

NEC

NPN SILICON EPITAXIAL TWIN TRANSISTOR

UPA826TF

FEATURES

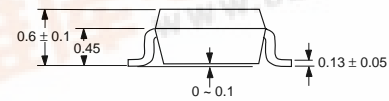
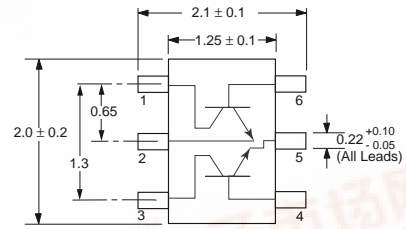
- **LOW NOISE AND HIGH GAIN**
- **OPERABLE AT LOW VOLTAGE**
- **SMALL FEEDBACK CAPACITANCE:**
Cre = 0.4 pF TYP
- **SMALL PACKAGE STYLE:**
2 NE685 die in a 2 mm x 1.25 mm x 0.6 mm package

DESCRIPTION

The UPA826TF has two built-in low-voltage transistors which are designed for low-noise amplification in the VHF to UHF band. The two die are chosen from adjacent locations on the wafer. These features combined with the pin configuration make this device ideal for balanced or mirrored applications. This device is suitable for very low voltage/low current, and low noise applications. The thinner package style allows for higher density designs.

OUTLINE DIMENSIONS (Units in mm)

Package Outline TS06 (Top View)



PIN CONNECTIONS

1. Collector (Q1)
2. Emitter (Q1)
3. Collector (Q2)
4. Base (Q2)
5. Emitter (Q2)
6. Base (Q1)

Note:

Pin 1 is the lower left most pin as the package lettering is oriented and read left to right.

ELECTRICAL CHARACTERISTICS (TA = 25°C)

PART NUMBER PACKAGE OUTLINE			UPA826TF TS06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
IcBO	Collector Cutoff Current at VCB = 5 V, IE = 0	μA			0.1
IEBO	Emitter Cutoff Current at VEB = 1 V, IC = 0	μA			0.1
hFE	DC Current Gain ¹ at VCE = 3 V, IC = 10 mA		75	110	150
fT	Gain Bandwidth at VCE = 3 V, IC = 10 mA, f = 2 GHz	GHz		12	
Cre	Feedback Capacitance ² at VCB = 3 V, IE = 0, f = 1 MHz	pF		0.4	0.7
S21E ²	Insertion Power Gain at VCE = 3 V, IC = 10 mA, f = 2 GHz	dB	7	8.5	
NF	Noise Figure at VCE = 3 V, IC = 3 mA, f = 2 GHz	dB		1.5	2.5
hFE1/hFE2	hFE Ratio, VCE = 3 V, IC = 10 mA hFE1 = Smaller hFE value between Q1 and Q2 hFE2 = Larger hFE value between Q1 and Q2		0.85	1.0	

Notes: 1. Pulsed measurement, pulse width ≤ 350 μs, duty cycle ≤ 2 %.

2. Collector to base capacitance when measured with capacitance meter (automatic balanced bridge method), with emitter connected to guard pin of capacitance meter.



