

# Germanium Power Devices Corp.

## SILICON UNIJUNCTION TRANSISTOR

## Specifications

Siemens Types

**2N1671**

The GPD Unijunction Transistor is a three terminal device having a stable "N" type negative resistance characteristic over a wide temperature range. A stable peak point voltage, a low peak point current, and a high pulse current rating make this device useful in oscillators, timing circuits, trigger circuits and pulse generators where it can serve the purpose of two conventional silicon or germanium transistors. The 2N1671 is intended for general purpose industrial applications where circuit economy

### absolute maximum ratings

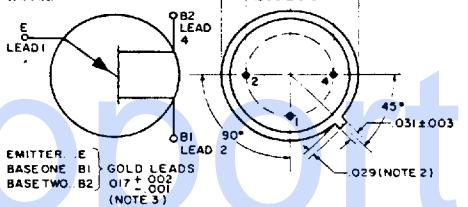
RMS Power Dissipation	450 mw <sup>1</sup>
RMS Emitter Current (25°C)	50 ma
Peak Emitter Current <sup>2</sup>	2 amperes
Emitter Reverse Voltage	30 volts
Interbase Voltage	35 volts
Operating Temperature Range	-65°C to +140°C
Storage Temperature Range	-65°C to +150°C

is of primary importance. The 2N1671A is intended for industrial use in firing circuits for Silicon Controlled Rectifiers and other applications where a guaranteed minimum pulse amplitude is required. The 2N1671B is intended for applications where a low emitter leakage current and a low peak point emitter current (trigger current) are required. These transistors feature Fixed-Bed Construction and are hermetically sealed in a welded case. All leads are electrically isolated from the case.

NOTE 1: This zone is controlled for automatic handling. The variation in actual diameter within this zone shall not exceed  $\pm 0.10$ .

NOTE 2: Measured from max. diameter of the actual device.

NOTE 3: The specified lead diameter applies in the zone between 050 and 250 from the base seal. Between 250 and 150 maximum of 021 diameter is held. Outside of these zones the lead diameter is not controlled.



### electrical characteristics (25°C)

PARAMETER	SYMBOL	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	UNITS
Intrinsic Standoff Ratio ( $V_{BB} = 10V$ ) (Note 3)	$\eta$	0.47	0.62	0.47	0.62	0.47	0.62	
Interbase Resistance ( $V_{BB} = 3V$ , $I_E = 0$ ) (Note 4)	$R_{BB0}$	4.7	9.1	4.7	9.1	4.7	9.1	KΩ
Emitter Saturation Voltage ( $V_{BB} = 10V$ , $I_E = 50 ma$ )	$V_E(SAT)$	5		5		5		volts
Modulated Interbase Current ( $V_{BB} = 10V$ , $I_E = 50 ma$ )	$I_{BE}(MOD)$	6.8	22	6.8	22	6.8	22	ma
Emitter Reverse Current ( $V_{BB} = 30V$ , $I_{RE} = 0$ ) (Fig. 6)	$I_{EO}$		12		12		0.2	.02
Peak Point Emitter Current ( $V_{BB} = 25V$ ) (Fig. 8)	$I_P$		25		25		6	.2
Valley Point Current ( $V_{BB} = 20V$ , $R_{B2} = 100\Omega$ ) (Fig. 9)	$I_V$	8		8		8		ma
Base-One Peak Pulse Voltage (Note 5)	$V_{OB1}$		3.0		3.0		3.0	volts
Emitter Reverse Current ( $V_{BB} = 25V$ , $V_{EB1} = V_B - .3V$ ) (Fig. 3)	$I_{EX}$						0.05	μa

### NOTES:

(1) Derate 3.9 MW/°C increase in ambient temperature. (Thermal resistance to case = 0.16°C/MW.)

(2) Capacitor discharge—10μfd or less, 30 volts or less—Total interbase power dissipation must be limited by external circuitry.

