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STX790A

Medium current, high performance, low voltage PNP transistor

Features

- Very low collector to emitter saturation voltage
- DC current gain, $h_{FE} > 100$
- 3 A continuous collector current
- 40 V breakdown voltage $V_{(BR)CER}$

Applications

- Power management in portable equipment
- Voltage regulation in bias supply circuits
- Switching regulator in battery charger applications
- Heavy load driver

Description

The devices are manufactured in low voltage PNP planar technology by using a "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage. The STX790AG-AP is supplied using halogen-free molding compound.

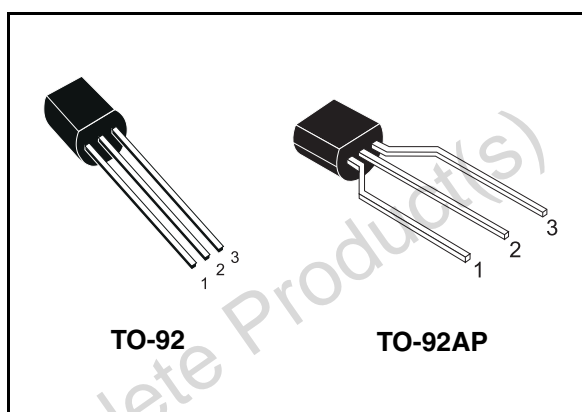


Figure 1. Internal schematic diagram

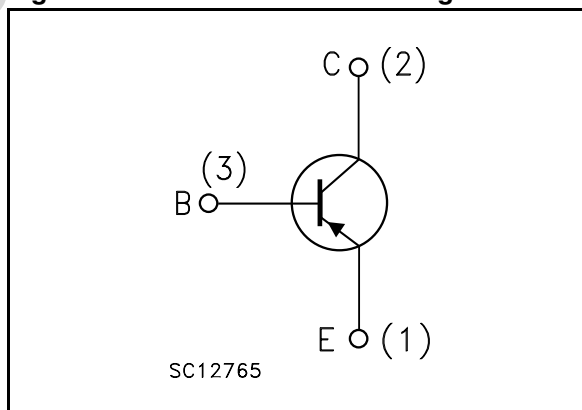


Table 1. Device summary

| Order codes | Marking | Packages | Packaging |
|-------------|---------|----------|-----------|
| STX790A | X790A | TO-92 | Bulk |
| STX790A-AP | X790A | TO-92 AP | Ammopack |
| STX790AG-AP | X790AG | TO-92 AP | Ammopack |

Electrical ratings

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------|
| V_{CBO} | Collector-base voltage ($I_E = 0$) | -40 | V |
| V_{CER} | Collector-emitter voltage ($R_{BE} = 47 \Omega$) | -40 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | -30 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | -5 | V |
| I_C | Collector current | -3 | A |
| I_{CM} | Collector peak current ($t_p < 5$ ms) | -6 | A |
| P_{tot} | Total dissipation at $T_{amb} = 25$ °C | 0.9 | W |
| T_{stg} | Storage temperature | -65 to 150 | °C |
| T_J | Max. operating junction temperature | 150 | °C |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|---|-------|------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 44.6 | °C/W |
| $R_{thj-amb}$ | Thermal resistance junction-ambient max | 139 | °C/W |

