $t_P < 5ms$ )       | 10         | A          |
| $I_B$     | Base current                                 | 3          | A          |
| $P_{TOT}$ | Total dissipation at $T_{case} = 25^\circ C$ | 65         | W          |
| $T_{stg}$ | Storage temperature                          | -65 to 150 | $^\circ C$ |
| $T_J$     | Max. operating junction temperature          | 150        | $^\circ C$ |

*Note:* For PNP types voltage and current values are negative

## 2 Electrical characteristics

( $T_{\text{case}} = 25^{\circ}\text{C}$ ; unless otherwise specified)

**Table 3. Electrical characteristics**

| Symbol                      | Parameter                                                      | Test conditions                                                                                                                                             | Min.                       | Typ. | Max.                 | Unit |
|-----------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------|----------------------|------|
| $I_{\text{CEO}}$            | Collector cut-off current<br>( $I_{\text{B}} = 0$ )            | $V_{\text{CE}} = 60 \text{ V}$                                                                                                                              |                            |      | 0.7                  | mA   |
| $I_{\text{EBO}}$            | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )              | $V_{\text{EB}} = 5 \text{ V}$                                                                                                                               |                            |      | 1                    | mA   |
| $I_{\text{CES}}$            | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )           | $V_{\text{CE}} = 100 \text{ V}$                                                                                                                             |                            |      | 0.4                  | mA   |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter<br>sustaining voltage ( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 30 \text{ mA}$                                                                                                                              | 100                        |      |                      | V    |
| $V_{\text{CE(sat)}}^{(1)}$  | Collector-emitter<br>saturation voltage                        | $I_{\text{C}} = 6 \text{ A}$ $I_{\text{B}} = 0.6 \text{ A}$                                                                                                 |                            |      | 1.5                  | V    |
| $V_{\text{BE(on)}}^{(1)}$   | Base-emitter voltage                                           | $I_{\text{C}} = 6 \text{ A}$ $V_{\text{CE}} = 4 \text{ V}$                                                                                                  |                            |      | 2                    | V    |
| $h_{\text{FE}}^{(1)}$       | DC current gain                                                | $I_{\text{C}} = 0.3 \text{ A}$ $V_{\text{CE}} = 4 \text{ V}$<br>$I_{\text{C}} = 3 \text{ A}$ $V_{\text{CE}} = 4 \text{ V}$<br>Group R<br>Group O<br>Group Y | 30<br>15<br>15<br>24<br>42 |      | 75<br>28<br>44<br>75 |      |

1. Pulsed duration = 300 ms, duty cycle  $\geq 1.5\%$ .

**Note:** 1 Product is pre-selected in DC current gain (group R, group O and group Y).  
STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

**Note:** For PNP types voltage e current values are negative.

2.1 Typical characteristic (curves)

Figure 2. DC current gain (NPN)

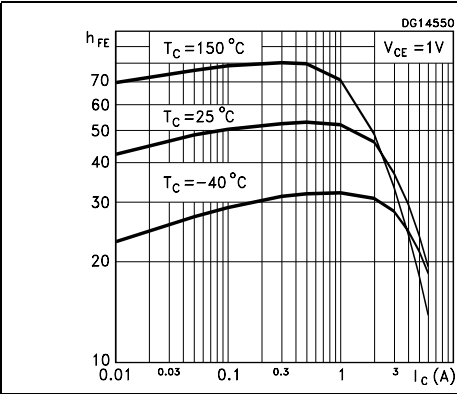


Figure 3. DC current gain (PNP)

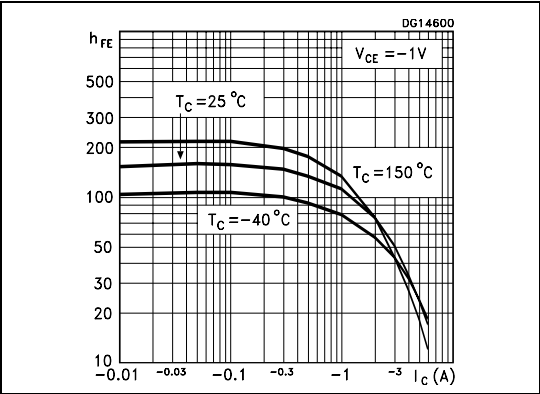


Figure 4. DC current gain (NPN)

