

3875081 G E SOLID STATE

01E 17415 D T-33-11

General-Purpose Power Transistors

File Number 676

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

Epitaxial-Base, Silicon N-P-N and P-N-P VERSAWATT Transistors

General-Purpose Medium-Power Types for
Switching and Amplifier Applications

Features:

- Low saturation voltages
- Complementary n-p-n and p-n-p types
- Maximum safe-area-of-operation curves specified for dc operation

The RCA-2N6106-2N6111, 2N6288-2N6293, and 2N6473-2N6476 are epitaxial-base silicon transistors supplied in a VERSAWATT package. The 2N6288-2N6293, 2N6473, and 2N6474* are n-p-n complements of p-n-p types 2N6106-2N6111, 2N6475, and 2N6476[†], respectively. All these transistors are intended for a wide variety of medium-power switching and amplifier applications, such as series and shunt regulators and driver and output stages of high-fidelity amplifiers.

The 2N6289, 2N6291, and 2N6293 n-p-n types and 2N6108, 2N6109, and 2N6110 p-n-p devices fit into TO-213AA sockets. The remaining types are supplied in the JEDEC TO-220AB straight-lead version of the VERSAWATT package. All of these devices are also available on special order in a variety of lead-form configurations.

*Formerly RCA Dev. Nos. TA7784, TA8323, TA7783, TA8232, TA7782, TA8231, TA8444, and TA8723, respectively.

[†]Formerly RCA Dev. Nos. TA8210, TA7741, TA8211, TA7742, TA8212, TA7743, TA8445, and TA8722, respectively.

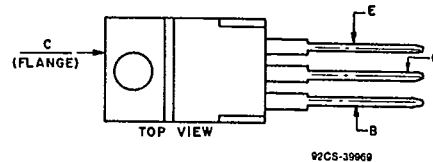
MAXIMUM RATINGS, Absolute-Maximum Values:

	2N6288	2N6290	2N6292			
N-P-N	2N6289	2N6291	2N6293	2N6473	2N6474	
P-N-P	2N6110 [‡] 2N6111 [‡]	2N6108 [‡] 2N6109 [‡]	2N6106 [‡] 2N6107 [‡]	2N6475 [‡]	2N6476 [‡]	
V _{CEO}	40	60	80	110	130	V
V _{CEX(SUS)} R _{BB} = 100 Ω, V _{BB} = 0 V	40	60	80	110	130	V
V _{CEO(SUS)}	30	50	70	100	120	V
V _{EB0}			5			V
I _C (T _C ≤ 106°C)		7		4		A
I _E (T _C ≤ 130°C)		3		2		A
P _T						
T _C ≤ 25°C			40			W
T _C > 25°C ≤ 100°C			16			W
T _C > 100°C			Derate linearly 0.32			W/°C
T _A ≤ 25°C			1.8			W
T _A > 25°C			Derate linearly 0.0144			W/°C
T _{stg} , T _J			-65 to 150			°C
T _L						
At distances ≥ 1/8 in. (3.17 mm) from case for 10 s max.			235			°C

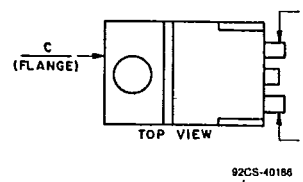
[‡]In accordance with JEDEC registration data.

[‡]For p-n-p devices, voltage and current values are negative.