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Electrical characteristics

2 Electrical characteristics

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

Table 4. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---|---|--------------------------------|--------------------------|--|--------------------------------|
| I_{CBO} | Collector cut-off current ($I_E = 0$) | $V_{CB} = -30\text{ V}$ $V_{CB} = -30\text{ V}; T_C = 100\text{ }^{\circ}\text{C}$ | | | -10 -100 | μA μA |
| I_{EBO} | Emitter cut-off current ($I_C = 0$) | $V_{EB} = -4\text{ V}$ | | | -10 | μA |
| $V_{(BR)CEO}^{(1)}$ | Collector-emitter breakdown voltage ($I_B = 0$) | $I_C = -10\text{ mA}$ | -30 | | | V |
| $V_{(BR)CER}^{(1)}$ | Collector-emitter breakdown voltage ($R_{BE} = 47\ \Omega$) | $I_C = -10\text{ mA}$ | -40 | | | V |
| $V_{(BR)CBO}$ | Collector-base breakdown voltage ($I_E = 0$) | $I_C = -100\ \mu\text{A}$ | -40 | | | V |
| $V_{(BR)EBO}$ | Emitter-base breakdown voltage ($I_C = 0$) | $I_E = -100\ \mu\text{A}$ | -5 | | | V |
| $V_{CE(sat)}^{(1)}$ | Collector-emitter saturation voltage | $I_C = -0.5\text{ A}$ $I_B = -5\text{ mA}$ $I_C = -1.2\text{ A}$ $I_B = -20\text{ mA}$ $I_C = -2\text{ A}$ $I_B = -20\text{ mA}$ $I_C = -3\text{ A}$ $I_B = -100\text{ mA}$ $I_C = -3\text{ A}$ $I_B = -100\text{ mA}$ $T_C = 100\text{ }^{\circ}\text{C}$ | | | -0.15 -0.25 -0.5 -0.7 -0.9 | V V V V V |
| $V_{BE(sat)}^{(1)}$ | Base-emitter saturation voltage | $I_C = -1\text{ A}$ $I_B = -10\text{ mA}$ | | -0.8 | -1 | V |
| $V_{BE(on)}^{(1)}$ | Base-emitter on voltage | $I_C = -1\text{ A}$ $V_{CE} = -2\text{ V}$ | | -0.8 | -1 | V |
| $h_{FE}^{(1)}$ | DC current gain | $I_C = -10\text{ mA}$ $V_{CE} = -2\text{ V}$ $I_C = -500\text{ mA}$ $V_{CE} = -2\text{ V}$ $I_C = -1\text{ A}$ $V_{CE} = -2\text{ V}$ $I_C = -2\text{ A}$ $V_{CE} = -1\text{ V}$ $I_C = -3\text{ A}$ $V_{CE} = -1\text{ V}$ | 100 100 100 100 90 | 200 200 160 130 | 400 400 | |

Electrical characteristics

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Table 4. Electrical characteristics (continued)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------|------------------------------|--|------|------|------|------|
| f_t | Transition frequency | $I_C = -50 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $f = 50 \text{ MHz}$ | | 100 | | MHz |
| t_d | Resistive load Delay time | $I_C = -3 \text{ A}$ $V_{CC} = -20 \text{ V}$ | | 180 | 220 | ns |
| t_r | Rise time | $I_{B1} = -I_{B2} = -60 \text{ mA}$ | | 160 | 210 | ns |
| t_s | Storage time | see Figure 8 | | 250 | 300 | ns |
| t_f | Fall time | | | 80 | 100 | ns |