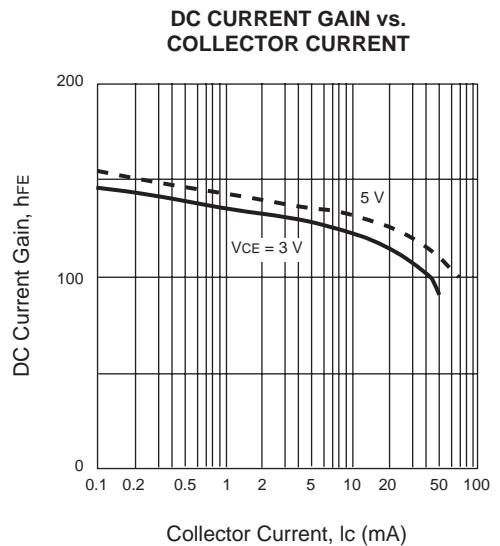
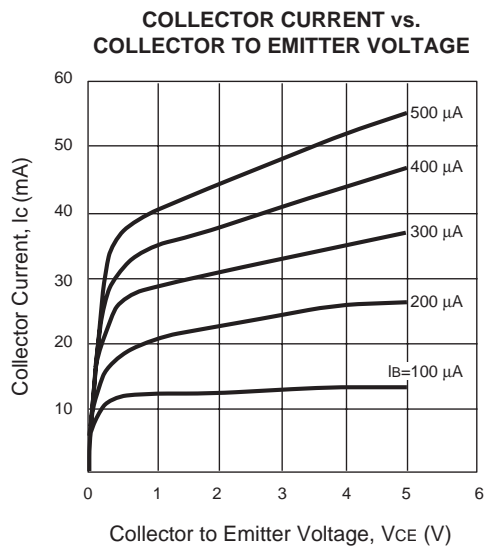
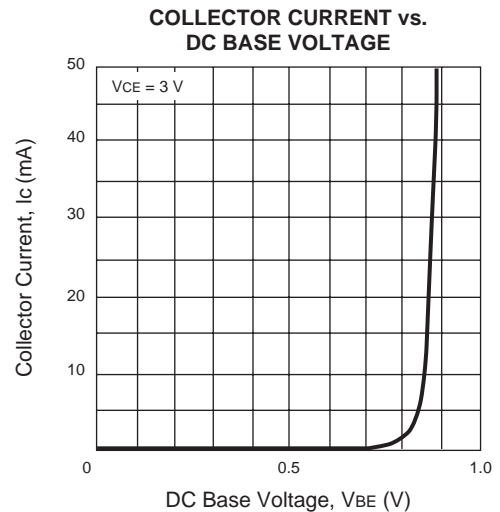
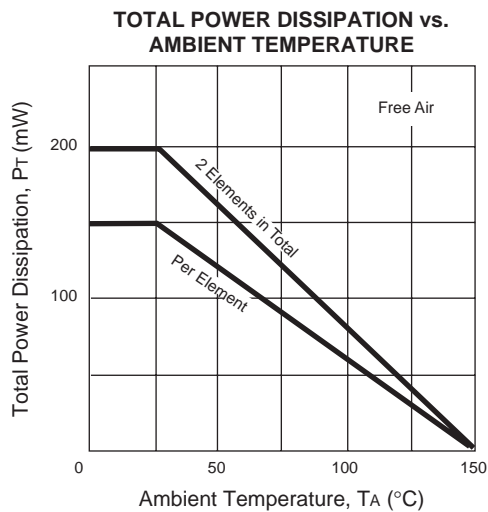
UPA826TF