TERMINAL DESIGNATIONS



JEDEC TO-220AB



JEDEC TO-220AA

3875081 G E SOLID STATE

01E 17416

D T-33-11

General-Purpose Power Transistors

T-33-19

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

ELECTRICAL CHARACTERISTICS At Case Temperature (T_C) = 25°C Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS [♦]				LIMITS						UNITS	
	VOLTAGE V dc		CURRENT A dc		2N6292 2N6293 2N6106 [♦] 2N6107 [♦]		2N6290 2N6291 2N6108 [♦] 2N6109 [♦]		2N6288 2N6289 2N6110 [♦] 2N6111 [♦]			
	V _{CE}	V _{BE}	I _C	I _B	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
I _{CER} (R _{BE} = 100 Ω)	75 55 35				—	0.1	—	—	—	—	mA	
(R _{BE} = 100 Ω, T _C = 150°C)	70 50 30				—	2	—	—	—	—		
* I _{CEX} (R _{BE} = 100 Ω)	75 56 37.5	—1.5 —1.5 —1.5			—	0.1	—	—	—	—		
(R _{BE} = 100 Ω, T _C = 150°C)	70 50 30	—1.5 —1.5 —1.5			—	2	—	—	—	—		
* I _{CEO}	60 40 20			0 0 0	— — —	1 — —	— — —	— 1 —	— — —	— — 1		
* I _{EBO}		—5	0		—	1	—	1	—	1		
* V _{CEO(sus)} ^b			0.1 ^a	0	70	—	50	—	30	—		V
V _{CER(sus)} ^b (R _{BE} = 100 Ω)			0.1 ^a		80	—	60	—	40	—		
* h _{FE}	4 4 4 4		2 ^a 2.5 ^a 3 ^a 7 ^a		30 — — 2.3	150 — — —	— 30 — 2.3	— 150 — —	— — 30 2.3	— — 150 —		V
* V _{BE}	4 4 4 4		2 ^a 2.5 ^a 3 ^a 7 ^a		— — — —	1.5 — — 3	— — — —	— 1.5 — 3	— — — —	— — 1.5 3		
* V _{CE(sat)}			2 ^a 2.5 ^a 3 ^a 7 ^a	0.2 0.25 0.3 3	— — — —	1 — — 3.5	— — — —	— 1 — 3.5	— — — —	— — 1 3.5		
* h _{fe} (f = 1 MHz)												
2N6288-93	4		0.5		4	—	4	—	4	—	MHz	
2N6106-11	—4		—0.5		10	—	10	—	10	—		
* h _{fe} (f = 50 kHz)	4		0.5		20	—	20	—	20	—		
f _T											MHz	
2N6288-93	4		0.5		10	—	10	—	10	—		
2N6106-11	—4		—0.5		10	—	10	—	10	—	pF	
* C _{obo} (f = 1 MHz)	10 ^c		0		—	250	—	250	—	250		
R _{θJC}					—	3.125	—	3.125	—	3.125		
R _{θJA}					—	70	—	70	—	70	°C/W	

^a In accordance with JEDEC registration data.^b Pulsed: Pulse duration = 300 μs, duty factor = 0.018.^c CAUTION: The sustaining voltage V_{CEO(sus)} and V_{CER(sus)} MUST NOT be measured on a curve tracer.^d V_{CE} value.^e For p-n-p devices, voltage and current values are negative.

3875081 G E SOLID STATE

01E 17417 D
General-Purpose Power Transistors

T-33-11

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

ELECTRICAL CHARACTERISTICS At Case Temperature (T_C) = 25°C Unless Otherwise Specified

T-33-19

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N6474 2N6476*		2N6473 2N6475*		
	V _{CE}	V _{BE}	I _C	I _B	Min.	Max.	Min.	Max.	
I _{CER} (R _{BE} = 100 Ω)	120 100				— —	0.1 —	— —	— 0.1	mA
(R _{BE} = 100 Ω T _C = 100°C)	120 100				— —	2 —	— —	— 2	
* I _{CEX} (R _{BE} = 100 Ω)	120 100	—1.5 —1.5			— —	0.1 —	— —	— 0.1	
(R _{BE} = 100 Ω, T _C = 100°C)	120 100	—1.5 —1.5			— —	2 —	— —	— 2	
* I _{CEO}	60 50			0 0	— —	1 —	— —	— 1	
* I _{EBO}		—5		0	—	1	—	1	
* V _{CEO(sus)} ^b			0.1 ^a	0	120	—	100	—	V
V _{CER(sus)} ^b (R _{BE} = 100 Ω)			0.1 ^a		130	—	110	—	
* h _{FE}	4 2.5		1.5 ^a 4 ^a		15 2	150 —	15 2	150 —	V
* V _{BE}	4 2.5		1.5 ^a 4 ^a		— —	2 3.5	— —	2 3.5	
* V _{CE(sat)}			1.5 ^a 4 ^a	0.15 2	— —	1.2 2.5	— —	1.2 2.5	MHz
* h _{fe} (f = 1 MHz) 2N6473-74	4		0.5		4	—	4	—	
2N6475-76	—4		—0.5		5	—	5	—	
* h _{fe} (f = 50 kHz)	4		0.5		20	—	20	—	pF
f _T 2N6473-74	4		0.5		4	—	4	—	
2N6475-76	—4		—0.5		5	—	4	—	
* C _{obo} (f = 1 MHz)	10 ^c		0		—	250	—	250	°C/W
R _{θJC}					—	3.125	—	3.125	
R _{θJA}					—	70	—	70	

