

# DATA SHEET

## **2N3866; 2N4427** Silicon planar epitaxial overlay transistors

Product specification  
Supersedes data of August 1986  
File under Discrete Semiconductors, SC08a

1995 Oct 27

## Silicon planar epitaxial overlay transistors

## 2N3866; 2N4427

### DESCRIPTION

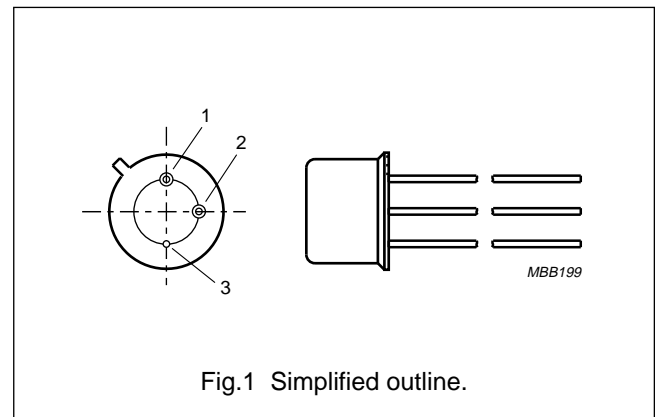
NPN overlay transistors in TO-39 metal packages with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits.

### APPLICATIONS

- The transistors are intended for use in output, driver or pre-driver stages in VHF and UHF equipment.

### PINNING - TO-39/1

PIN	DESCRIPTION
1	emitter
2	base
3	collector



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CER}$	collector-emitter voltage	$R_{BE} = 10 \Omega$	-	55	V
	2N3866			40	V
$V_{CEO}$	collector-emitter voltage	open base	-	30	V
	2N4427			20	V
$V_{EBO}$	emitter-base voltage	open collector	-	3.5	V
	2N4427			2.0	V
$I_C$	collector current (DC)		-	0.4	A
$I_{C(AV)}$	average collector current	measured over any 20 ms period	-	0.4	A
$P_{tot}$	total power dissipation	up to $T_{mb} = 25^\circ C$	-	3.5	W
$f_T$	transition frequency	$I_C = 50 \text{ mA}$ ; $V_{CE} = 15 \text{ V}$ ; $f = 200 \text{ MHz}$	500	-	MHz
$T_j$	junction temperature		-	200	$^\circ C$

### RF 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

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## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter			
	2N3866		–	55	V
	2N4427		–	40	V
V <sub>CER</sub>	collector-emitter voltage	R <sub>BE</sub> = 10 Ω			
	2N3866		–	55	V
	2N4427		–	40	V
V <sub>CEO</sub>	collector-emitter voltage	open base			
	2N3866		–	30	V
	2N4427		–	20	V
V <sub>EBO</sub>	emitter-base voltage	open collector			
	2N3866		–	3.5	V
	2N4427		–	2.0	V
I <sub>C</sub>	collector current (DC)		–	0.4	A
I <sub>C(AV)</sub>	average collector current	measured over any 20 ms period	–	0.4	A
I <sub>CM</sub>	collector current peak value		–	0.4	A
P <sub>tot</sub>	total power dissipation	up to T <sub>mb</sub> = 25 °C	–	3.5	W
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	junction temperature		–	200	°C

