TYPES 2N514, 2N514A, 2N514B

P-N-P ALLOY-JUNCTION GERMANIUM POWER TRANSISTORS

BULLETIN NO. DL-S 1053 MARCH, 1959
TYPES 2N514, 2N514A, 2N514B

40, 60, 80 VOLTS

25-AMP COLLECTOR CURRENT

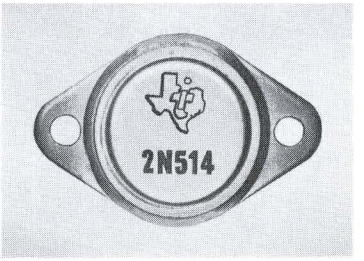
80-WATT DISSIPATION — 0.05 OHM MAX R_{CS}

LOW I_{CO} LOW V_{BE}

for

HIGH POWER CONVERSION — HIGH CURRENT SWITCHING

AUDIO AMPLIFIER OUTPUTS



ACTUAL SIZE

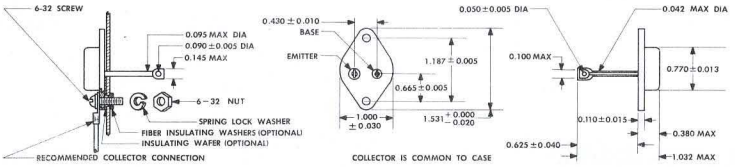
qualification testing

All units are subjected to a high-pressure leak test and are heat cycled from −55°C and room humidity to +95°C and 95% relative humidity, for four complete cycles over an eight-hour period. In addition, all units are stored at + 95°C for 100 hours and then thoroughly tested for rigid adherence to electrical design characteristics.

mechanical data

The use of high-temperature silver solder to assemble the mounting base and the use of projection welds to seal the can, provide a hermetically-sealed enclosure which can withstand up to 300 psi. During the assembly process, the absence of flux, soft solder, and wet processing combined with extra cleanliness, prevents sealed-in contamination.

The mounting base is a high conductivity copper which provides an excellent heat path from the collector junction to a heat sink which must be tightly attached to permit operation at maximum rated dissipation. The approximate weight of the unit is 23 grams.



maximum ratings at 25°C*

		2N514	2N514A	2N514B	unit
V_{CBO}	Collector-to-Base Voltage (I_C = −5ma, I_E = 0)	−40	−60	−80	v
V_{CEX}	Collector-to-Emitter Voltage (V_{BE} = +0.2 v, I_C = −5ma)	−40	−60	−80	v
V_{EBO}	Emitter-to-Base Voltage (I_E = −5ma, I_C = 0)	−30	−30	−30	v
I_C	DC Collector Current	−25	−25	−25	a
I_E	DC Emitter Current	−25	−25	−25	a
I_B	Base Current	−5	−5	−5	a
	Total Dissipation†	80	80	80	w
T_J	Junction Temperature	95	95	95	°C

typical characteristics at 25°C*

h_{FE}	Forward Current Transfer Ratio (V_{CE} = −1.5 v, I_C = −6.25a) (V_{CE} = −1.5 v, I_C = −25a)	 40 12	 40 12	 40 12	
R_{CS}	Common Emitter Saturation Resistance (I_C = −25a, I_B = −3.75a)	0.025	0.025	0.025	ohm
K	Thermal Resistance from Collector Junction to Mounting Base	0.7	0.7	0.7	°C/w
BV_{CES}	Collector to Emitter Breakdown Voltage with Base Shorted to Emitter (I_C = −300ma, V_{BE} = 0)	−55	−65	−75	v
BV_{CEO}	Collector to Emitter Breakdown Voltage (I_C = −300ma, I_B = 0)	−40	−50	−60	v
I_{CBO}	Collector Reverse Current (V_{CB} = ½V_{CBO} max, T_J = 85°C)	−8.0	−8.0	−8.0	ma

* Temperature is measured on mounting base.

† For operation at higher temperatures refer to derating curve.