* In accordance with JEDEC registration data

^a Pulsed: Pulse duration = 300 μs, duty factor = 0.018.^b CAUTION: The sustaining voltage V_{CEO(sus)} are V_{CER(sus)}
MUST NOT be measured on a curve tracer.^c V_{CB} value.♦ For p-n-p devices, voltage and current
values are negative.

3875081 G E SOLID STATE
General-Purpose Power Transistors

01E 17418

D) T-33-11

T-33-19

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

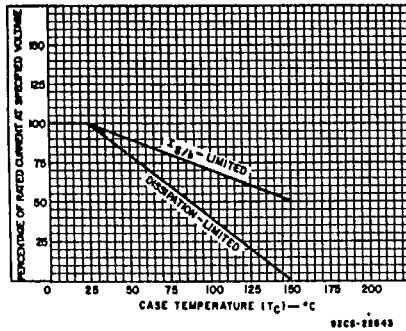


Fig. 1 - Current derating curves for all types.

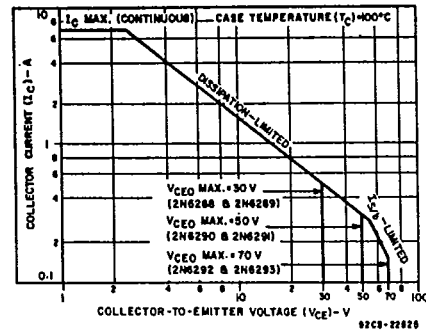
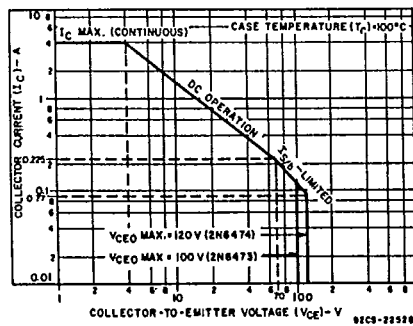
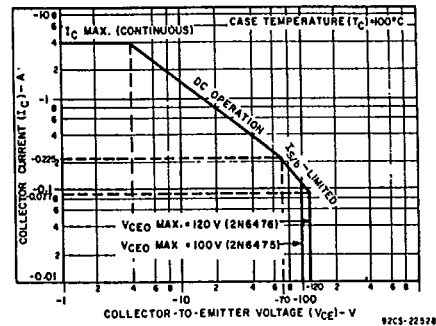
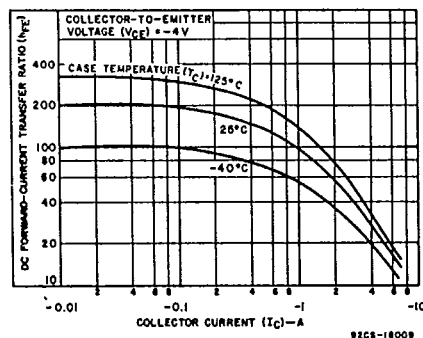
Fig. 2 - Maximum operating areas for 2N6288 - 2N6293 ($T_C = 100^\circ\text{C}$).Fig. 3 - Maximum operating areas for 2N6473 - 2N6474 ($T_C = 100^\circ\text{C}$).Fig. 4 - Maximum operating areas for 2N6475 and 2N6476 ($T_C = 100^\circ\text{C}$).

Fig. 5 - Typical dc beta characteristics for 2N6106 - 2N6111.