## THERMAL CHARACTERISTICS

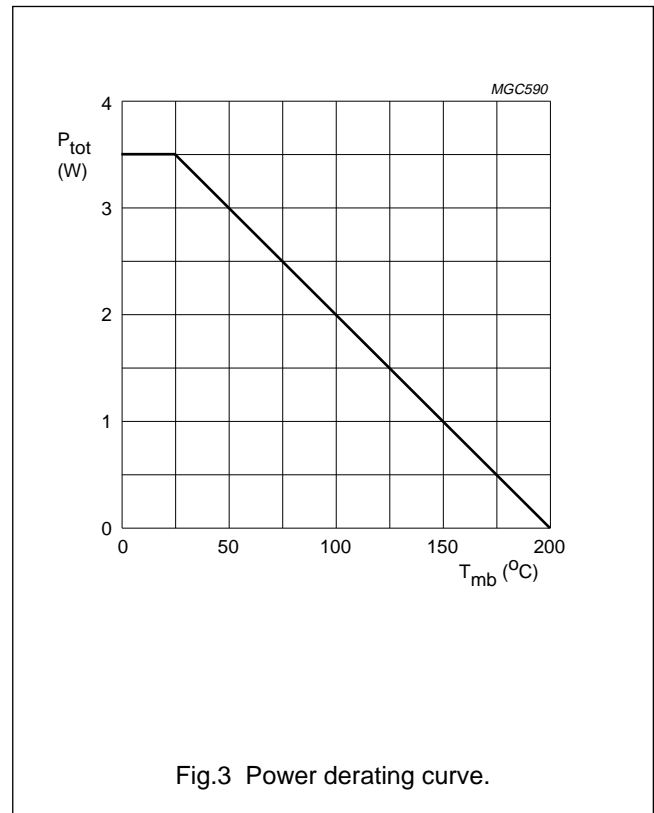
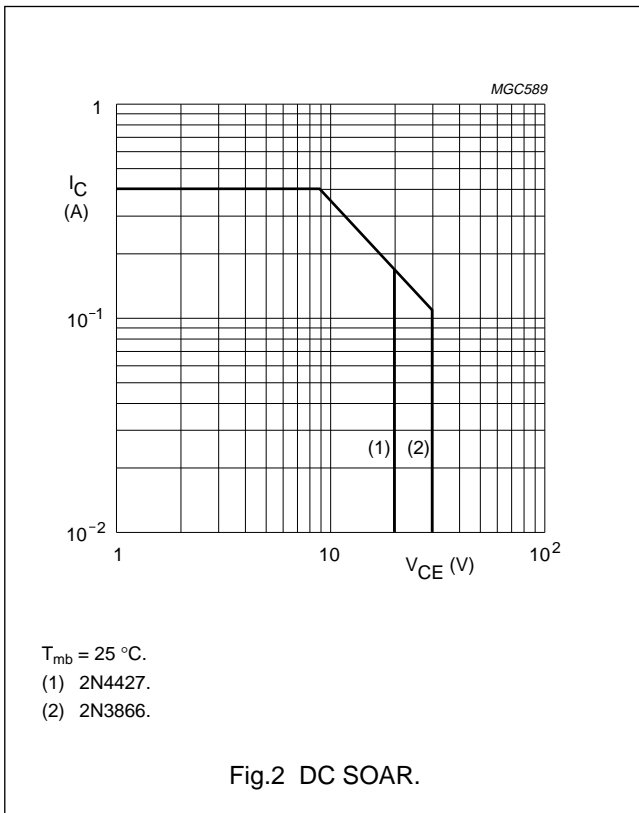
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-a</sub>	thermal resistance from junction to ambient in free air		200	K/W
R <sub>th j-mb</sub>	thermal resistance from junction to mounting base		50	K/W
R <sub>th mb-h</sub>	thermal resistance from mounting base to heatsink	note 1	1.0	K/W
		note 2	2.5	K/W

### Notes

1. Mounted with top clamping washer 56218.
2. Mounted with top clamping washer 56218 and a boron nitride washer for electrical insulation.