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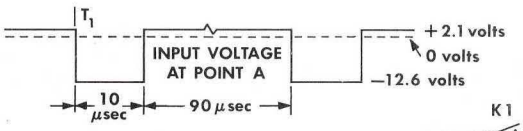
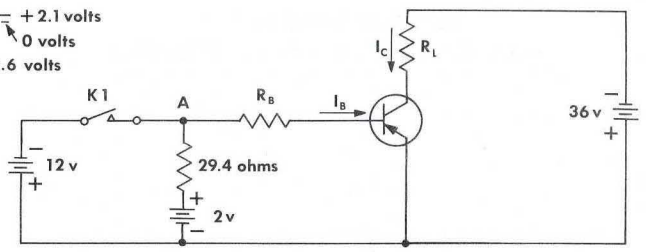
TYPICAL SWITCHING CHARACTERISTICS AT 25°C–TURN ON CIRCUIT



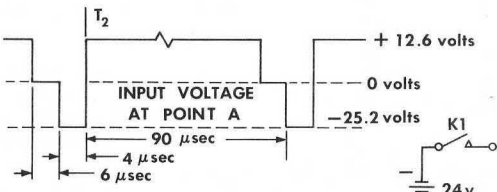


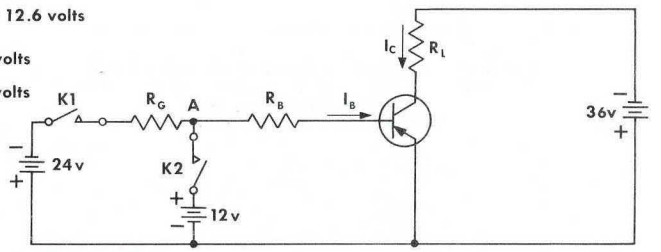
T_{on} is time from T_1 until 0.9 I_C
t_d is time from T_1 until 0.1 I_C
t_r is time from 0.1 I_C until 0.9 I_C
$t_d \approx 0.1\ T_{on}$

I_C	I_{B1}	R_B	R_L	T_{on}
–25a	–3.0a	3.81 ohms	1.41 ohms	11.5 μsec

K1 is a mercury contact relay
All power sources are batteries

TYPICAL SWITCHING CHARACTERISTICS AT 25°C–TURN OFF CIRCUIT



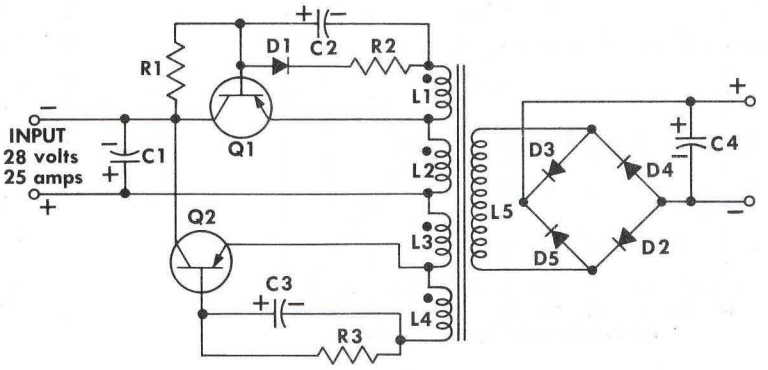


t_s is time from T_2 until 0.9 I_C
t_f is time from 0.9 I_C until 0.1 I_C

I_C	$I_{B2} = -I_{B1}$	R_G	R_B	R_L	t_s	t_f
–25a	3.0a	4.24 ohms	3.81 ohms	1.41 ohms	2.0 μsec	5.0 μsec

K1 and K2 are mercury contact relays
All power sources are batteries

DC-TO-DC POWER CONVERTER
620-WATT OUTPUT AT 90% EFFICIENCY



L5 may be wound according to the output voltage desired, allowing about 0.639 turns per volt. The wire size should be large enough to allow one circular mil per millampere. The output current and load will then determine D3, D4, D5, D6 and C4.
L2, L3—17 turns each #10 bifilar wound
L1, L2—4 turns each #16
Q1, Q2—2N514B 80 volt 25 amp each mounted on a min of 200 sq. in. of ¼" aluminum to be good to 50°C.
D1—1N1124 mounted on a min of 1 sq. in. of exposed aluminum 1/16" thick. Operation to 50°C.
R1—1K ohms ¼ watt
R2—1.5 ohms 20 watt
R3—2 ohms 20 watt
C1—500 μf @50 volt (must not be omitted)
C2, C3—20μf @20 volt
Frequency about 1 kc.
Core-type 50022-2A Magnetics, Inc.