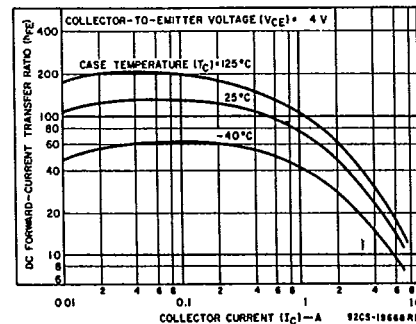


Fig. 6 - Typical dc beta characteristics for 2N6288 - 2N6293.

3875081 G E SOLID STATE

01E 17419 D T-33-11

General-Purpose Power Transistors

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

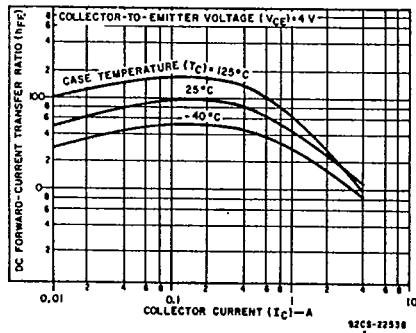


Fig. 7 - Typical dc beta characteristics for 2N6473 and 2N6474.

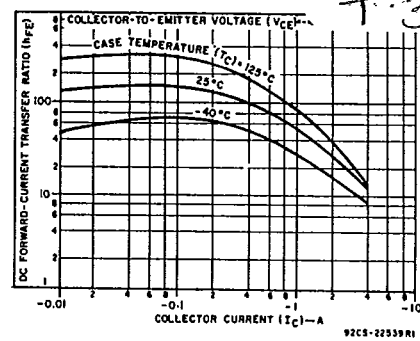
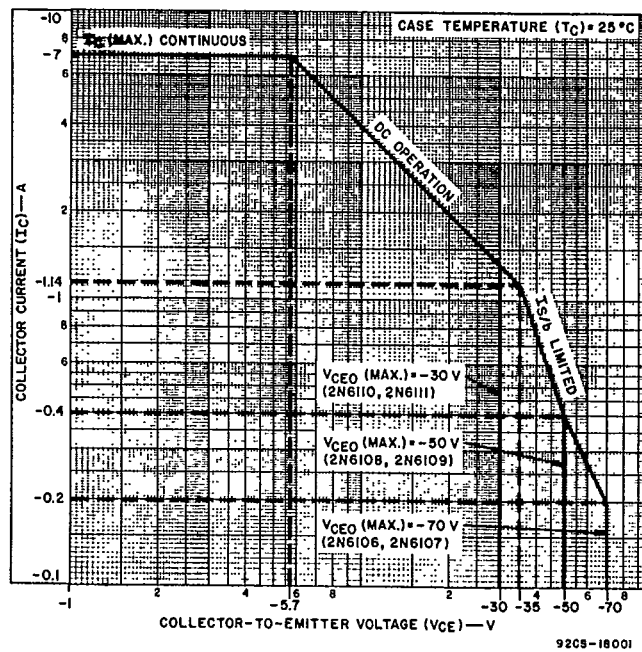


Fig. 8 - Typical dc beta characteristics for 2N6475 and 2N6476.

Fig. 9 - Maximum operating areas for 2N6106 - 2N6111 ($T_C = 25^\circ\text{C}$).