1. Pulse duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

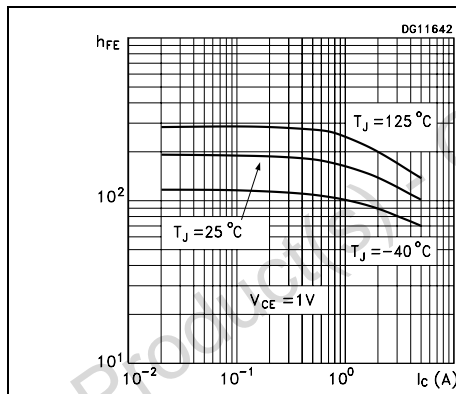


Figure 3. DC current gain

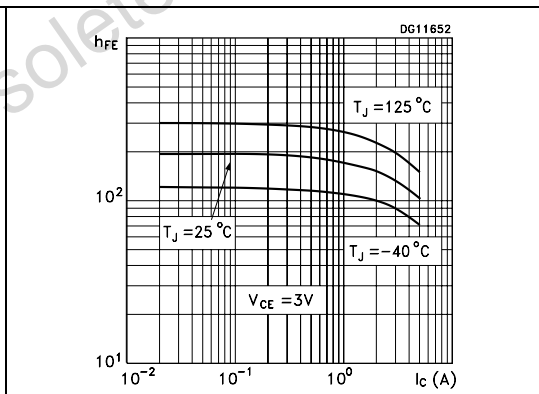


Figure 4. Collector-emitter saturation voltage

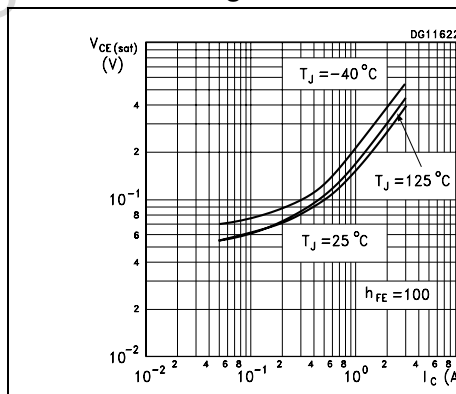
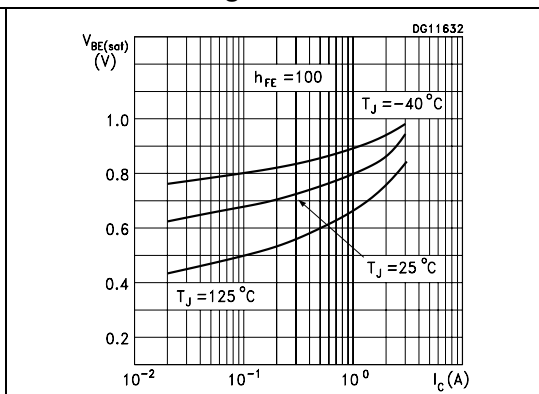


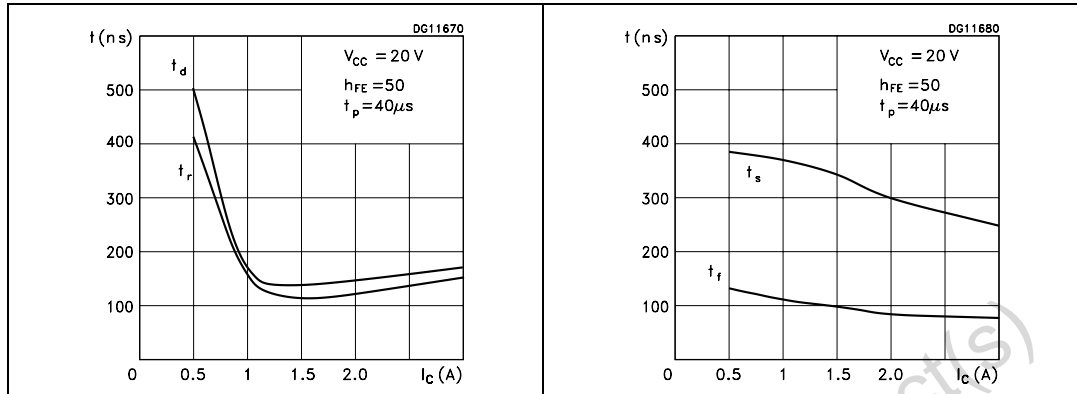
Figure 5. Base-emitter saturation voltage