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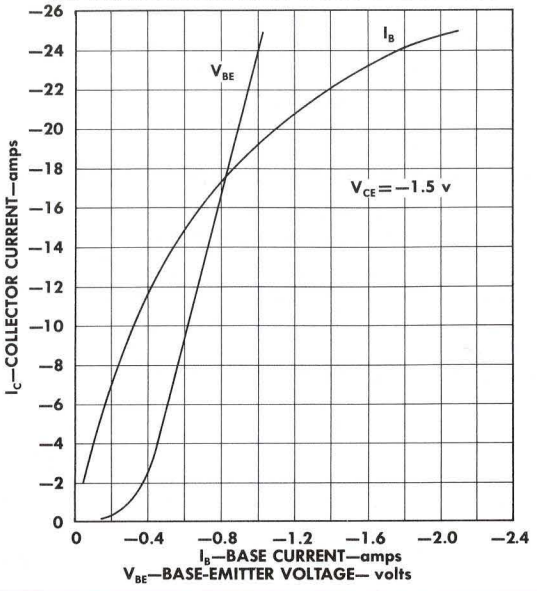
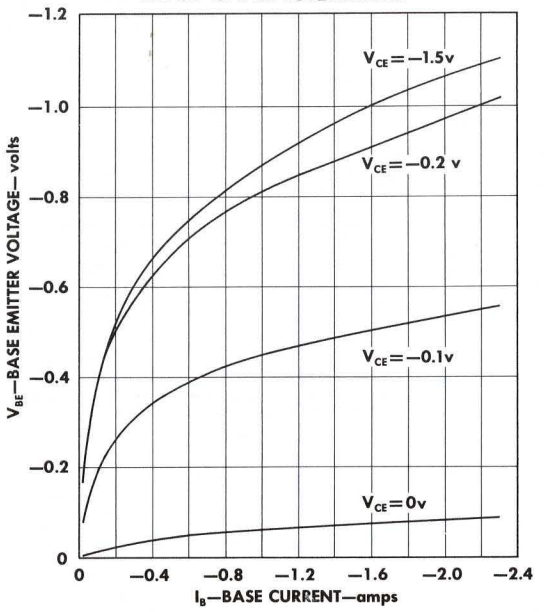
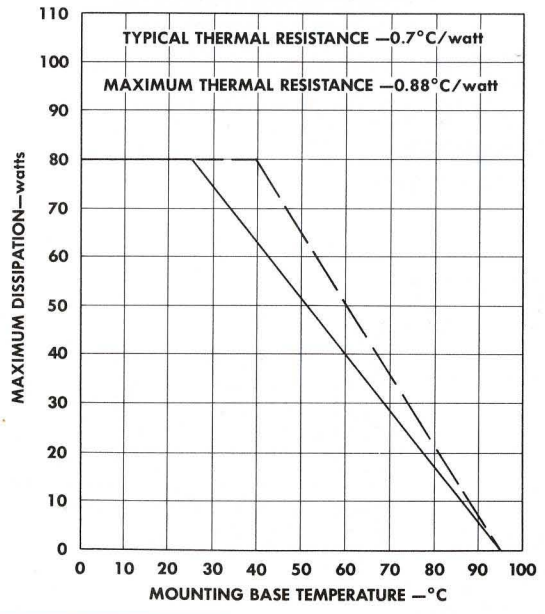
CURRENT TRANSFER AND TRANSCONDUCTANCE CHARACTERISTICS



