

Germanium Power Devices Corp.

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SILICON UNIJUNCTION TRANSISTOR

Specifications

SILICON TYPES

2N1671

2N1671A

2N1671B

2N1671C

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

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.

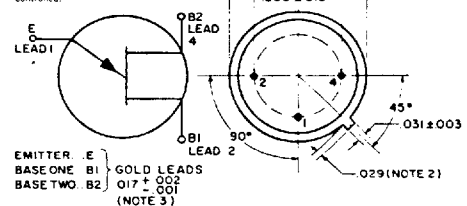
absolute maximum ratings

RMS Power Dissipation	450 mw ¹
RMS Emitter Current (25°C)	50 ma
Peak Emitter Current ²	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

NOTE 1: This zone is controlled for automatic handling. The variation in actual diameter within this zone shall not exceed 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 1.5 maximum of .021 diameter is held. Outside of these zones the lead diameter is not controlled.



electrical characteristics (25°C)

PARAMETER	SYMBOL	2N1671		2N1671A		2N1671B		2N1671C		UNITS
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Intrinsic Standoff Ratio ($V_{BB} = 10V$) (Note 3)	η	0.47	0.62	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	4.7	9.1	K Ω
Emitter Saturation Voltage ($V_{BB} = 10V, I_E = 50$ ma)	$V_E(SAT)$		5		5		5		5	volts
Modulated Interbase Current ($V_{BB} = 10V, I_E = 50$ ma)	$I_{B2}(MOD)$	6.8	22	6.8	22	6.8	22	6.8	22	ma
Emitter Reverse Current ($V_{RE} = 30V, I_{B1} = 0$) (Fig. 6)	I_{EO}		12		12		0.2		.02	μ a
Peak Point Emitter Current ($V_{BB} = 25V$) (Fig. 8)	I_P		25		25		6		2	μ a
Valley Point Current ($V_{BB} = 20V, R_{B2} = 100\Omega$) (Fig. 9)	I_V	8		8		8		8		ma
Base-One Peak Pulse Voltage (Note 5)	V_{OB1}			3.0		3.0		3.0		volts
Emitter Reverse Current ($V_{BB} = 25V, V_{EB1} = V_P - 3V$) (Fig. 3)	I_{EX}								0.05	μ a

NOTES:

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

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

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

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

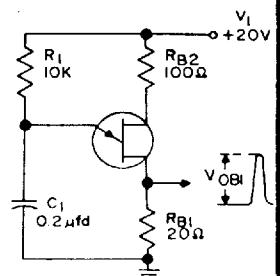
Where V_P = Peak point emitter voltage

V_{BB} = interbase voltage

T_J = 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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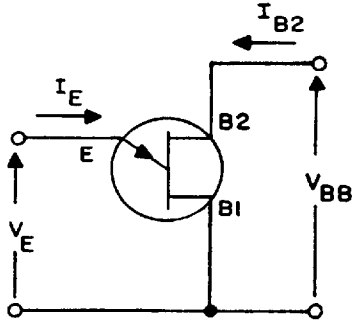


FIG. 1

Unijunction Transistor Symbol with Nomenclature used for voltage and currents.

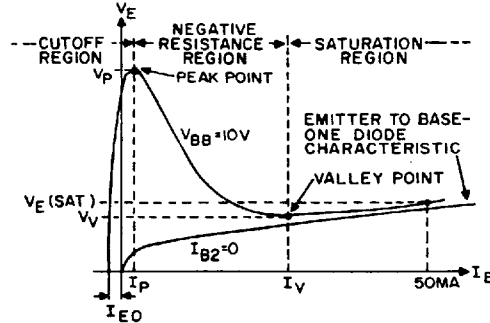


FIG. 2

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

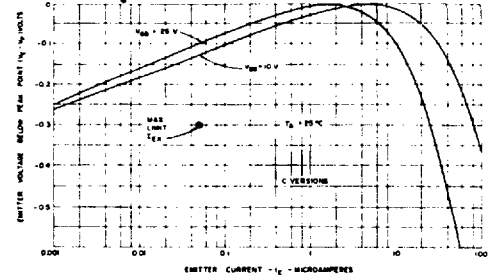


FIG. 3

Static Emitter Characteristics at Peak Point.

