

## SILICON PLANAR EPITAXIAL OVERLAY TRANSISTORS

N-P-N overlay transistors in TO-39 metal envelopes with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits. The transistors are suitable in output, driver or pre-driver stages in v.h.f. and u.h.f. equipment.

### QUICK REFERENCE DATA

		2N3866	2N4427
Collector-emitter voltage $R_{BE} = 10 \Omega$	$V_{CER}$ max.	55	40 V
Collector-emitter voltage (open base)	$V_{CEO}$ max.	30	20 V
Emitter-base voltage (open collector)	$V_{EBO}$ max.	3,5	2,0 V
Collector current (d.c. or averaged over any 20 ms period)	$I_C$ max.	0,4	0,4 A
Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$	$P_{tot}$ max.	5	3,5 W
Junction temperature	$T_j$ max.	200	200 $^\circ\text{C}$
Transition frequency $I_C = 50 \text{ mA}; V_{CE} = 15 \text{ V}; f = 200 \text{ MHz}$	$f_T$ min.	500	500 MHz

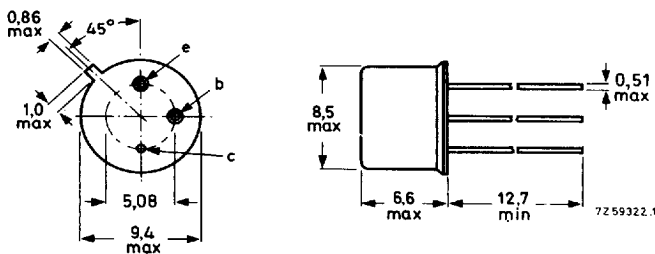
### R.F. performance

type number	f (MHz)	$V_{CE}$ (V)	$P_O$ (W)	$G_p$ (dB)	$\eta$ (%)
2N3866	400	28	1	> 10	> 45
2N4427	175	12	1	> 10	> 50

### MECHANICAL DATA

Dimensions in mm

Fig.1 TO-39/1; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

**RATINGS** Limiting values in accordance with the Absolute Maximum System (IEC 134)

		2N3866	2N4427
Collector-base voltage (open emitter) <sup>1)</sup>	V <sub>CBO</sub> max.	55	40 V
Collector-emitter voltage <sup>1)</sup> R <sub>BE</sub> = 10 Ω	V <sub>CER</sub> max.	55	40 V
Collector-emitter voltage (open base) <sup>1)</sup>	V <sub>CEO</sub> max.	30	20 V
Emitter-base voltage (open collector) <sup>1)</sup>	V <sub>EBO</sub> max.	3.5	2.0 V
Collector current (d.c. or averaged over any 20 ms period) <sup>1)</sup>	I <sub>C</sub> max.	0.4	0.4 A
Collector current (peak value) <sup>1)</sup>	I <sub>CM</sub> max.	0.4	0.4 A
Total power dissipation up to T <sub>mb</sub> = 25 °C <sup>1)</sup>	P <sub>tot</sub> max.	5	3.5 W
Storage temperature	T <sub>stg</sub>	-65 to +200 °C	
Junction temperature	T <sub>j</sub>	max. 200 °C	
<b>THERMAL RESISTANCE</b>			
From junction to ambient in free air	R <sub>th j-a</sub> =	200 K/W	
From junction to mounting base	R <sub>th j-mb</sub> =	35 K/W	
From mounting base to heatsink mounted with top clamping washer of 56218	R <sub>th mb-h</sub> =	1.0 K/W	
top clamping washer of 56218 and a boron nitride washer for electrical insulation	R <sub>th mb-h</sub> =	2.5 K/W	

1) See also graphs indicating areas of permissible operation.

Silicon planar epitaxial overlay transistors

2N3866

2N4427

**CHARACTERISTICS**

$T_j = 25^\circ\text{C}$  unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$

$I_B = 0; V_{CE} = 12\text{ V}$

	2N3866	2N4427
$I_{CEO}$	< 20	$\mu\text{A}$
$I_{CEO}$	<	20 $\mu\text{A}$

Breakdown voltages

$I_E = 0; I_C = 100\ \mu\text{A}$

$I_C = 5\text{ mA}; R_{BE} = 10\ \Omega$

$I_B = 0; I_C = 5\text{ mA}$

$I_C = 0; I_E = 100\ \mu\text{A}$

$V_{(BR)CBO}$	> 55	40 V
$V_{(BR)CER}$	> 55	40 V
$V_{(BR)CEO}$	> 30	20 V
$V_{(BR)EBO}$	> 3,5	2 V

Collector-emitter saturation voltage

$I_C = 100\text{ mA}; I_B = 20\text{ mA}$

$V_{CEsat}$	< 1,0	0,5 V
-------------	-------	-------

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$

$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$

$I_C = 360\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE}$	10 to 200	10 to 200
$h_{FE}$	> 5	
$h_{FE}$	> 5	