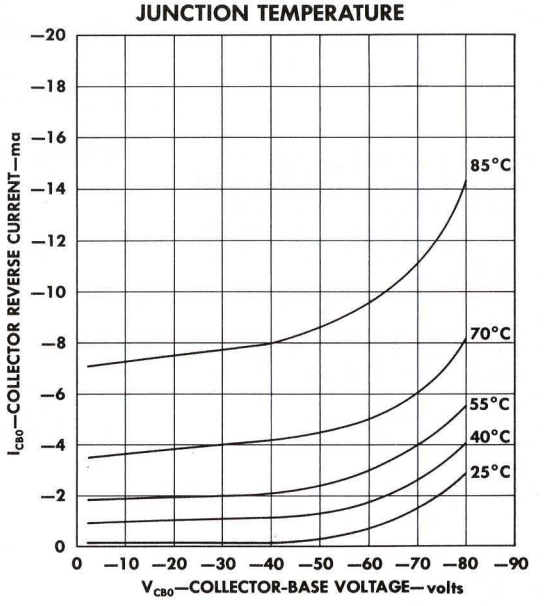
INPUT CHARACTERISTICS



DISSIPATION DERATING CURVE



COLLECTOR REVERSE CURRENT VS JUNCTION TEMPERATURE



TYPES 2N514, 2N514A, 2N514B

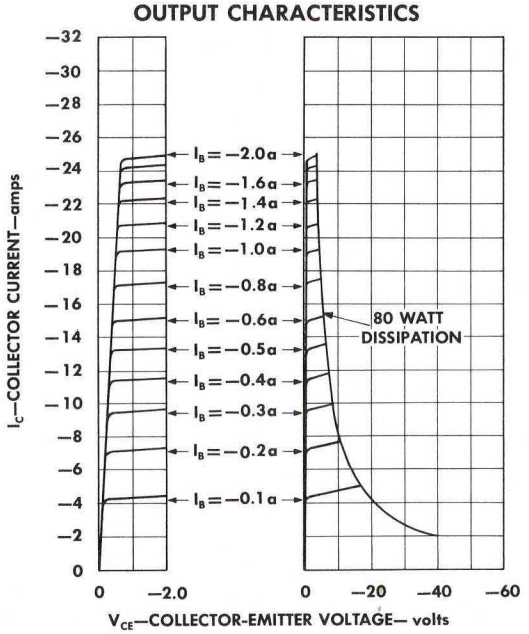
TYPICAL CHARACTERISTICS

design characteristics at 25°C

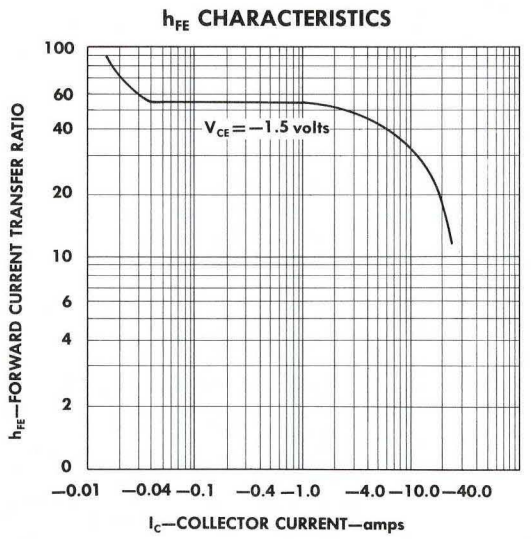
type	symbol	parameter	test conditions	min	design center	max	unit
2N514	BV_{CBO}	Collector-to-Base Breakdown Voltage	$I_C = -5ma$, $I_E = 0$	−40	—	—	v
	I_{CBO}	Collector Reverse Current	$V_{CBO} = -20$ v, $I_E = 0$	—	−0.2	−2.0	ma
2N514A	BV_{CBO}	Collector-to-Base Breakdown Voltage	$I_C = -5ma$, $I_E = 0$	−60	—	—	v
	I_{CBO}	Collector Reverse Current	$V_{CB} = -30$ v, $I_E = 0$	—	−0.2	−2.0	ma
2N514B	BV_{CBO}	Collector-to-Base Breakdown Voltage	$I_C = -5ma$, $I_E = 0$	−80	—	—	v
	I_{CBO}	Collector Reverse Current	$V_{CB} = -40$ v, $I_E = 0$	—	−0.2	−2.0	ma
All	I_{CBO}	Collector Reverse Current	$V_{CB} = -2$ v, $I_E = 0$	—	−0.14	—	ma
All	BV_{EBO}	Emitter-to-Base Breakdown Voltage	$I_E = -5ma$, $I_C = 0$	−30	—	—	v
All	I_{EBO}	Emitter Reverse Current	$V_{EB} = 15$ v, $I_C = 0$	—	−0.20	—	ma
All	I_B	Base Current	$V_{CE} = -1.5$ v, $I_C = -6.25a$	—	−156	−340	ma
			$V_{CE} = -1.5$ v, $I_C = -25a$	—	−2.1	−2.5	a
All	V_{BE}	Base Voltage	$V_{CE} = -1.5$ v, $I_C = -6.25a$	—	−0.50	—	v
			$V_{CE} = -1.5$ v, $I_C = -25a$	—	−1.1	−1.5	v
All	V_{CE} (SAT)	Collector-to-Emitter Saturation Voltage	$I_C = -25a$, $I_B = -3.75a$	—	−0.62	−1.25	v
All	$f\alpha e$	Common-Emitter Frequency Cutoff	$V_{CE} = -6$ v, $I_C = -1a$	—	7.0	—	kc

TYPICAL CHARACTERISTICS — COMMON EMITTER

OUTPUT CHARACTERISTICS



h_{FE} CHARACTERISTICS



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