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## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 100\text{ }\mu\text{A}$	55	–	V
	2N3866 2N4427		40	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 5\text{ mA}$	30	–	V
	2N3866 2N4427		20	–	V
$V_{(BR)CER}$	collector-emitter breakdown voltage	$R_{BE} = 10\text{ }\Omega$ ; $I_C = 5\text{ mA}$	55	–	V
	2N3866 2N4427		40	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 100\text{ }\mu\text{A}$	3.5	–	V
	2N3866 2N4427		2	–	V
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100\text{ mA}$ ; $I_B = 20\text{ mA}$	–	1	V
	2N3866 2N4427		–	0.5	V
$I_{CEO}$	collector leakage current	open base; $V_{CE} = 28\text{ V}$	–	20	$\mu\text{A}$
	2N3866 2N4427	open base; $V_{CE} = 12\text{ V}$	–	20	$\mu\text{A}$
$h_{FE}$	DC current gain				
	2N3866	$I_C = 50\text{ mA}$ ; $V_{CE} = 5\text{ V}$	10	200	
	2N3866	$I_C = 360\text{ mA}$ ; $V_{CE} = 5\text{ V}$	5	–	
	2N4427	$I_C = 100\text{ mA}$ ; $V_{CE} = 5\text{ V}$	10	200	
$h_{FE}$	2N4427	$I_C = 360\text{ mA}$ ; $V_{CE} = 5\text{ V}$	5	–	
$f_T$	transition frequency	$I_C = 50\text{ mA}$ ; $V_{CE} = 15\text{ V}$ ; $f = 200\text{ MHz}$	500	–	MHz
$C_c$	collector capacitance				
	2N3866	$V_{CB} = 28\text{ V}$ ; $I_E = I_e = 0$ ; $f = 1\text{ MHz}$	–	3	pF
	2N4427	$V_{CB} = 12\text{ V}$ ; $I_E = I_e = 0$ ; $f = 1\text{ MHz}$	–	4	pF

## APPLICATION INFORMATION

**Table 1** RF performance at  $T_{mb} = 25\text{ }^\circ\text{C}$ .

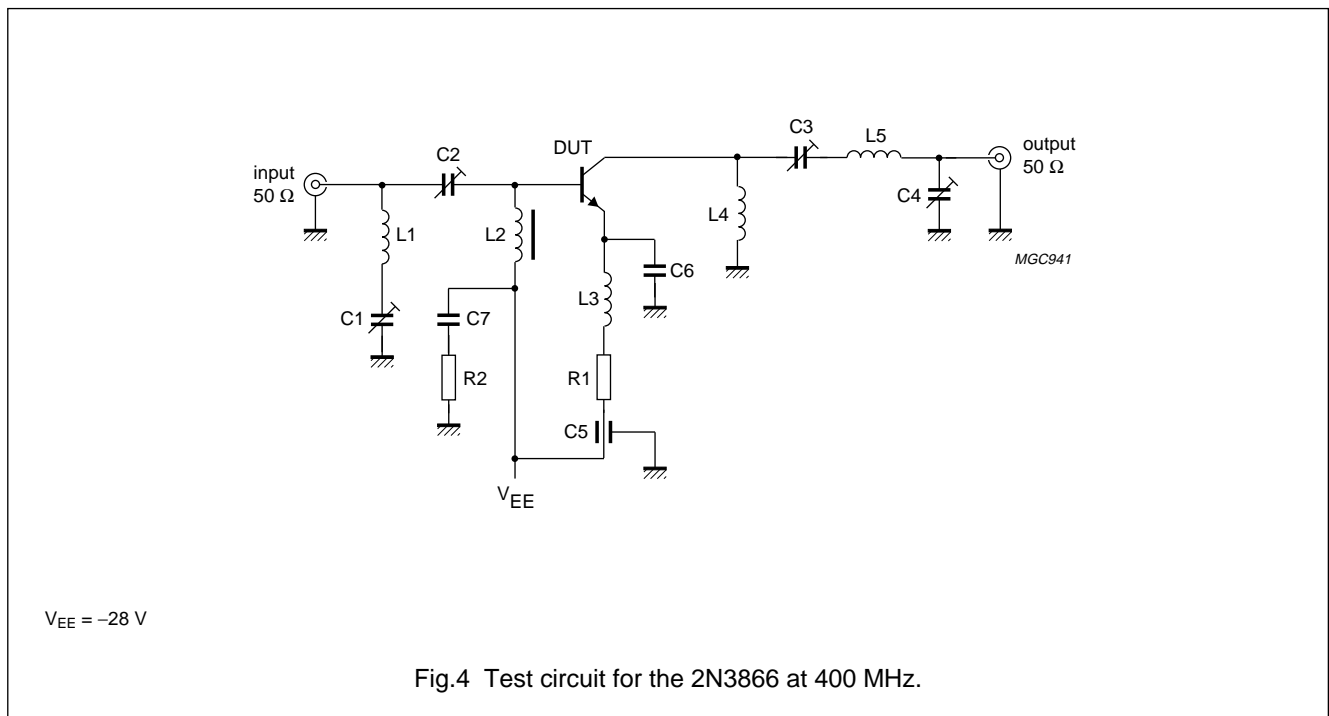
TYPE NUMBER	f (MHz)	$V_{CE}$ (V)	$P_o$ (W)	$G_p$ (dB)	$I_c$ (mA)	$\eta$ (%)
2N3866	100	28	1.8	>10	<107	>60
	250	28	1.5	>10	<107	>50
	400	28	1.0	>10	<79	>45
2N4427	175	12	1.0	>10	<167	>50
	470	12	0.4	>10	67	50