Transition frequency

$I_C = 50\text{ mA}; V_{CE} = 15\text{ V}; f = 200\text{ MHz}$

$f_T$	$\geq 500$	500 MHz
-------	------------	---------

Collector capacitance

$V_{CB} = 28\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$

$V_{CB} = 12\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$

$C_c$	< 3	pF
$C_c$	<	4 pF

R.F. performance at  $T_{mb} = 25^\circ\text{C}$

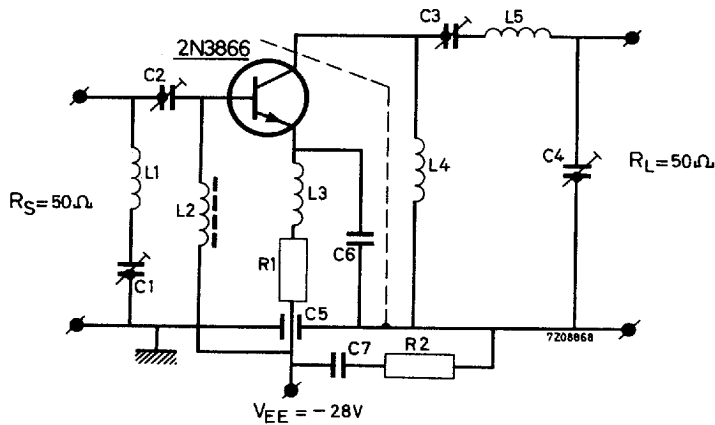
	f (MHz)	$V_{CE}$ (V)	$P_o$ (W)	$G_p$ (dB)	$I_C$ (mA)	$\eta$ (%)	test circuit
2N3866	100	28	1,8	> 10	<107	> 60	I* II*
2N3866	250	28	1,5	> 10	<107	> 50	
2N3866	400	28	1,0	> 10	< 79	> 45	
2N4427	175	12	1,0	> 10	<167	> 50	
2N4427	470	12	0,4	> 10	67	50	

\* The transistor can withstand an output V.S.W.R. of 3 : 1 varied through all phases for conditions, mentioned in the table above.

2N3866  
2N4427

CHARACTERISTICS (continued)

Test circuit I (with the 2N3866 at  $f = 400$  MHz)

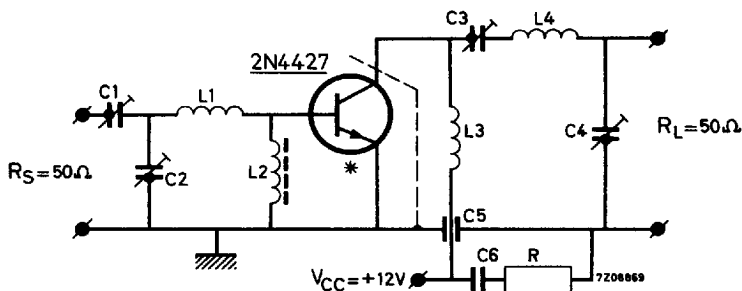


- C1 = C2 = C3 = 4 to 29 pF     air trimmer
- C4 =                    4 to 14 pF     air trimmer
- C5 =                    1 nF            feed through
- C6 =                    12 pF
- C7 =                    12 nF
- R1 =                    5.6  $\Omega$
- R2 =                    10  $\Omega$

- L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 3 mm
- L2 = Ferroxcube choke coil; Z (at  $f = 250$  MHz) = 450  $\Omega$  (code number 4312 020 36690)
- L3 = L4 = 6 turns enamelled Cu wire (0.5 mm); int. diam. 3.5 mm (100 nH)
- L5 = 2 turns Cu wire (1 mm); int. diam. 7 mm; winding pitch 2.5 mm; leads 2x15 mm.