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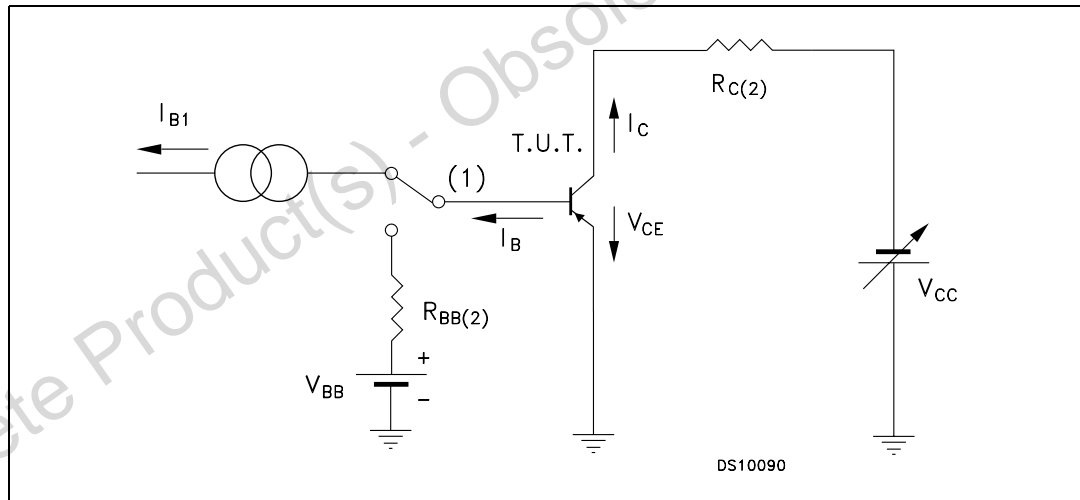
Electrical characteristics

Figure 6. Switching time resistive load Figure 7. Switching time resistive load



2.2 Test circuit

Figure 8. Resistive load switching test circuit



- 1. Fast electronic switch
- 2. Non-inductive resistor

3 Package mechanical data

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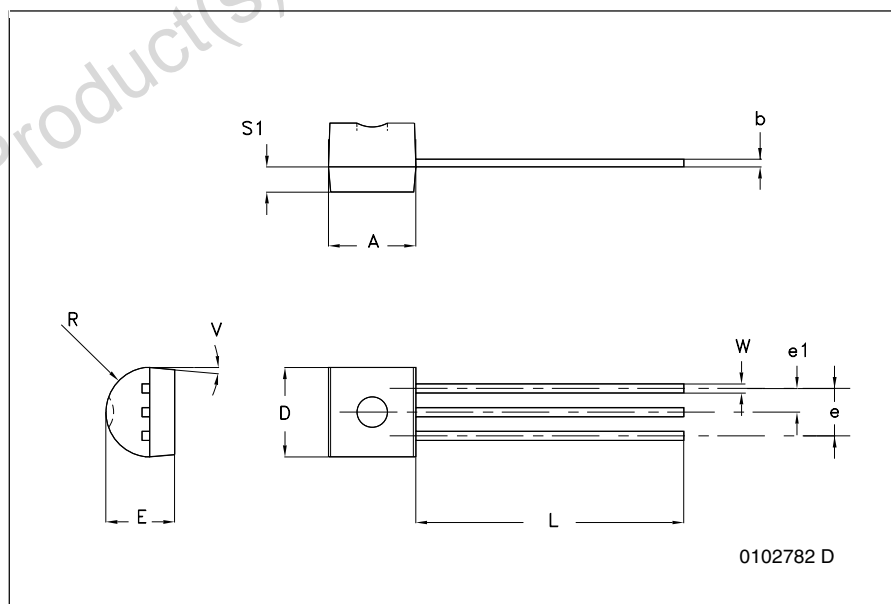
Obsolete Product(s) - Obsolete Product(s)

STX790A

Package mechanical data

TO-92 bulk shipment mechanical data

| DIM. | mm. | | |
|------|-------|-----|-------|
| | MIN. | TYP | MAX. |
| A | 4.32 | | 4.95 |
| b | 0.36 | | 0.51 |
| D | 4.45 | | 4.95 |
| E | 3.30 | | 3.94 |
| e | 2.41 | | 2.67 |
| e1 | 1.14 | | 1.40 |
| L | 12.70 | | 15.49 |
| R | 2.16 | | 2.41 |
| S1 | 0.92 | | 1.52 |
| W | 0.41 | | 0.56 |
| V | | 5° | |