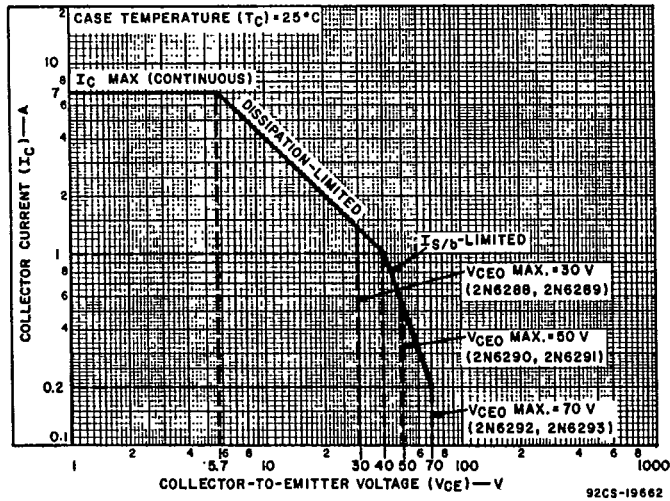
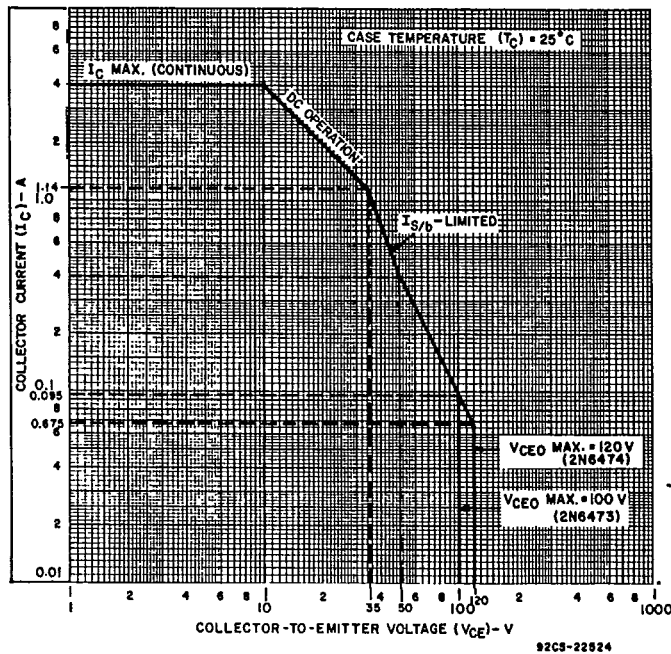
3875081 G E SOLID STATE
General-Purpose Power Transistors

01E 17420

DT-33-11

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

T-33-19

Fig. 10 - Maximum operating areas for 2N6288-2N6293 ($T_C = 25^\circ\text{C}$).Fig. 11 - Maximum operating areas for 2N6473 and 2N6474 ($T_C = 25^\circ\text{C}$).

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

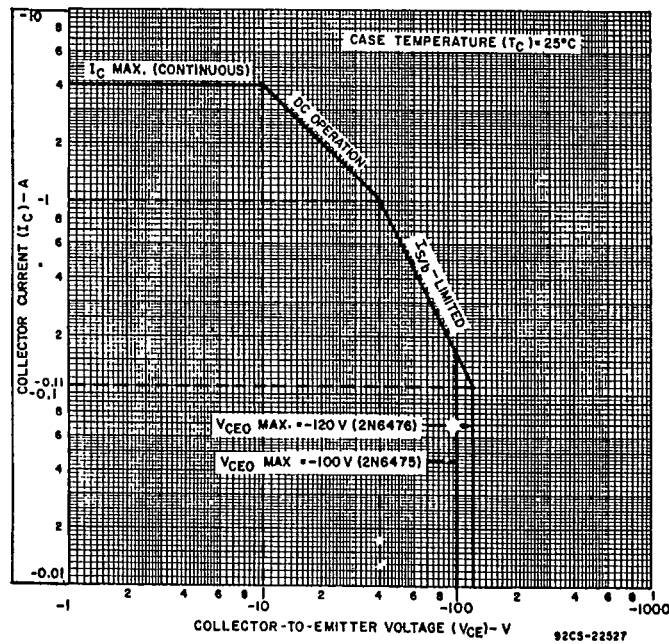
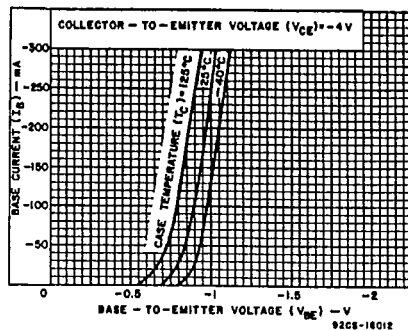
Fig. 12 - Maximum operating areas for 2N6475 - 2N6476 ($T_C = 25^\circ\text{C}$).

Fig. 13 - Typical input characteristics for 2N6106 - 2N6111, 2N6475, and 2N6476.

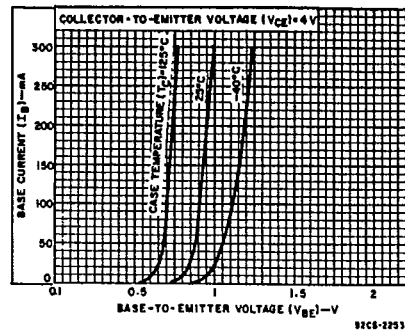


Fig. 14 - Typical input characteristics for 2N6288 - 2N6293.