(3) The intrinsic standoff ratio,  $\eta$ , is essentially constant with temperature and interbase voltage.  $\eta$  is defined by the equation:

$$V_P = \eta V_{BB} + \frac{200}{T_1}$$

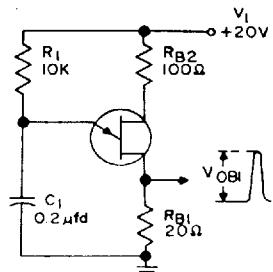
Where  $V_P$  = Peak point emitter voltage

$V_{BB}$  = Interbase voltage

$T_1$  = Junction Temperature (Degrees Kelvin)

(4) The interbase resistance is nearly ohmic and increases with temperature in a well defined manner as shown in figures 10 and 11. The temperature coefficient at 25°C is approximately 0.8%/°C.

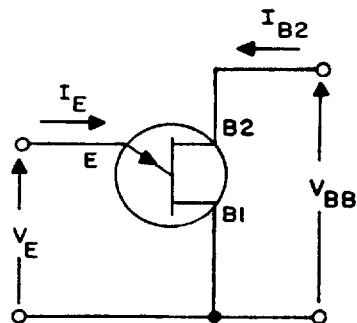
(5) The base-one peak pulse voltage is measured in the circuit below. This specification on the 2N1671A is used to ensure a minimum pulse amplitude for applications in SCR firing circuits and other types of pulse circuits. The variation of pulse amplitude with temperature and circuit parameters is shown in figures 12 to 15.



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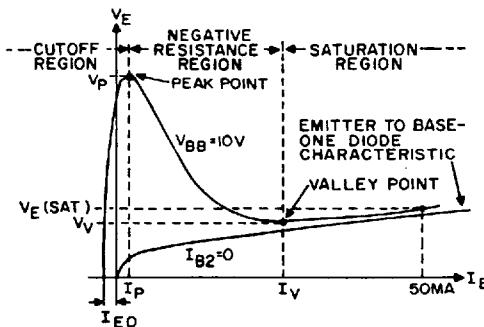
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# SILICON UNIJUNCTION TRANSISTOR T<sup>+</sup>



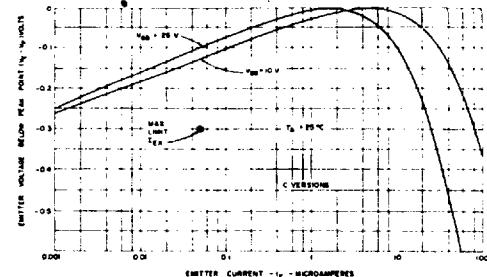
**FIG. 1**

Unijunction Transistor Symbol with Nomenclature used for voltage and currents.



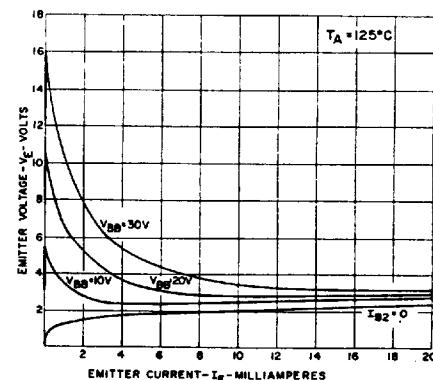
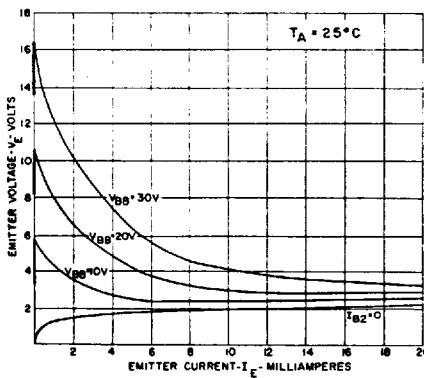
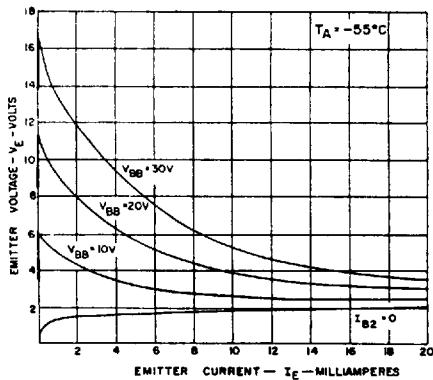
**FIG. 2**

Static Emitter Characteristic curves showing important parameters and measurement points (exaggerated to show details).