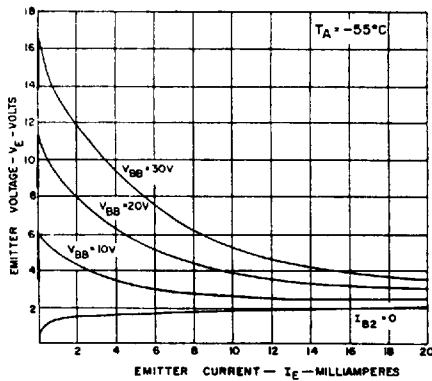
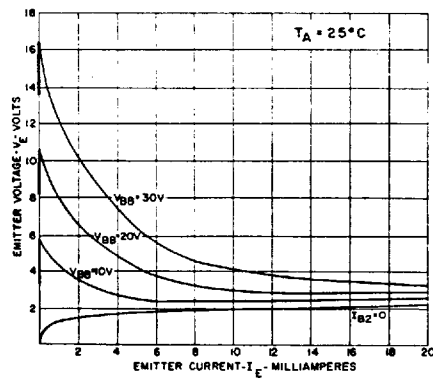


FIG. 4



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

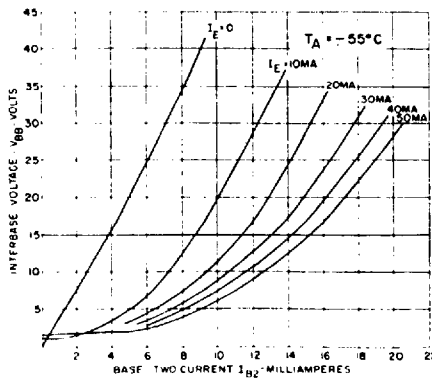
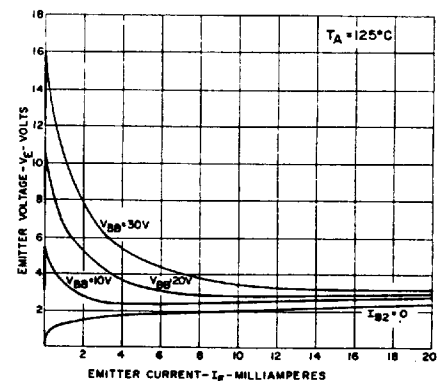
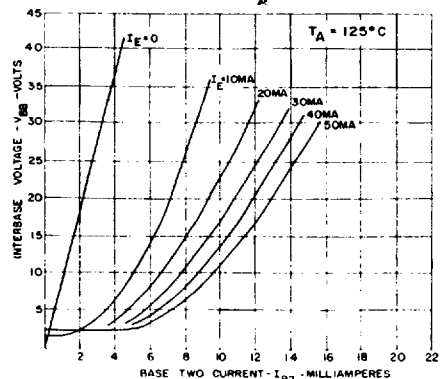
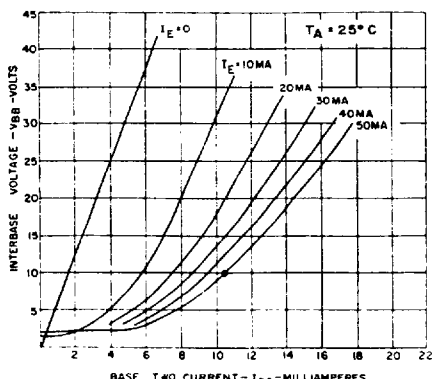


FIG. 5

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



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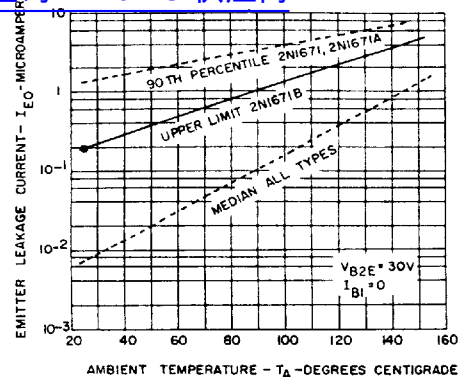


FIG. 6

Emitter reverse current vs. temperature.

