

**Programmable unijunction transistor/
Silicon controlled switch**

BRY39

FEATURES

- Silicon controlled switch
- Programmable unijunction transistor.

APPLICATIONS

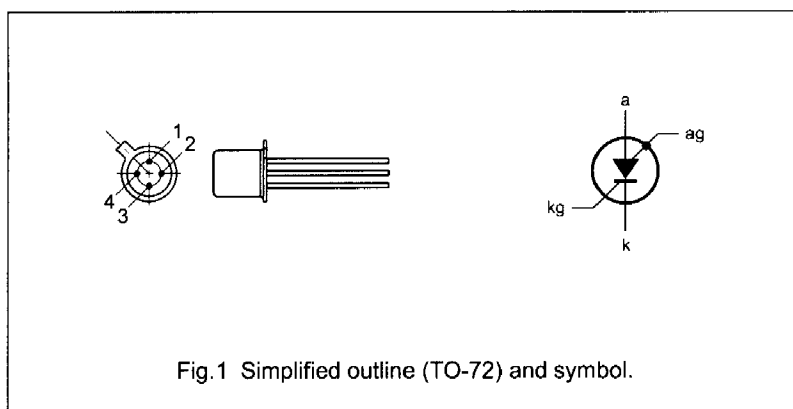
- Switching applications such as:
 - Motor control
 - Oscillators
 - Relay replacement
 - Timers
 - Pulse shapers, etc.

DESCRIPTION

Silicon planar PNPN switch or trigger device in a TO-72 metal package. It is an integrated PNP/NPN transistor pair with all electrodes accessible.

PINNING

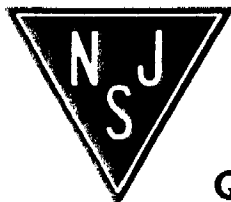
| PIN | DESCRIPTION |
|-----|--------------------------------|
| 1 | cathode |
| 2 | cathode gate |
| 3 | anode gate (connected to case) |
| 4 | anode |



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|--|---------------------------------|--|------|------------|
| Silicon controlled switch | | | | |
| PNP TRANSISTOR | | | | |
| V_{EBO} | emitter-base voltage | open collector | -70 | V |
| NPN TRANSISTOR | | | | |
| V_{CBO} | collector-base voltage | open emitter | 70 | V |
| I_{ERM} | repetitive peak emitter current | | -2.5 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25^\circ C$ | 275 | mW |
| T_j | junction temperature | | 150 | $^\circ C$ |
| V_{AK} | forward on-state voltage | $I_A = 50 \text{ mA}; I_{AG} = 0; R_{KG-K} = 10 \text{ k}\Omega$ | 1.4 | V |
| I_H | holding current | $I_{AG} = 10 \text{ mA}; V_{BB} = -2 \text{ V}; R_{KG-K} = 10 \text{ k}\Omega$ | 1 | mA |
| t_{on} | turn-on time | | 0.25 | μs |
| t_{off} | turn-off time | | 15 | μs |
| Programmable unijunction transistor | | | | |
| V_{GA} | gate-anode voltage | | 70 | V |
| I_A | anode current (DC) | $T_{amb} \leq 25^\circ C$ | 175 | mA |
| T_j | junction temperature | | 150 | $^\circ C$ |
| I_p | peak point current | $V_S = 10 \text{ V}; R_G = 10 \text{ k}\Omega$ | 0.2 | μA |

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LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|--|---------------------------------|--|------|------|------|
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | – | 275 | mW |
| T_{stg} | storage temperature | | –65 | +200 | °C |
| T_j | junction temperature | | – | 150 | °C |
| T_{amb} | operating ambient temperature | | –65 | +150 | °C |
| Silicon controlled switch | | | | | |
| V_{CBO} | collector-base voltage | open emitter | | | |
| | PNP | | – | –70 | V |
| | NPN | | – | 70 | V |
| V_{CER} | collector-emitter voltage | $R_{BE} = 10\text{ k}\Omega$ | | | |
| | PNP | | – | – | V |
| | NPN | | – | 70 | V |
| V_{CEO} | collector-emitter voltage | open base | | | |
| | PNP | | – | –70 | V |
| | NPN | | – | – | V |
| V_{EBO} | emitter-base voltage | open collector | | | |
| | PNP | | – | –70 | V |
| | NPN | | – | 5 | V |
| I_C | collector current (DC) | note 1 | | | |
| | PNP | | – | – | |
| | NPN | | – | 175 | mA |
| I_{CM} | peak collector current | note 2 | | | |
| | PNP | | – | – | |
| | NPN | | – | 175 | mA |
| I_E | emitter current (DC) | | | | |
| | PNP | | – | 175 | mA |
| | NPN | | – | –175 | mA |
| I_{ERM} | repetitive peak emitter current | $t_p = 10\text{ }\mu\text{s}; \delta = 0.01$ | | | |
| | PNP | | – | 2.5 | A |
| | NPN | | – | –2.5 | A |
| Programmable unijunction transistor | | | | | |
| V_{GA} | gate-anode voltage | | – | 70 | V |
| I_A | anode current (AV) | $T_{amb} \leq 25\text{ °C}$ | – | 175 | mA |

