

# DATA SHEET

**LXE16350X**

**NPN microwave power transistor**

Product specification  
Supersedes data of November 1994  
File under Discrete Semiconductors, SC15

1997 Feb 19

# NPN microwave power transistor

# LXE16350X

### FEATURES

- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Interdigitated structure provides high emitter efficiency
- Gold metallization realizes very good stability of the characteristics and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensures good stability and allows an easier design of wideband circuits.

### APPLICATIONS

Common emitter class AB power amplifiers for military and professional applications at 1.65 GHz.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT439A metal ceramic package, with emitter connected to flange.

### QUICK REFERENCE DATA

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common emitter class AB amplifier.

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V)	I <sub>CQ</sub> (A)	P <sub>L1</sub> (W)	G <sub>po</sub> (dB)	Z <sub>i</sub> ; Z <sub>L</sub> (Ω)
Class AB (CW)	1.65	24	0.3	≥32	≥9	see Figs 8 and 9

### PINNING - SOT439A

PIN	DESCRIPTION
1	collector
2	base
3	emitter connected to flange

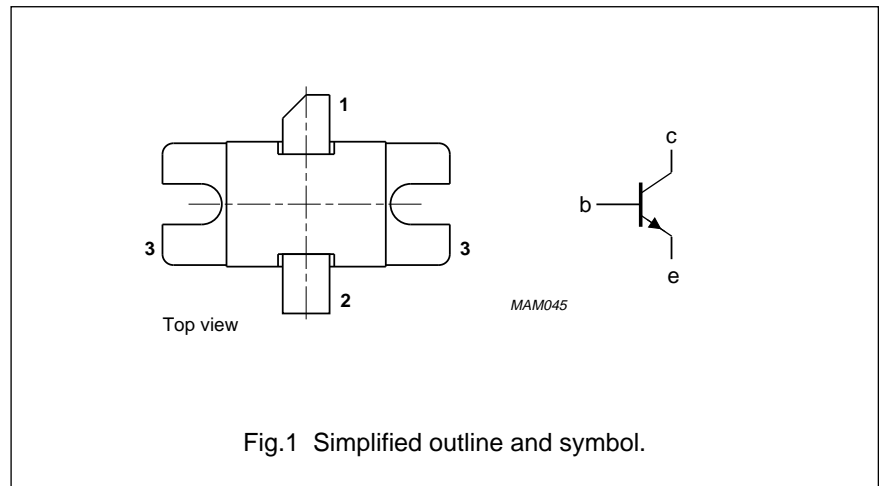


Fig.1 Simplified outline and symbol.

### WARNING

#### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

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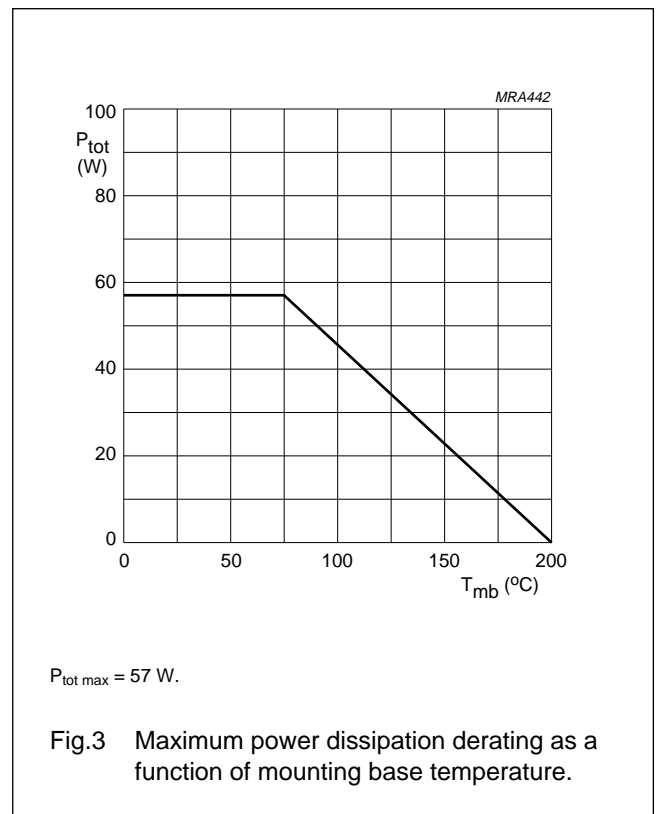
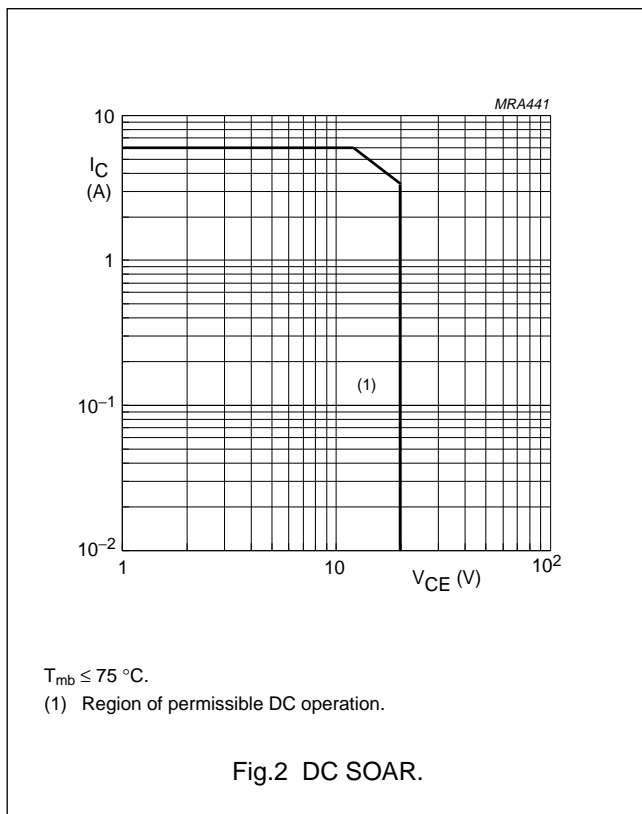
**LIMITING VALUES**