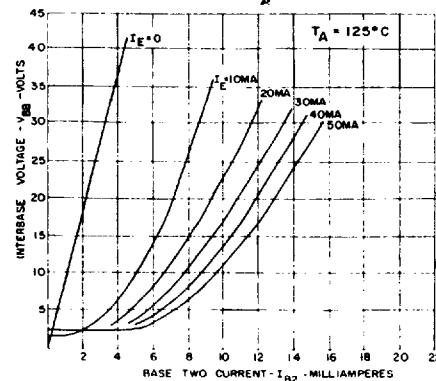
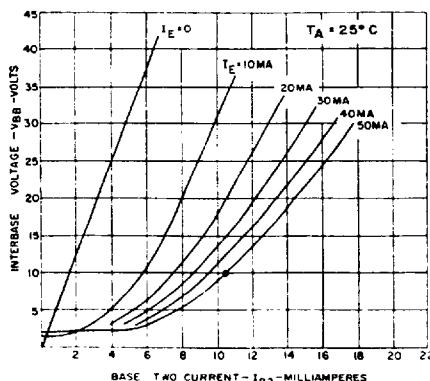
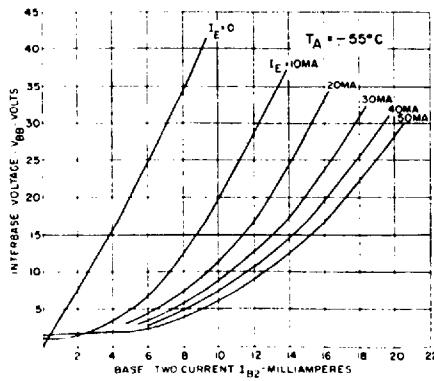
**FIG. 3**

Static Emitter Characteristics at Peak Point.



**FIG. 4**

Static emitter characteristics for a typical 2N1671 unijunction transistor at three different ambient temperatures.



**FIG. 5**

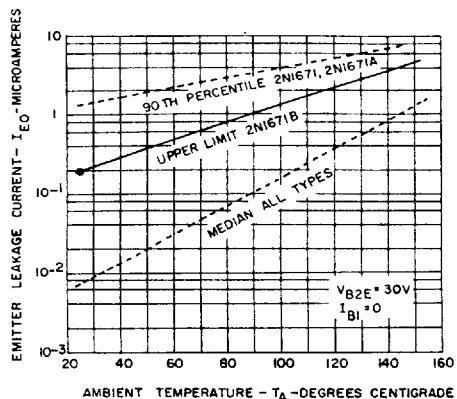
Static interbase characteristics for a typical 2N1671 unijunction transistor at three different ambient temperatures.

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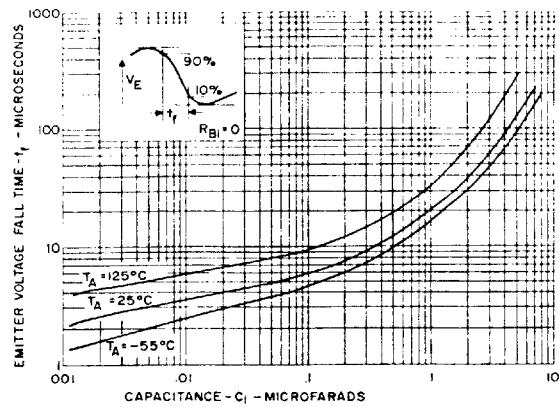
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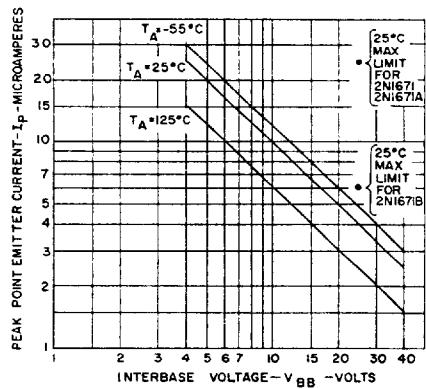
**FIG. 6**

Emitter reverse current vs. temperature.