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| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|-----------------------------------|--|------|------|------------|
| I_{ARM} | repetitive peak anode current | $t_p = 10 \mu s; \delta = 0.01$ | – | 2.5 | A |
| I_{ASM} | non-repetitive peak anode current | $t_p = 10 \mu s; T_j = 150 \text{ }^\circ\text{C}$ | – | 3 | A |
| di_A/dt | rate of rise of anode current | $I_A \leq 2.5 \text{ A}$ | – | 20 | A/ μs |

Notes

1. Provided the I_E rating is not exceeded.
2. During switching on, the device can withstand the discharge of a capacitor of a maximum value of 500 pF. This capacitor is charged when the transistor is in cut-off condition, with a collector supply voltage of 160 V and a series resistance of 100 k Ω .

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|--------------|---|-------------|-------|------|
| $R_{th j-a}$ | thermal resistance from junction to ambient | in free air | 450 | K/W |

CHARACTERISTICS

$T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|----------------------------------|--------------------------------------|---|------|------|---------------|
| Silicon controlled switch | | | | | |
| INDIVIDUAL PNP TRANSISTOR | | | | | |
| I_{CEO} | collector cut-off current | $I_B = 0; V_{CE} = -70 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$ | – | –10 | μA |
| I_{EBO} | emitter cut-off current | $I_C = 0; V_{EB} = -70 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$ | – | –10 | μA |
| h_{FE} | DC current gain | $I_E = 1 \text{ mA}; V_{CE} = -5 \text{ V}$ | 3 | 15 | |
| INDIVIDUAL NPN TRANSISTOR | | | | | |
| I_{CER} | collector cut-off current | $V_{CE} = 70 \text{ V}; R_{BE} = 10 \text{ k}\Omega$ | – | 100 | nA |
| | | $V_{CE} = 70 \text{ V}; R_{BE} = 10 \text{ k}\Omega; T_j = 150 \text{ }^\circ\text{C}$ | – | 10 | μA |
| I_{EBO} | emitter cut-off current | $I_C = 0; V_{EB} = 5 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$ | – | 10 | μA |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$ | – | 0.5 | V |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 10 \text{ mA}; I_B = 1 \text{ mA}$ | – | 0.9 | V |
| h_{FE} | DC current gain | $I_C = 10 \text{ mA}; V_{CE} = 2 \text{ V}$ | 50 | – | |
| C_C | collector capacitance | $I_E = i_e = 0; V_{CB} = 20 \text{ V}$ | – | 5 | pF |
| C_e | emitter capacitance | $I_C = i_c = 0; V_{EB} = 1 \text{ V}; f = 1 \text{ MHz}$ | – | 25 | pF |
| f_T | transition frequency | $I_C = 10 \text{ mA}; V_{CE} = 2 \text{ V}; f = 100 \text{ MHz}$ | 100 | – | MHz |
| COMBINED DEVICE | | | | | |
| V_{AK} | forward on-state voltage | $R_{KG-K} = 10 \text{ k}\Omega$ | – | 1.4 | V |
| | | $I_A = 50 \text{ mA}; I_{AG} = 0$ | – | 1.9 | V |
| | | $I_A = 50 \text{ mA}; I_{AG} = 0; T_j = -55 \text{ }^\circ\text{C}$ | – | 1.2 | V |
| | | $I_A = 1 \text{ mA}; I_{AG} = 10 \text{ mA}$ | – | 1.2 | V |
| I_H | holding current | $V_{BB} = -2 \text{ V}; I_{AG} = 10 \text{ mA}; R_{KG-K} = 10 \text{ k}\Omega; \text{ see Fig. 14}$ | – | 1 | mA |

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PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 4 leads

SOT18/9