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	–	45	V
V <sub>CER</sub>	collector-emitter voltage	R <sub>BE</sub> = 220 Ω	–	30	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	20	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current (DC)		–	6	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 75 °C	–	57	W
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	operating junction temperature		–	200	°C
T <sub>slid</sub>	soldering temperature	t ≤ 10 s; note 1	–	235	°C

**Note**

- Up to 0.2 mm from ceramic.



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	$T_j = 100\text{ °C}$	1.7	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	0.2	K/W

## Note

- See "Mounting recommendations in the General part of handbook SC15".

## CHARACTERISTICS

$T_{mb} = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 20\text{ V}; I_E = 0$	–	3	mA
		$V_{CB} = 40\text{ V}; I_E = 0$	–	30	mA
$I_{CER}$	collector cut-off current	$V_{CE} = 30\text{ V}; R_{BE} = 220\ \Omega$	–	30	mA
$I_{CEO}$	collector cut-off current	$V_{CE} = 20\text{ V}; I_B = 0$	–	30	mA
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\text{ V}; I_C = 0$	–	300	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 3\text{ V}; I_C = 3\text{ A}$	15	100	

## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\text{ °C}$  in a common-emitter class AB amplifier (note 1).

MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$I_{CQ}$ (A)	$P_{L1}$ (W)	$G_{po}$ (dB)	$Z_i; Z_L$ ( $\Omega$ )
Class AB (CW)	1.65	24	0.3	$\geq 32$ typ. 35	$\geq 9$ typ. 10	see Figs 8 and 9

