

DISCRETE SEMICONDUCTORS

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

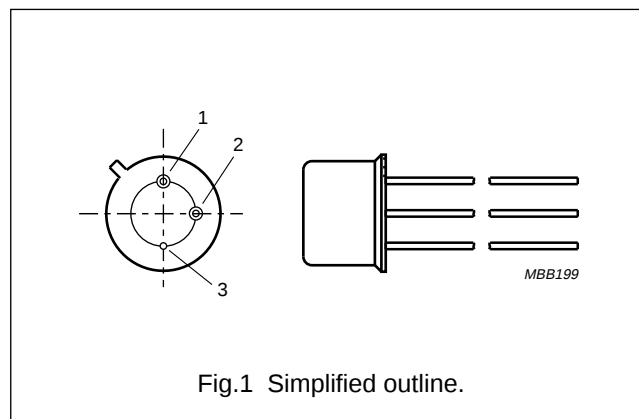
NPN overlay transistors in TO-39 metal packages with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits.

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 2N3866 2N4427	$R_{BE} = 10\ \Omega$	— —	55 40	V V
V_{CEO}	collector-emitter voltage 2N3866 2N4427	open base	— —	30 20	V V
V_{EBO}	emitter-base voltage 2N3866 2N4427	open collector	— —	3.5 2.0	V 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 $T_{mb} = 25\ ^\circ\text{C}$	—	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	$^\circ\text{C}$

RF performance

TYPE NUMBER	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	η (%)
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_{CBO}	collector-base voltage	open emitter			
	2N3866		–	55	V
	2N4427		–	40	V
V_{CER}	collector-emitter voltage	$R_{BE} = 10\ \Omega$			
	2N3866		–	55	V
	2N4427		–	40	V
V_{CEO}	collector-emitter voltage	open base			
	2N3866		–	30	V
	2N4427		–	20	V
V_{EBO}	emitter-base voltage	open collector			
	2N3866		–	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
I_{CM}	collector current peak value		–	0.4	A
P_{tot}	total power dissipation	up to $T_{mb} = 25\ ^\circ\text{C}$	–	3.5	W
T_{stg}	storage temperature		–65	+200	$^\circ\text{C}$
T_j	junction temperature		–	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

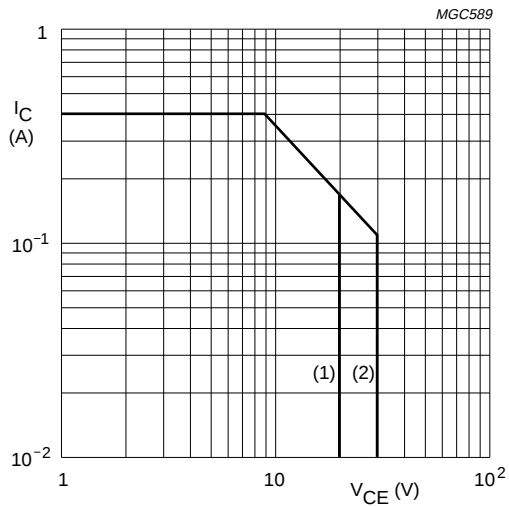
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air		200	K/W
$R_{th\ j-mb}$	thermal resistance from junction to mounting base		50	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	1.0	K/W
		note 2	2.5	K/W

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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$T_{mb} = 25^\circ\text{C}$.
(1) 2N4427.
(2) 2N3866.

Fig.2 DC SOAR.

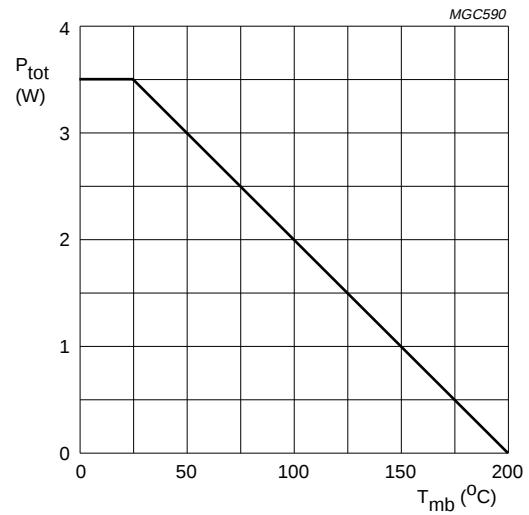


Fig.3 Power derating curve.