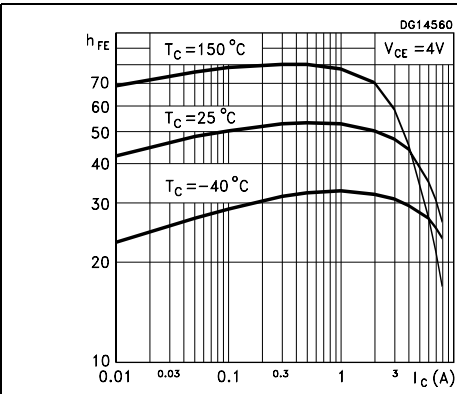


Figure 5. DC current gain (PNP)

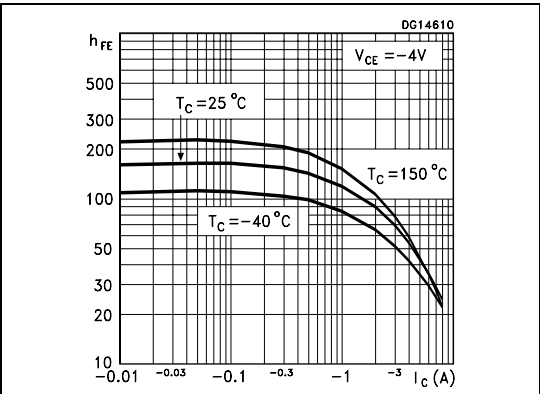


Figure 6. Collector-emitter saturation voltage (NPN)

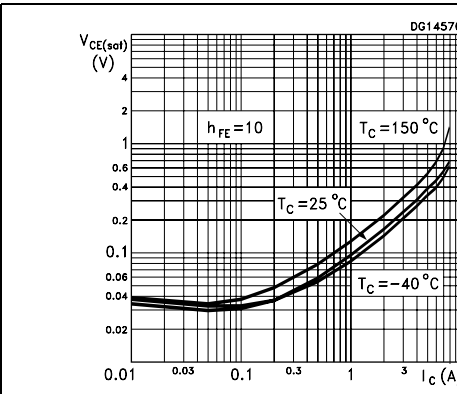


Figure 7. Collector-emitter saturation voltage (PNP)

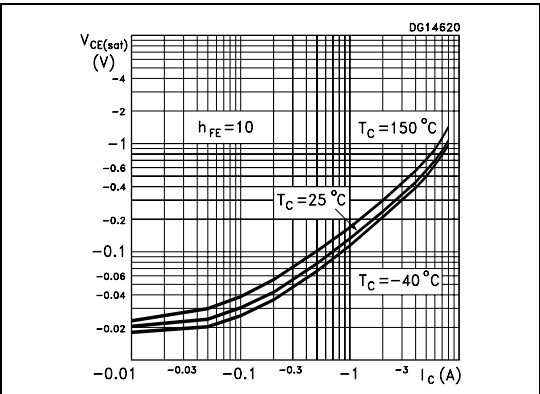


Figure 8. Base-emitter saturation voltage (NPN)

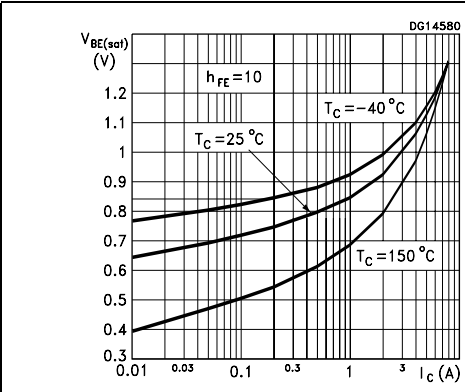


Figure 9. Base-emitter saturation voltage (PNP)

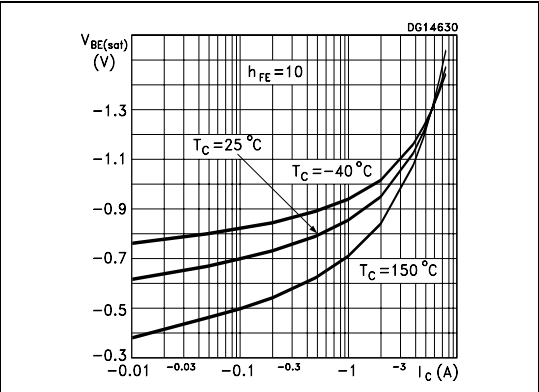


Figure 10. Base-emitter voltage (NPN)