## Note

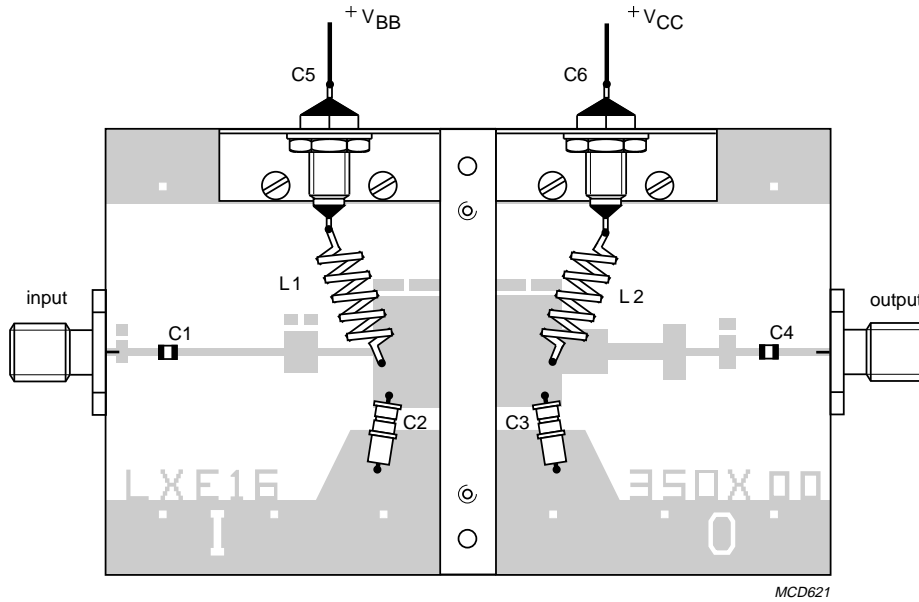
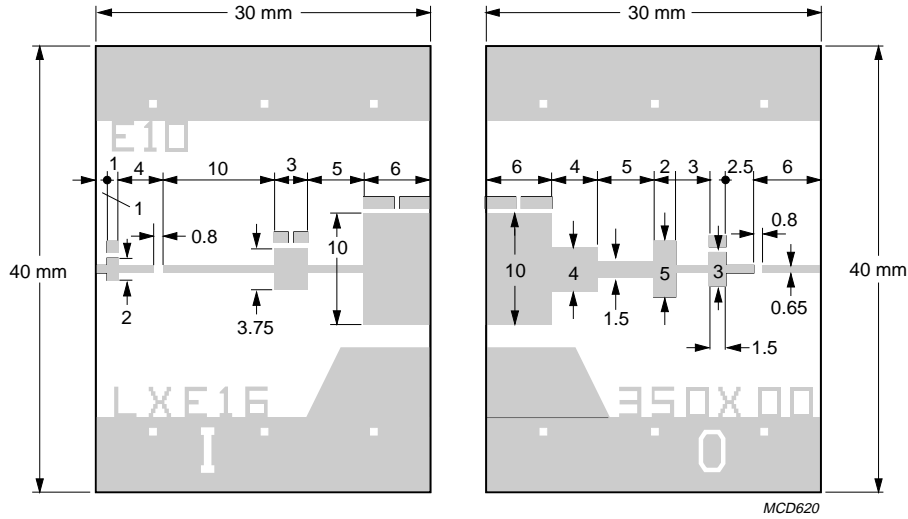
- The test circuit is split into 2 independent halves each being  $30 \times 40\text{ mm}$  in size.

## List of components (see Fig 4).

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1	5 turns 0.5 mm diameter copper wire with ferrite bead		int. dia. 2 mm	
L2	5 turns 0.5 mm diameter copper wire		int. dia. 2 mm	
C1, C4	DC blocking chip capacitor	100 pF		
C2, C3	trimmer capacitor	0.5 to 5 pF		Tekelec
C5, C6	feedthrough bypass capacitor	1500 pF		Erie, ref. 1250-003

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Substrate: Epsilam 10.  
Thickness: 0.635 mm.  
Permittivity:  $\epsilon_r = 10$ .

Fig.4 Prematching test circuit board.

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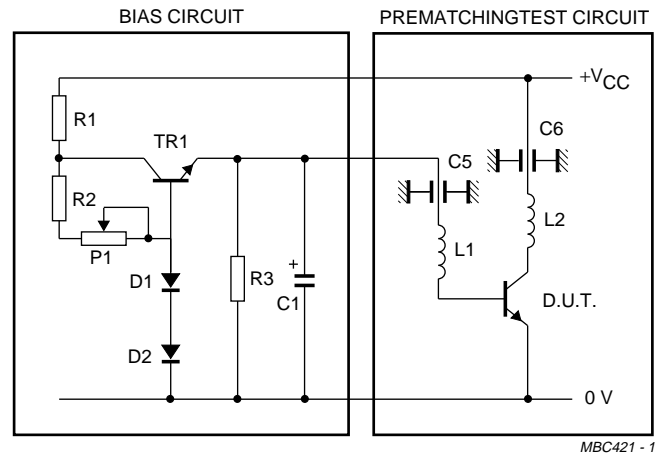


Fig.5 Class AB bias circuit at 1.65 GHz.