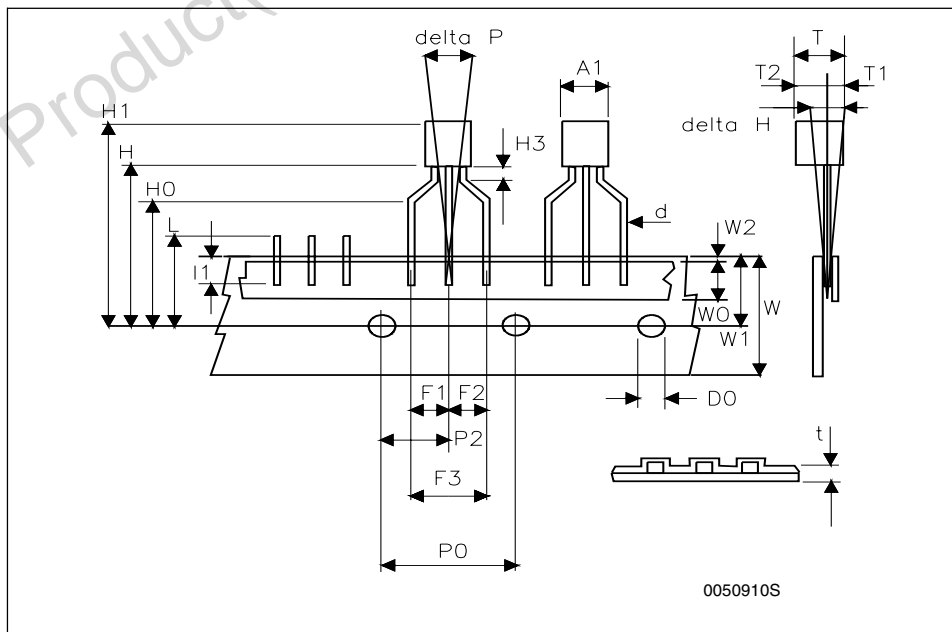


Package mechanical data

STX790A

TO-92 ammpack shipment (suffix"-AP") mechanical data

| Dim. | mm | | |
|---------|-------|-------|-------|
| | Min | Typ | Max |
| A1 | | | 4.80 |
| T | | | 3.80 |
| T1 | | | 1.60 |
| T2 | | | 2.30 |
| d | | | 0.48 |
| P0 | 12.50 | 12.70 | 12.90 |
| P2 | 5.65 | 6.35 | 7.05 |
| F1,F2 | 2.44 | 2.54 | 2.94 |
| F3 | 4.98 | 5.08 | 5.48 |
| delta H | -2.00 | | 2.00 |
| W | 17.50 | 18.00 | 19.00 |
| W0 | 5.70 | 6.00 | 6.30 |
| W1 | 8.50 | 9.00 | 9.25 |
| W2 | | | 0.50 |
| H | 18.50 | | 20.50 |
| H3 | 0.5 | 1 | 1.5 |
| H0 | 15.50 | 16.00 | 16.50 |
| H1 | | | 25.00 |
| D0 | 3.80 | 4.00 | 4.20 |
| t | | | 0.90 |
| L | | | 11.00 |
| I1 | 3.00 | | |
| delta P | -1.00 | | 1.00 |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 24-Mar-2003 | 1 | Initial release. |
| 29-Mar-2006 | 2 | New template. |
| 25-Jun-2008 | 3 | Updated TO-92 mechanical data. |
| 28-Apr-2009 | 4 | Added new order code STX790AG-AP Table 1 on page 1 . |

Obsolete Product(s) - Obsolete Product(s)

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