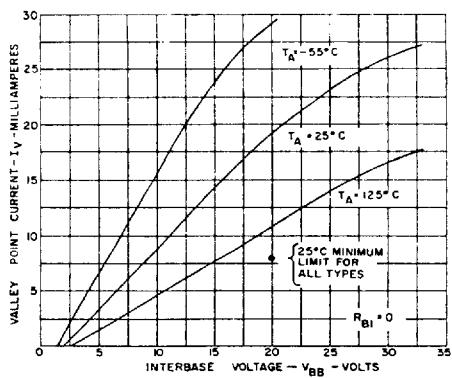
**FIG. 7**

Emitter voltage fall time vs. capacitance and ambient temperature for a typical unit in relaxation oscillator circuit.



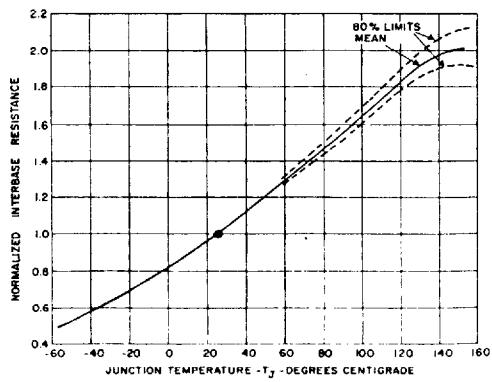
**FIG. 8**

Peak Point Emitter Current vs. interbase voltage and ambient temperature for a typical unit.



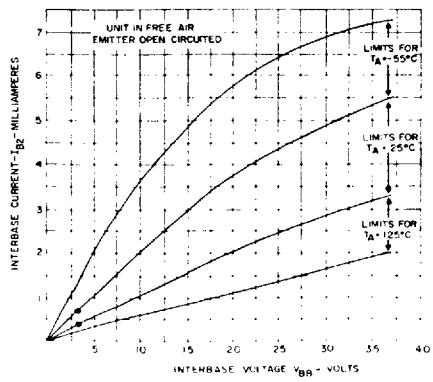
**FIG. 9**

Valley Point Current vs. interbase voltage and ambient temperature for a typical unit.



**FIG. 10**

Normalized interbase resistance vs. junction temperature.



**FIG. 11**

Limit values of static interbase characteristics with zero emitter current.

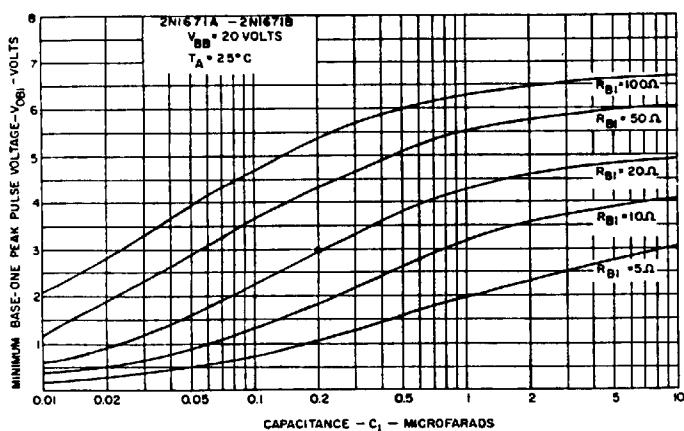
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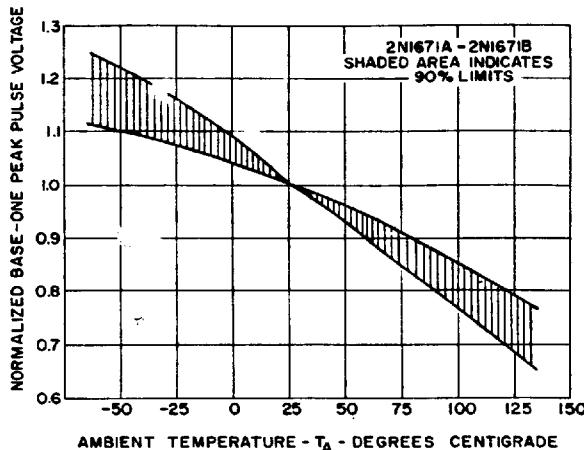
# 2N1671A - 2N1671B