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

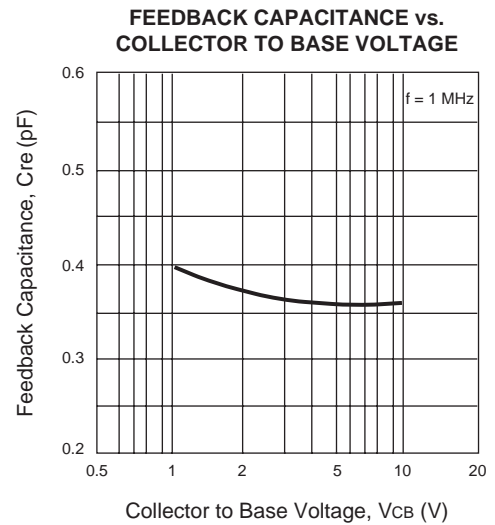
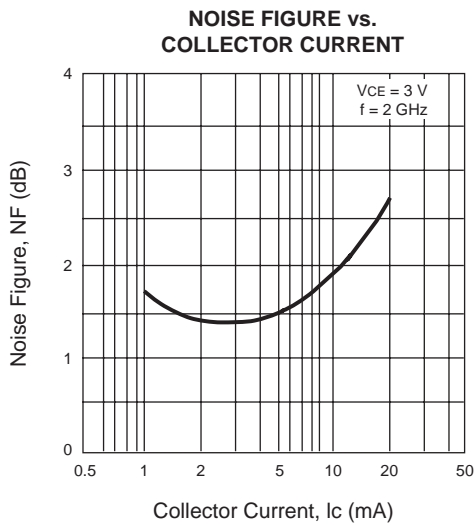
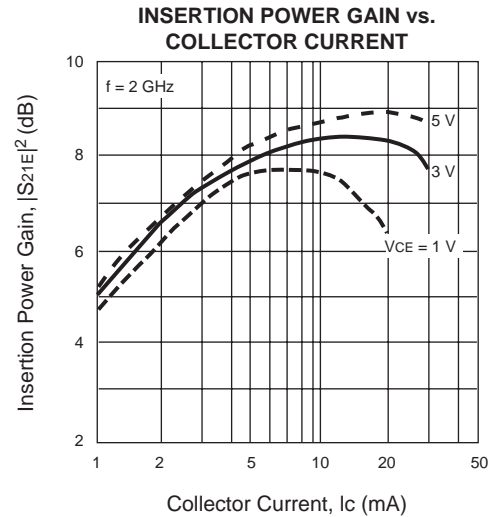
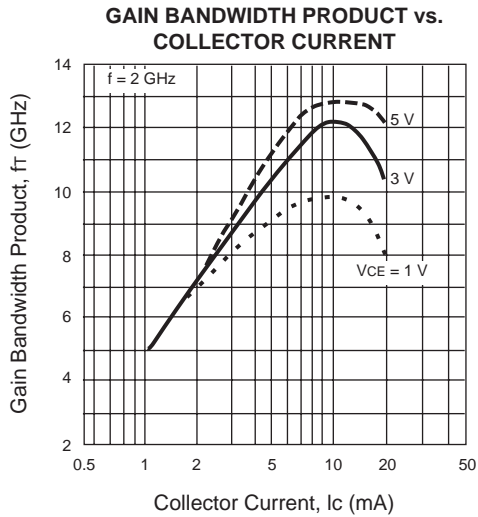
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CB0}	Collector to Base Voltage	V	9
V _{CE0}	Collector to Emitter Voltage	V	6
V _{EB0}	Emitter to Base Voltage	V	2
I _C	Collector Current	mA	30
P _T	Total Power Dissipation		
	1 Element	mW	150
	2 Elements ²	mW	200
T _J	Junction Temperature	°C	150
T _{STG}	Storage Temperature	°C	-65 to +150

Note: 1. Operation in excess of any one of these parameters may result in permanent damage.
 2. When operating both devices, the power dissipation for either device should not exceed 110 mW.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)



TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)



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TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

Q1

V_{CE} = 3 V, I_c = 1 mA, Z_o = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.98	-5.93	2.38	172.32	0.02	85.76	1.00	-3.86
0.20	0.97	-11.90	2.36	165.08	0.04	81.15	0.99	-7.44
0.30	0.95	-18.17	2.39	158.35	0.06	76.27	0.97	-11.14
0.40	0.93	-24.00	2.35	151.83	0.07	72.22	0.96	-14.73
0.50	0.90	-30.10	2.35	145.70	0.09	68.30	0.94	-18.02
0.60	0.87	-36.17	2.33	140.22	0.10	64.18	0.92	-21.42
0.70	0.84	-42.49	2.30	134.45	0.12	60.68	0.89	-24.18
0.80	0.80	-48.69	2.29	129.32	0.13	56.90	0.87	-27.47
0.90	0.76	-55.28	2.29	123.53	0.14	53.94	0.84	-29.94
1.00	0.73	-61.26	2.24	118.31	0.15	51.07	0.81	-32.50
1.20	0.64	-74.79	2.19	108.30	0.16	45.85	0.76	-36.89
1.50	0.51	-96.77	2.10	93.80	0.18	39.24	0.69	-42.90
1.70	0.43	-112.09	2.00	84.70	0.19	36.24	0.65	-46.79
2.00	0.35	-138.38	1.84	72.75	0.19	32.40	0.60	-51.51
2.50	0.31	-175.03	1.62	54.64	0.20	29.55	0.53	-59.91
3.00	0.35	140.64	1.41	40.02	0.21	28.96	0.47	-69.74