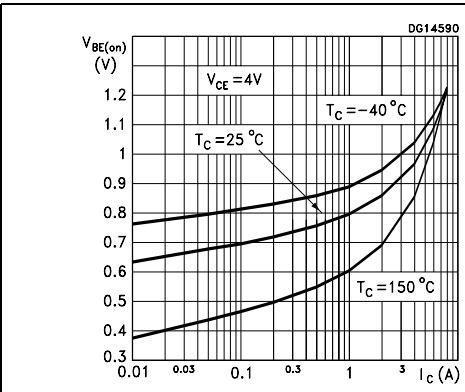


Figure 11. Base-emitter voltage (PNP)

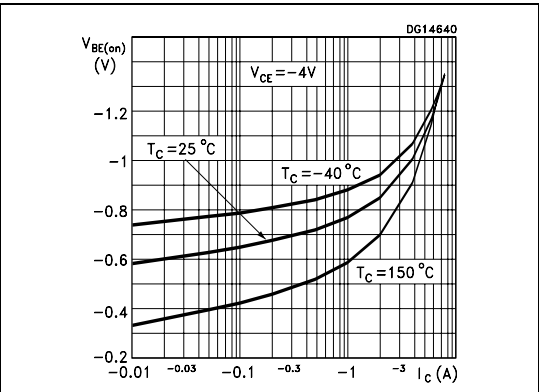


Figure 12. Resistive load switching time (NPN)

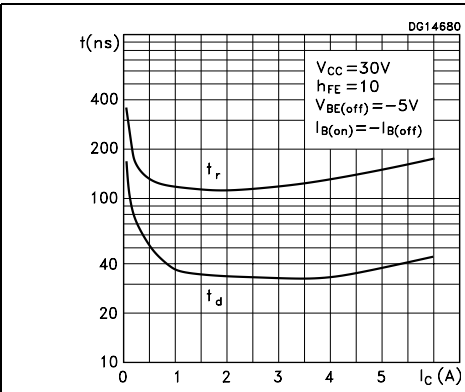


Figure 13. Resistive load switching time (PNP)

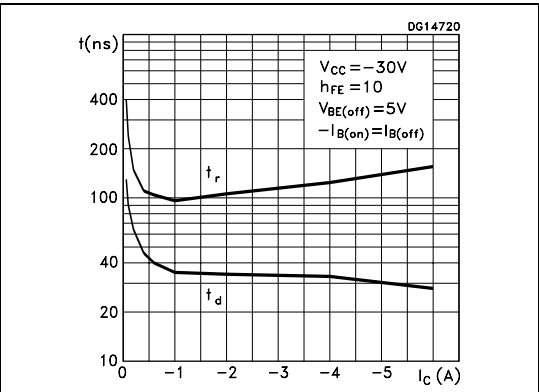


Figure 14. Resistive load switching time (NPN) Figure 15. Resistive load switching time (PNP)