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### Ruggedness

The transistors are capable of withstanding a load mismatch corresponding to VSWR = 3 : 1 varied through all phases, under the conditions mentioned in Table 1.

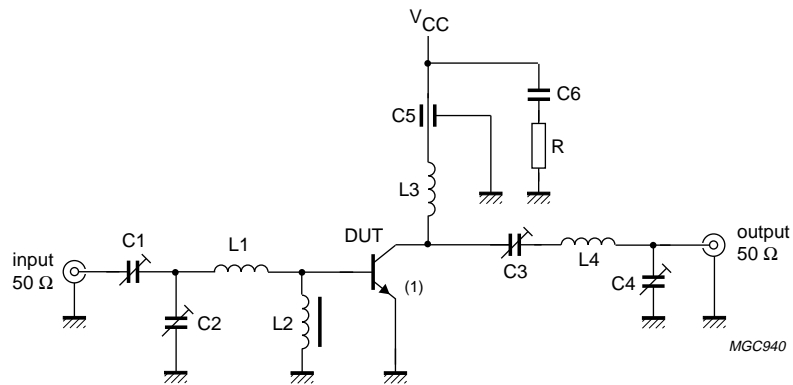


### List of components (see Fig.4)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3	air trimmer capacitor	4 to 29 pF		
C4	air trimmer capacitor	4 to 14 pF		
C5	feed-through capacitor	1 nF		
C6	capacitor	12 pF		
C7	capacitor	12 nF		
R1	resistor	5.6 $\Omega$		
R2	resistor	10 $\Omega$		
L1	2 turns 1.0 mm copper wire	–	int. diameter 6 mm; winding pitch 3 mm	
L2	Ferroxcube choke coil	Z = 450 $\Omega$ ; f = 250 MHz		4312 020 36690
L3, L4	6 turns enamelled 0.5 mm copper wire	100 nH	int. diameter 3.5 mm	
L5	2 turns 1.0 mm copper wire	–	int. diameter 7 mm; winding pitch 2.5 mm; leads 2 $\times$ 15 mm	

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$V_{CC} = +12\text{ V}$ .

(1) The length of the external emitter wire is 1.6 mm.

Fig.5 Test circuit for the 2N4427 at 175 MHz.