Q2

V_{CE} = 3 V, I_c = 1 mA, Z_o = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.98	-5.93	2.43	171.79	0.02	85.64	0.99	-3.75
0.20	0.97	-11.82	2.41	164.40	0.04	80.86	0.99	-7.53
0.30	0.95	-17.85	2.42	157.59	0.05	76.45	0.97	-11.10
0.40	0.93	-23.59	2.39	151.04	0.07	72.26	0.95	-14.56
0.50	0.90	-29.61	2.38	144.91	0.09	68.73	0.93	-17.91
0.60	0.87	-35.62	2.37	139.49	0.10	64.78	0.90	-21.19
0.70	0.84	-41.49	2.34	133.87	0.11	61.52	0.87	-23.71
0.80	0.81	-47.40	2.32	128.66	0.12	58.06	0.85	-26.91
0.90	0.77	-53.49	2.32	123.12	0.13	55.30	0.82	-29.05
1.00	0.73	-59.00	2.26	118.06	0.14	52.86	0.78	-31.52
1.20	0.65	-71.05	2.21	108.31	0.16	48.61	0.73	-35.51
1.50	0.54	-89.53	2.13	94.49	0.17	43.82	0.66	-41.12
1.70	0.47	-101.29	2.02	86.01	0.18	41.68	0.61	-44.56
2.00	0.40	-120.45	1.90	74.87	0.19	39.57	0.55	-49.87
2.50	0.33	-153.17	1.71	57.60	0.21	38.43	0.46	-59.91
3.00	0.33	177.01	1.54	42.57	0.23	38.11	0.38	-74.21

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

Q1

V_{CE} = 3 V, I_c = 3 mA, Z_o = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.94	-9.29	6.55	168.08	0.02	84.10	0.98	-6.91
0.20	0.90	-18.39	6.32	157.85	0.04	76.93	0.95	-13.21
0.30	0.85	-27.47	6.21	148.76	0.05	71.79	0.91	-18.80
0.40	0.80	-36.15	5.98	140.53	0.06	66.81	0.86	-23.80
0.50	0.74	-44.62	5.77	133.00	0.07	63.60	0.81	-27.41
0.60	0.67	-52.69	5.51	126.23	0.08	60.13	0.76	-31.19
0.70	0.60	-60.71	5.28	119.27	0.09	58.07	0.72	-33.67
0.80	0.54	-68.45	5.03	113.12	0.10	55.93	0.68	-36.31
0.90	0.47	-75.60	4.76	107.23	0.11	54.62	0.64	-38.10
1.00	0.42	-82.57	4.50	101.09	0.11	53.45	0.61	-39.74
1.20	0.32	-96.78	4.02	92.52	0.13	51.59	0.56	-42.63
1.50	0.21	-122.39	3.42	80.83	0.15	49.61	0.50	-46.74
1.70	0.17	-143.90	3.10	74.15	0.16	48.63	0.46	-49.50
2.00	0.16	179.12	2.70	64.83	0.18	46.70	0.42	-54.02
2.50	0.22	136.13	2.24	51.62	0.21	43.76	0.36	-63.34
3.00	0.29	115.80	1.89	39.81	0.23	40.27	0.31	-75.36

Q2

V_{CE} = 3 V, I_c = 3 mA, Z_o = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.93	-9.39	6.76	166.53	0.02	82.60	0.98	-7.24
0.20	0.90	-18.39	6.46	155.80	0.03	76.86	0.94	-13.64
0.30	0.84	-27.39	6.32	146.52	0.05	71.65	0.89	-18.91
0.40	0.79	-35.83	6.06	138.21	0.06	67.47	0.83	-23.49
0.50	0.72	-44.06	5.82	103.60	0.07	64.58	0.77	-26.46
0.60	0.66	-51.67	5.54	123.94	0.08	61.95	0.72	-29.65
0.70	0.59	-58.86	5.28	117.07	0.09	60.46	0.68	-31.43
0.80	0.53	-65.57	5.01	111.07	0.10	59.12	0.64	-33.17
0.90	0.48	-71.57	4.72	105.46	0.10	57.98	0.60	-34.36
1.00	0.43	-77.20	4.45	100.46	0.11	57.39	0.57	-35.31
1.20	0.34	-87.82	3.95	91.74	0.13	56.54	0.52	-37.08
1.50	0.26	-104.50	3.37	80.85	0.15	55.21	0.46	-39.70
1.70	0.22	-116.75	3.06	74.57	0.16	54.46	0.43	-41.65
2.00	0.19	-137.84	2.71	66.02	0.18	53.01	0.38	-44.95
2.50	0.19	-174.18	2.29	53.07	0.22	49.89	0.30	-52.82
3.00	0.24	159.82	1.99	41.14	0.26	45.56	0.22	-65.40