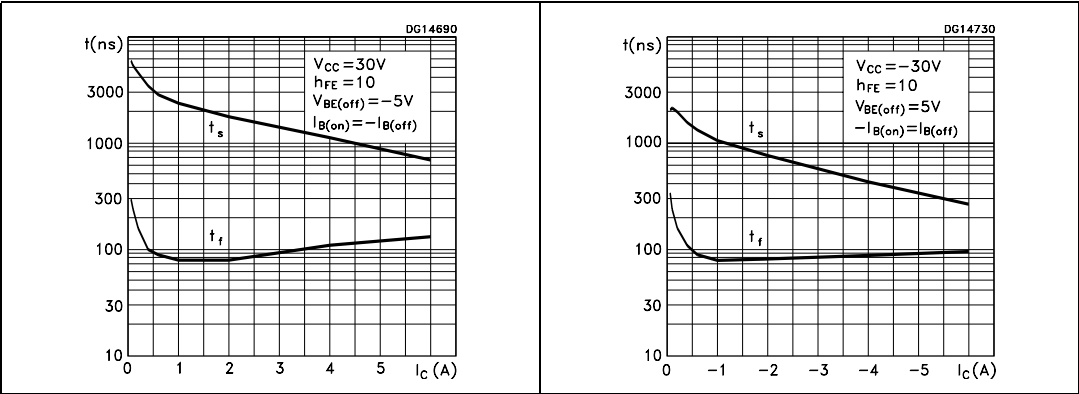
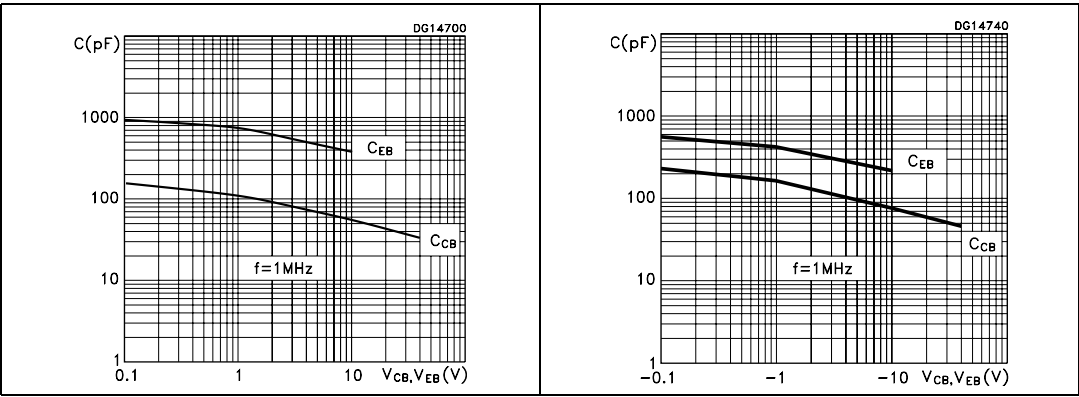


Figure 16. Collector-base and collector-emitter capacitance (NPN) Figure 17. Collector-base and collector-emitter capacitance (PNP)



