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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

Fig.1 Simplified outline (TO-72) and symbol.

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	$T_{amb} \leq 25$ °C	275	mW
T_j	junction temperature		150	°C
V_{AK}	forward on-state voltage	I_A = 50 mA; I_{AG} = 0; R_{KG-K} = 10 kΩ	1.4	V
I_H	holding current	I_{AG} = 10 mA; V_{BB} = –2 V; R_{KG-K} = 10 kΩ	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)	$T_{amb} \leq 25$ °C	175	mA
T_j	junction temperature		150	°C
I_p	peak point current	V_S = 10 V; R_G = 10 kΩ	0.2	µA

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °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 kΩ			
	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 µs; δ = 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)	$T_{amb} \leq 25$ °C	–	175	mA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{ARM}	repetitive peak anode current	t_p = 10 µs; δ = 0.01	–	2.5	A
I_{ASM}	non-repetitive peak anode current	t_p = 10 µs; T_j = 150 °C	–	3	A
dI_A/dt	rate of rise of anode current	$I_A \leq 2.5$ 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 kΩ.

THERMAL CHARACTERISTICS

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

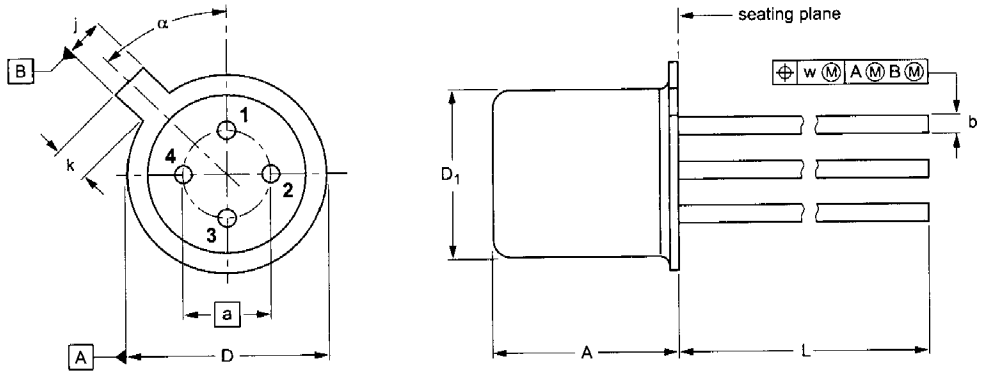
CHARACTERISTICS

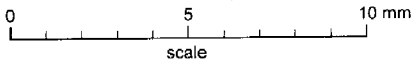
T_{amb} = 25 °C unless otherwise specified.

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

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 4 leads **SOT18/9**





DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	a	b	D	D_1	j	k	L	w	α
mm	5.31 4.74	2.54	0.46 0.42	5.45 5.30	4.70 4.55	1.05 0.95	1.0 0.9	14.5 13.5	0.36	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT18/9	B12/C7 type 3	TO-72				