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TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

Q1

V_{CE} = 3 V, I_C = 10 mA, Z₀ = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.82	-17.52	16.52	159.99	0.02	80.28	0.94	-12.68
0.20	0.72	-33.22	14.93	144.21	0.03	72.82	0.85	-22.43
0.30	0.60	-46.83	13.32	131.03	0.04	68.07	0.75	-28.43
0.40	0.49	-57.62	11.65	120.45	0.05	65.62	0.67	-32.14
0.50	0.40	-65.90	10.15	112.22	0.06	65.03	0.60	-34.25
0.60	0.33	-72.93	8.90	105.92	0.07	63.86	0.56	-35.78
0.70	0.27	-79.33	7.89	100.37	0.08	63.74	0.52	-36.80
0.80	0.22	-85.38	7.07	95.73	0.08	63.50	0.49	-37.69
0.90	0.18	-91.73	6.39	91.61	0.09	63.16	0.46	-38.46
1.00	0.15	-98.81	5.83	87.88	0.10	62.77	0.45	-39.30
1.20	0.10	-118.22	4.95	81.32	0.11	61.85	0.41	-41.01
1.50	0.07	-176.19	4.05	72.82	0.14	59.79	0.38	-44.69
1.70	0.08	149.79	3.61	67.81	0.15	58.31	0.35	-47.69
2.00	0.13	125.94	3.12	60.46	0.18	55.55	0.32	-53.15
2.50	0.21	109.57	2.54	49.58	0.22	50.37	0.27	-65.07
3.00	0.29	100.79	2.14	39.46	0.25	45.03	0.21	-81.46

Q2

V_{CE} = 3 V, I_C = 10 mA, Z₀ = 50 Ω

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.10	0.79	-18.18	17.81	156.05	0.02	79.00	0.92	-14.07
0.20	0.67	-33.75	15.65	139.27	0.03	72.98	0.80	-22.91
0.30	0.55	-46.32	13.67	125.80	0.04	69.74	0.69	-27.06
0.40	0.44	-55.16	11.71	115.64	0.05	69.07	0.61	-28.96
0.50	0.37	-61.11	10.03	108.02	0.06	68.93	0.56	-29.47
0.60	0.31	-65.90	8.70	102.30	0.07	68.67	0.52	-29.62
0.70	0.26	-69.64	7.66	97.45	0.07	68.49	0.49	-29.55
0.80	0.23	-73.22	6.84	93.31	0.08	68.26	0.46	-29.57
0.90	0.20	-76.64	6.18	89.63	0.09	68.18	0.44	-29.61
1.00	0.18	-80.09	5.63	86.38	0.10	67.74	0.43	-29.60
1.20	0.14	-88.42	4.80	80.51	0.12	66.68	0.40	-29.99
1.50	0.10	-107.91	3.94	72.79	0.15	64.56	0.36	-31.58
1.70	0.08	-126.27	3.53	68.12	0.16	62.66	0.33	-33.11
2.00	0.09	-158.61	3.08	61.31	0.19	59.98	0.29	-35.72
2.50	0.13	164.55	2.57	50.55	0.24	54.48	0.22	-42.08
3.00	0.20	146.66	2.21	40.11	0.28	48.32	0.14	-51.14

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKAGING
UPA826TF-T1	3000	Tape & Reel

EXCLUSIVE NORTH AMERICAN AGENT FOR **NEC** RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS

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