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

APPLICATION INFORMATION

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

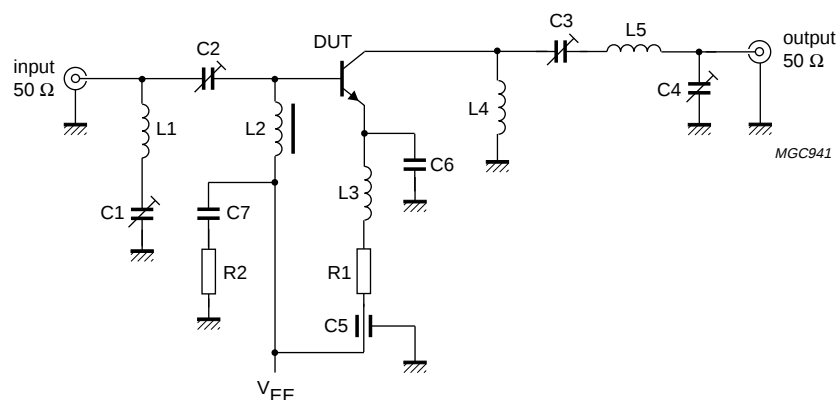
TYPE NUMBER	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	I_c (mA)	η (%)
2N3866	100	28	1.8	>10	<107	>60
	250	28	1.5	>10	<107	>50
	400	28	1.0	>10	<79	>45
2N4427	175	12	1.0	>10	<167	>50
	470	12	0.4	>10	67	50

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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.



$V_{EE} = -28\text{ V}$

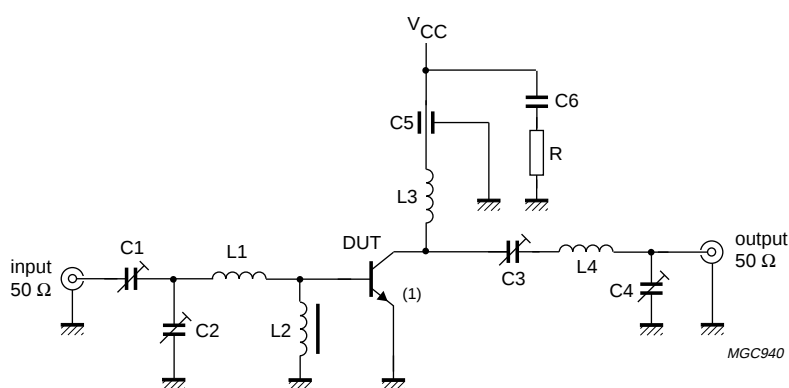
Fig.4 Test circuit for the 2N3866 at 400 MHz.

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 Ω		
R2	resistor	10 Ω		
L1	2 turns 1.0 mm copper wire	—	int. diameter 6 mm; winding pitch 3 mm	
L2	Ferroxcube choke coil	Z = 450 Ω; 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 × 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.

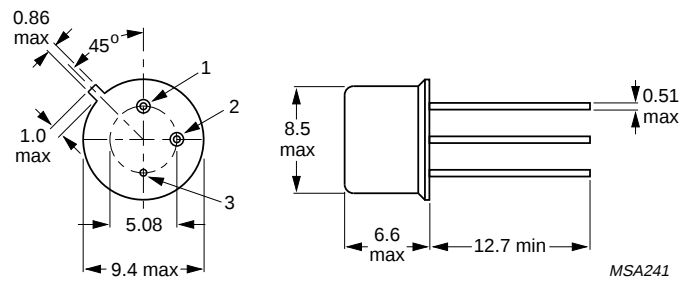
List of components (see Fig.5)

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 $\times$ 10 mm	
L2	Ferroxcube choke coil	$Z = 550\ \Omega$; $f = 175\text{ MHz}$		4312 020 36640
L3	2 turns 1.0 mm copper wire	—	int. diameter 5 mm; winding pitch 2 mm; leads 2 $\times$ 10 mm	
L4	3 turns 1.5 mm copper wire	—	int. diameter 10 mm; winding pitch 2 mm; leads 2 $\times$ 15 mm	

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PACKAGE OUTLINE



Dimensions in mm.

Fig.6 TO-39.

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DEFINITIONS

Data Sheet Status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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