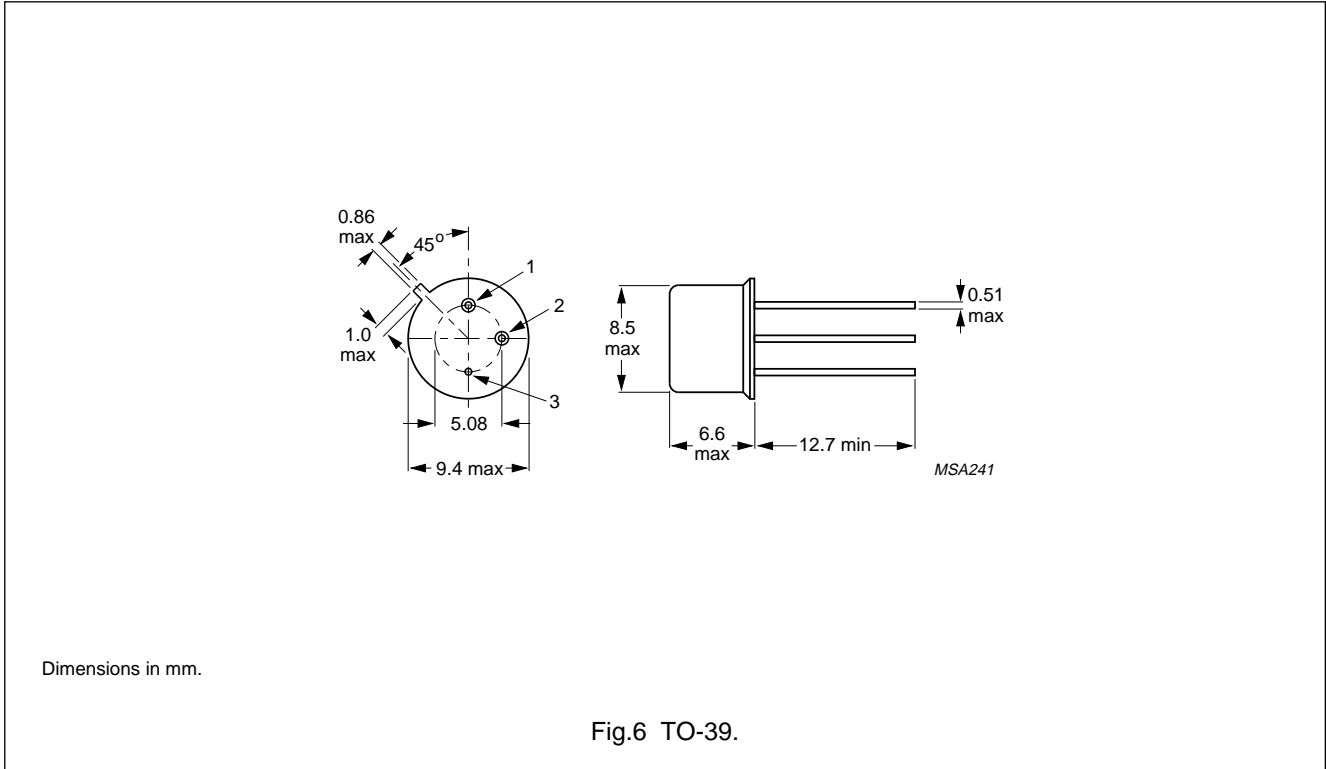
List of components (see Fig.5)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3, C4	air trimmer capacitor	4 to 29 pF		
C5	feed-through capacitor	1 nF		
C6	capacitor	12 nF		
R	resistor	10 Ω		
L1	2 turns 1.0 mm copper wire	–	int. diameter 6 mm; winding pitch 2 mm; leads 2 × 10 mm	
L2	Ferroxcube choke coil	Z = 550 Ω; f = 175 MHz		4312 020 36640
L3	2 turns 1.0 mm copper wire	–	int. diameter 5 mm; winding pitch 2 mm; leads 2 × 10 mm	
L4	3 turns 1.5 mm copper wire	–	int. diameter 10 mm; winding pitch 2 mm; leads 2 × 15 mm	

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PACKAGE OUTLINE





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## DEFINITIONS

<b>Data Sheet Status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

## LIFE SUPPORT APPLICATIONS

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