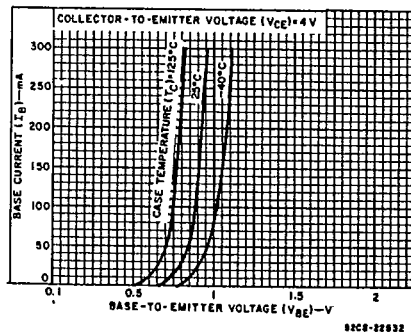


Fig. 15 - Typical input characteristics for 2N6473 - 2N6474.

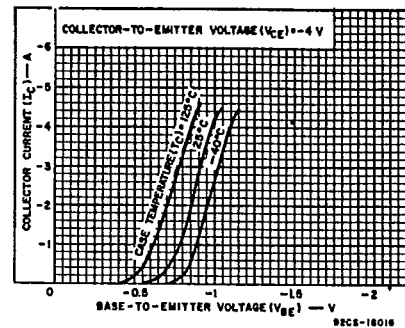


Fig. 16 - Typical transfer characteristics for 2N6106 - 2N6111.

3875081 G E SOLID STATE

General-Purpose Power Transistors

01E 17422

D T-33-11

T-33-19

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

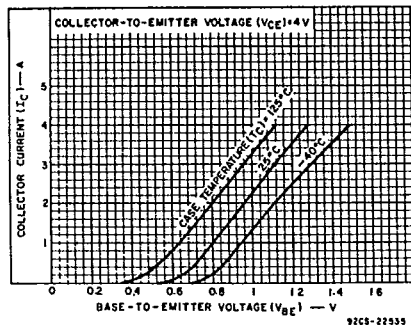


Fig. 17 - Typical transfer characteristics for 2N6288 - 2N6293.

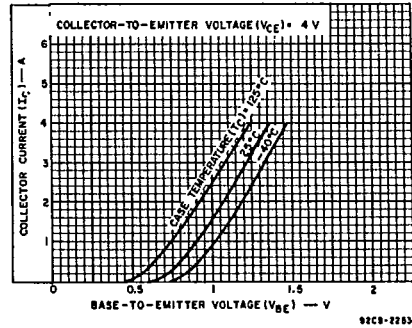


Fig. 18 - Typical transfer characteristics for 2N6473 and 2N6474.

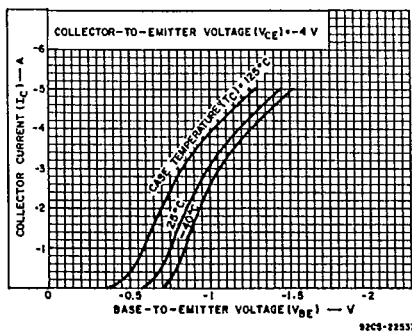


Fig. 19 - Typical transfer characteristics for 2N6475 and 2N6476.

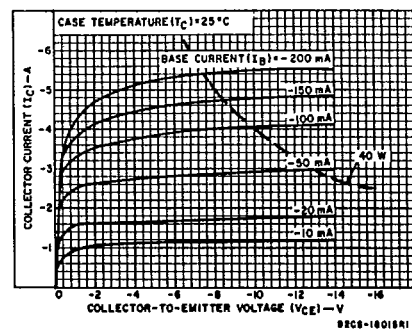


Fig. 20 - Typical output characteristics for 2N6106 - 2N6111.

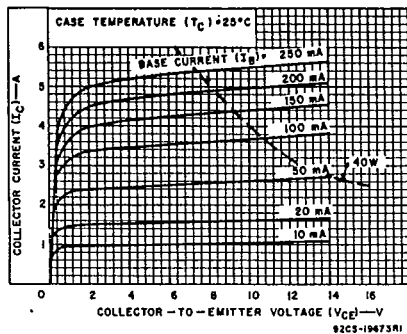


Fig. 21 - Typical output characteristics for 2N6288 - 2N6293.