APPLICATION INFORMATION (continued)

Test circuit II (with the 2N4427 at  $f = 175$  MHz)

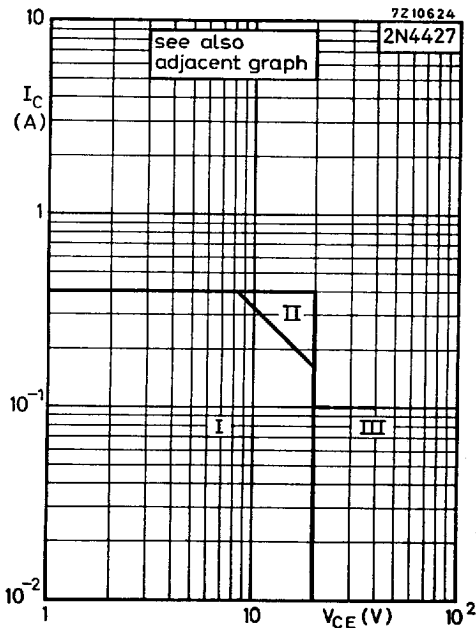
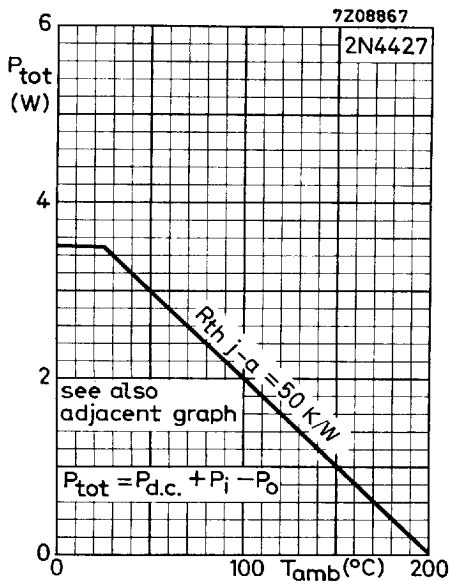
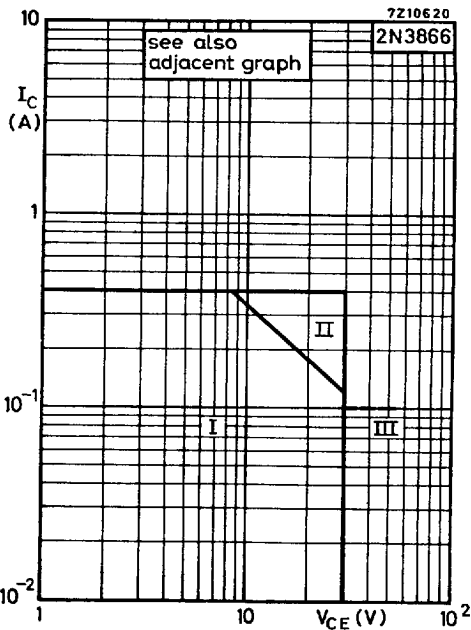
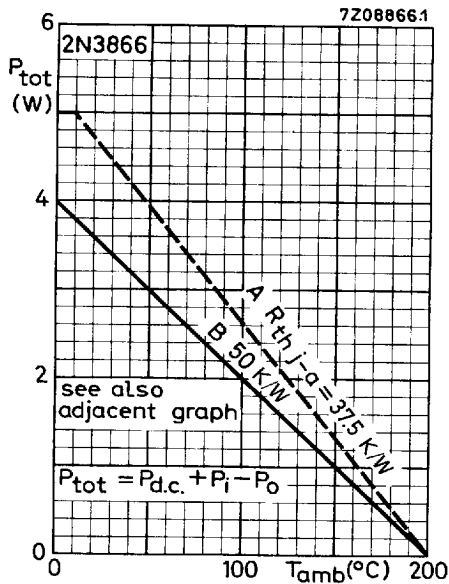


\*) The length of the external emitter wire is 1.6 mm

- |                     |            |              |
|---------------------|------------|--------------|
| C1 = C2 = C3 = C4 = | 4 to 29 pF | air trimmer  |
| C5 =                | 1 nF       | feed through |
| C6 =                | 12 nF      |              |
| R =                 | 10 Ω       |              |

- L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 2 mm; leads 2x10 mm  
 L2 = Ferroxcube choke coil; Z (at  $f = 175$  MHz) = 550 Ω (code number 4312 020 36640)  
 L3 = 2 turns Cu wire (1 mm); int. diam. 5 mm; winding pitch 2 mm; leads 2x10 mm  
 L4 = 3 turns Cu wire (1.5 mm); int. diam. 10 mm; winding pitch 2 mm; leads 2x15 mm

2N3866  
2N4427



- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at  $f \geq 1$  MHz.  
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.
- III Operating during switching off in this region is allowed, provided the transistor is cut-off with  $-V_{BB} \leq 1.5$  V and  $R_{BE} \geq 33 \Omega$ ,  $I_C \leq 100$  mA and the transient energy does not exceed 0.125 mWs.