## GENERAL PURPOSE PULSE CIRCUITS AND FIRING CIRCUITS FOR SILICON CONTROLLED RECTIFIERS



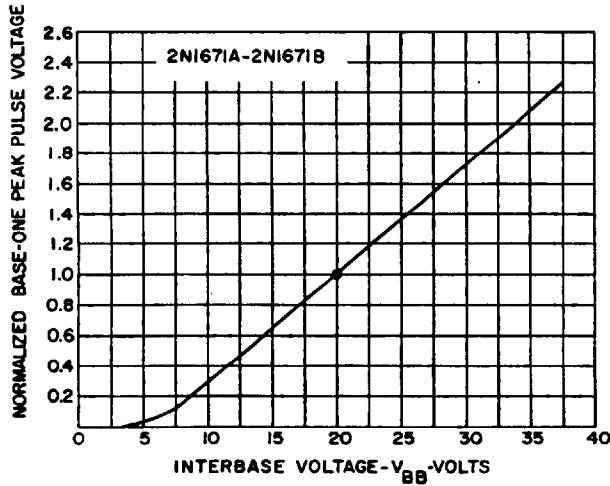
**FIG. 12**

Minimum base-one peak pulse voltage vs. capacitance and base-one resistance in relaxation oscillator circuit.



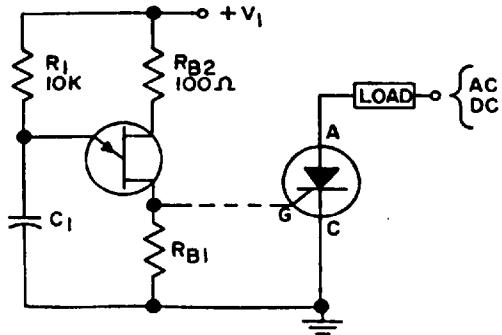
**FIG. 13**

Normalized base-one peak pulse voltage vs. temperature in relaxation oscillator circuit.

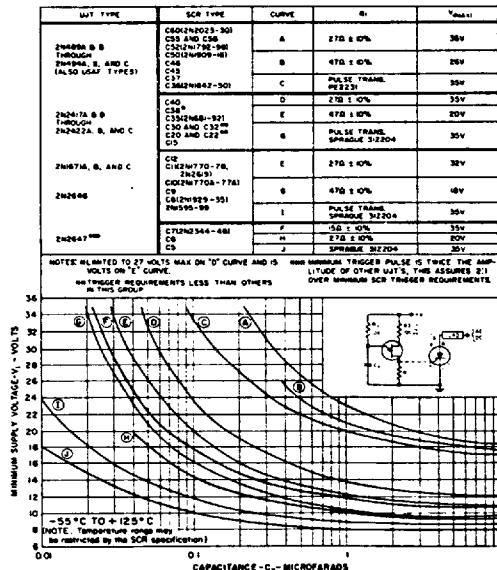


**FIG. 14**

Normalized base-one peak pulse voltage vs. interbase voltage in relaxation oscillator circuit.



**FIG. 16**  
Basic unijunction transistor firing circuit controlled rectifiers.



**FIG. 15**

Minimum supply voltage required to fire standard types of silicon controlled rectifiers vs. capacitance in circuit below.

Period of Relaxation Oscillator

$$\tau = 0.80 R_1 C_1 (\pm 0.21 R_1 C_1)$$

Maximum Value of  $R_1$  for oscillation (-55°C to +140°C)

$$R_1 (\text{max}) = 430 V_i^2 \text{ (2N1671-2N1671A)}$$

$$R_1 (\text{max}) = 1800 V_i^2 \text{ (2N1671B)}$$

$\tau$  = Period in Seconds

$C_1$  = Capacitance in Farads

$R_1$  = Resistance in ohms

$V_i$  = Supply voltage in volts

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