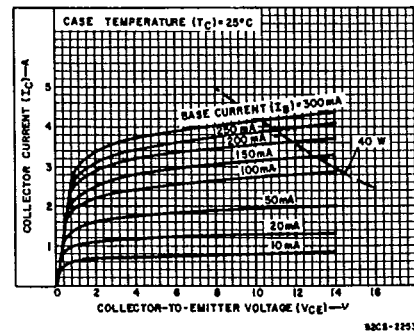


Fig. 22 - Typical output characteristics for 2N6473 and 2N6474.

3875081 G E SOLID STATE

01E 17423 D T-33-11
General-Purpose Power Transistors

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

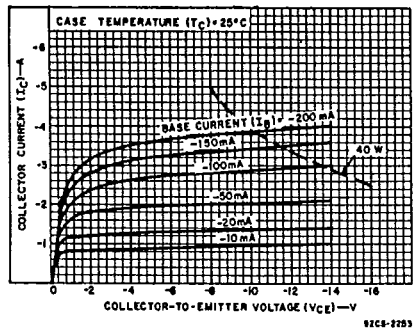


Fig. 23 - Typical output characteristics for 2N6475 and 2N6476.

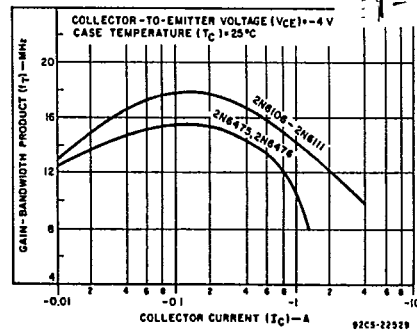


Fig. 24 - Typical gain-bandwidth product 2N6106 - 2N6111, 2N6475, and 2N6476.

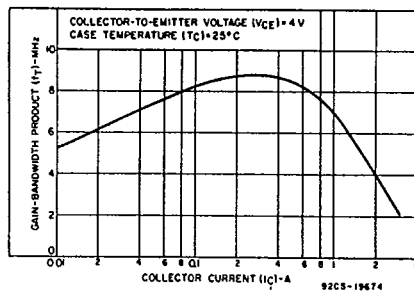


Fig. 25 - Typical gain-bandwidth product for 2N6288 - 2N6293.

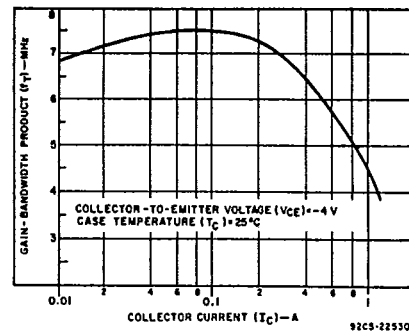
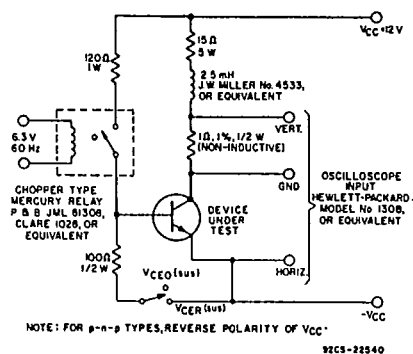
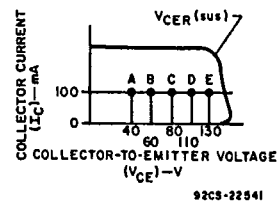


Fig. 26 - Typical gain-bandwidth product for 2N6473 and 2N6474.

Fig. 27 - Circuit used to measure sustaining voltage $V_{CE(sus)}$ for all types.

Note: Curve will be inverted and polarity reversed for p-n-p types. The sustaining voltage, $V_{CE(sus)}$, is acceptable when the traces fall to the right and above the designated points:
 Point A: 2N6110, 2N6111, 2N6288, 2N6289
 Point B: 2N6108, 2N6109, 2N6290, 2N6291
 Point C: 2N6106, 2N6107, 2N6292, 2N6293
 Point D: 2N6475, 2N6473
 Point E: 2N6476, 2N6474

Fig. 28 - Oscilloscope delay for measurement of sustaining voltage (test circuit shown in Fig. 27).