## 2.2 Test circuit

Figure 18. Inductive load switching test circuit

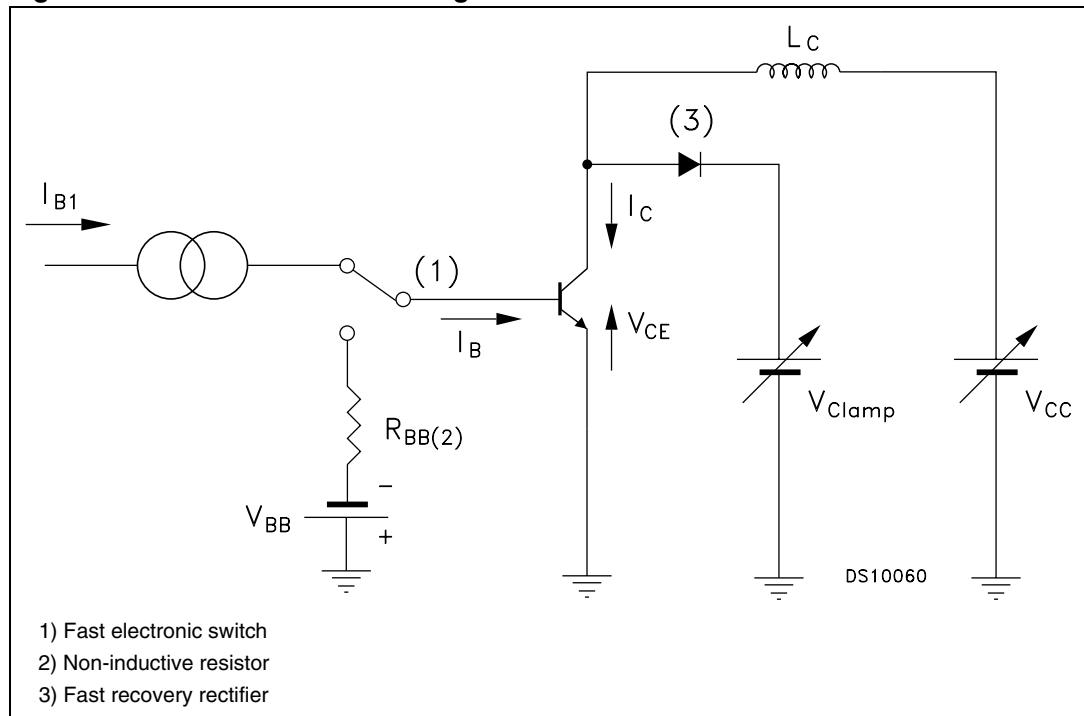
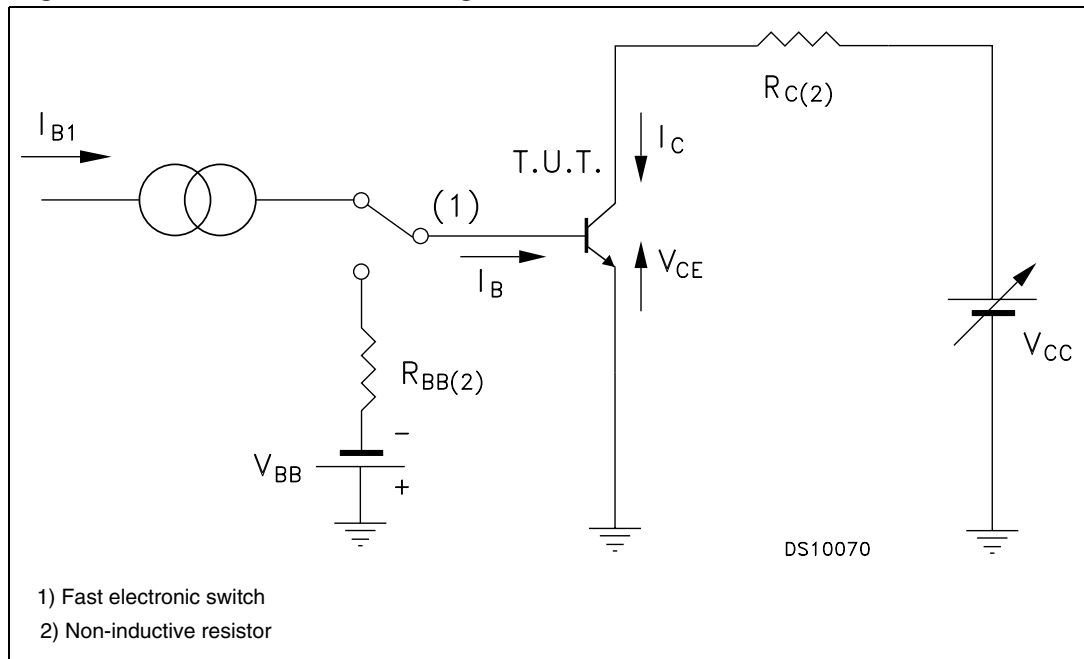


Figure 19. Resistive load switching test circuit



Note: For PNP types voltage e current values are negative.

### 3      **Package mechanical data**

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

TO-220 mechanical data

| Dim | mm    |       |       | inch  |       |       |
|-----|-------|-------|-------|-------|-------|-------|
|     | Min   | Typ   | Max   | Min   | Typ   | Max   |
| A   | 4.40  |       | 4.60  | 0.173 |       | 0.181 |
| b   | 0.61  |       | 0.88  | 0.024 |       | 0.034 |
| b1  | 1.14  |       | 1.70  | 0.044 |       | 0.066 |
| c   | 0.49  |       | 0.70  | 0.019 |       | 0.027 |
| D   | 15.25 |       | 15.75 | 0.6   |       | 0.62  |
| D1  |       | 1.27  |       |       | 0.050 |       |
| E   | 10    |       | 10.40 | 0.393 |       | 0.409 |
| e   | 2.40  |       | 2.70  | 0.094 |       | 0.106 |
| e1  | 4.95  |       | 5.15  | 0.194 |       | 0.202 |
| F   | 1.23  |       | 1.32  | 0.048 |       | 0.051 |
| H1  | 6.20  |       | 6.60  | 0.244 |       | 0.256 |
| J1  | 2.40  |       | 2.72  | 0.094 |       | 0.107 |
| L   | 13    |       | 14    | 0.511 |       | 0.551 |
| L1  | 3.50  |       | 3.93  | 0.137 |       | 0.154 |
| L20 |       | 16.40 |       |       | 0.645 |       |
| L30 |       | 28.90 |       |       | 1.137 |       |
| ØP  | 3.75  |       | 3.85  | 0.147 |       | 0.151 |
| Q   | 2.65  |       | 2.95  | 0.104 |       | 0.116 |