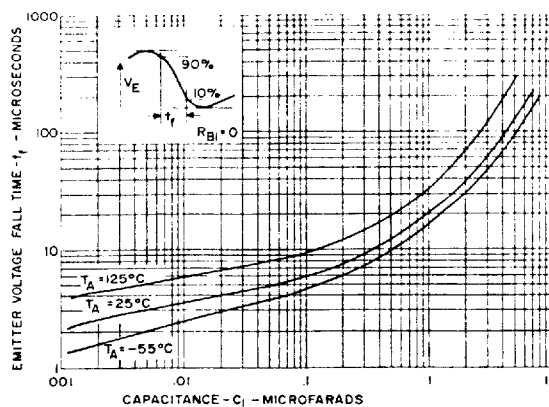


FIG. 7

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

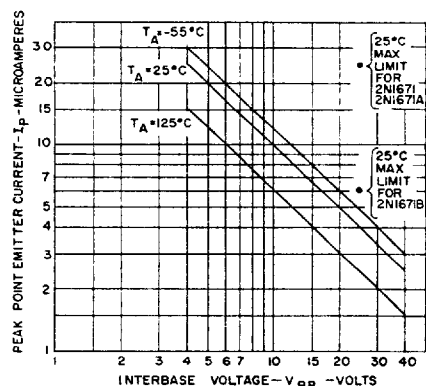


FIG. 8

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

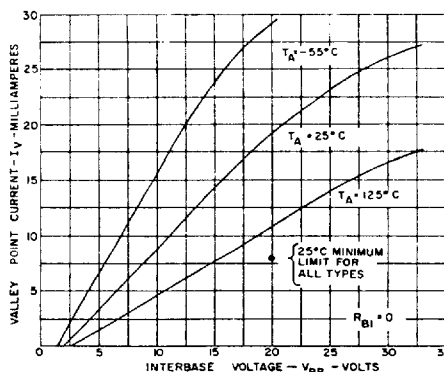


FIG. 9

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

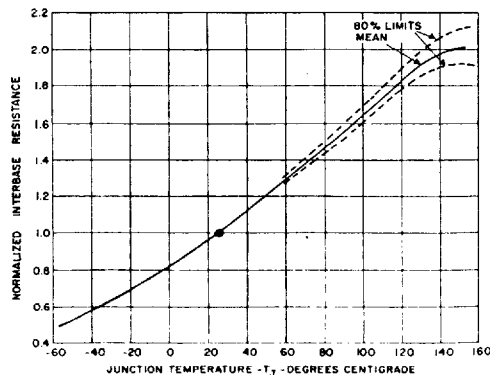


FIG. 10

Normalized interbase resistance vs. junction temperature.

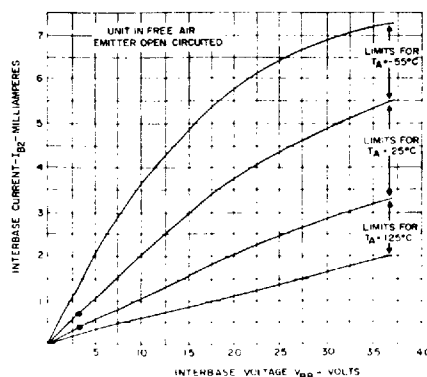


FIG. 11

Limit values of static interbase characteristics with zero emitter current.

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GENERAL PURPOSE PULSE CIRCUITS AND FIRING CIRCUITS FOR SILICON CONTROLLED RECTIFIERS

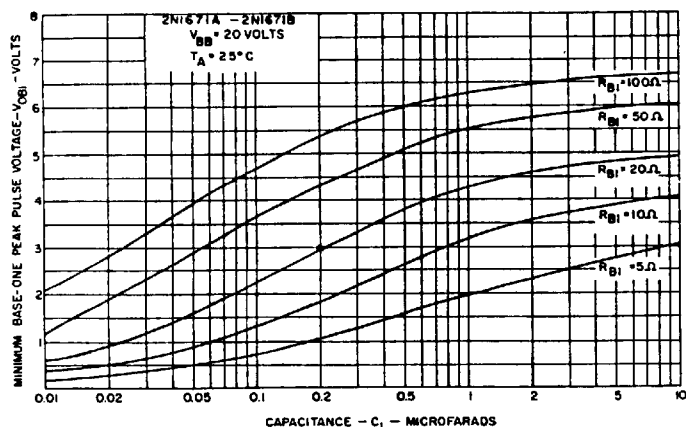


FIG. 12

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

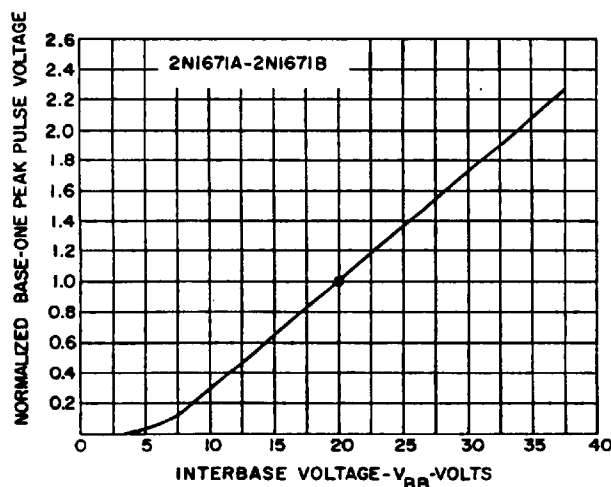


FIG. 14

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

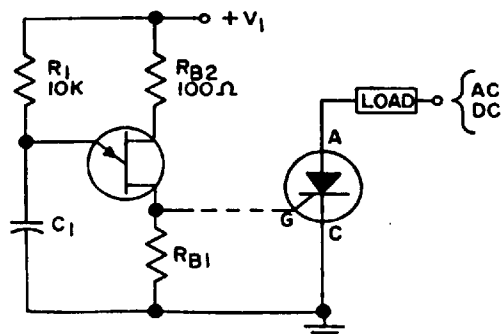


FIG. 16

Basic unijunction transistor firing circuit controlled rectifiers.

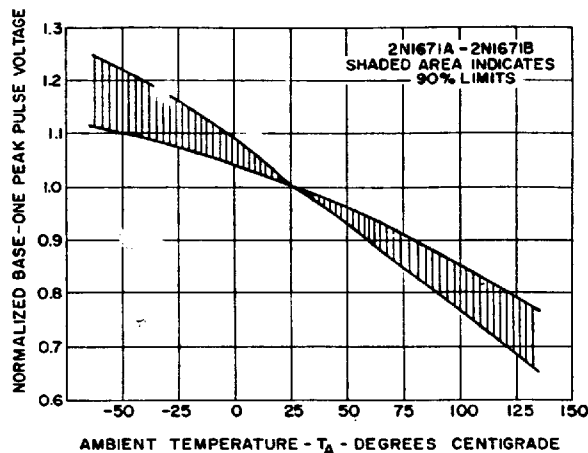


FIG. 13

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

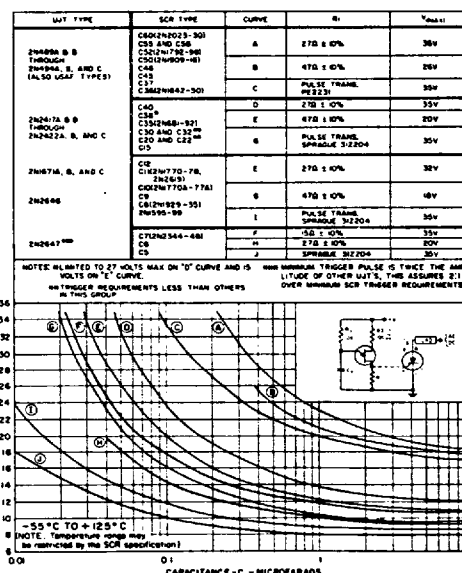


FIG. 15

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 $+140^\circ\text{C}$)

$$R_1 (\text{max}) = 430 V_1^2 (2N1671-2N1671A)$$

$$R_1 (\text{max}) = 1800 V_1^2 (2N1671B)$$

$$\tau = \text{Period in Seconds}$$

$$C_1 = \text{Capacitance in Farads}$$

$$R_1 = \text{Resistance in ohms}$$

$$V_1 = \text{Supply voltage in volts}$$