## List of components (see Fig 5)

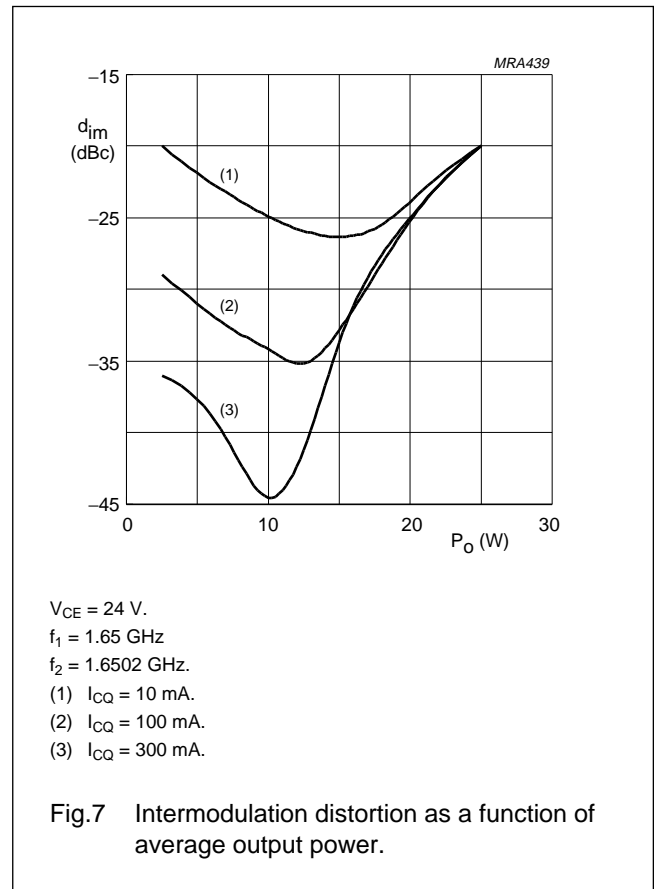
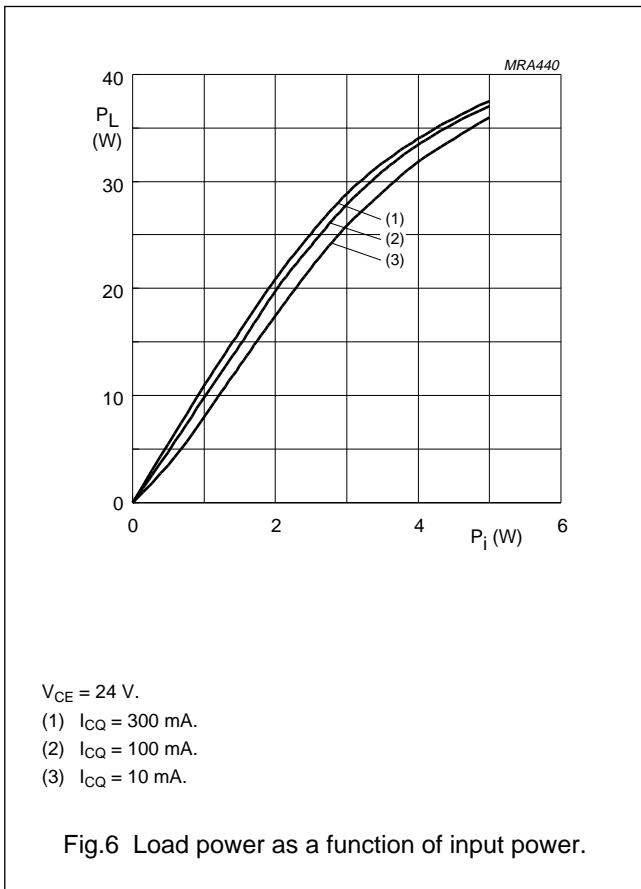
COMPONENT	DESCRIPTION	VALUE	CATALOGUE NO.
TR1	transistor, BDT85 (or equivalent)		
D1	diode, IN4148 (or equivalent); note 1		
D2	diode, BY239800; note 2		
R1	resistor	100 $\Omega$	
R2	resistor	10 k $\Omega$	
R3	resistor	56 $\Omega$	
P1	potentiometer, 10 turns (sfernice)	4.7 k $\Omega$	
C1	electrolytic capacitor	10 $\mu$ F (>30 V)	
C5, C6	feedthrough bypass capacitor	1500 pF	Erie, ref. 1250-003
L1	5 turns 0.5 mm copper wire with ferrite bead		
L2	5 turns 0.5 mm copper wire		

## Notes

1. In thermal contact with TR1.
2. In thermal contact with D.U.T.

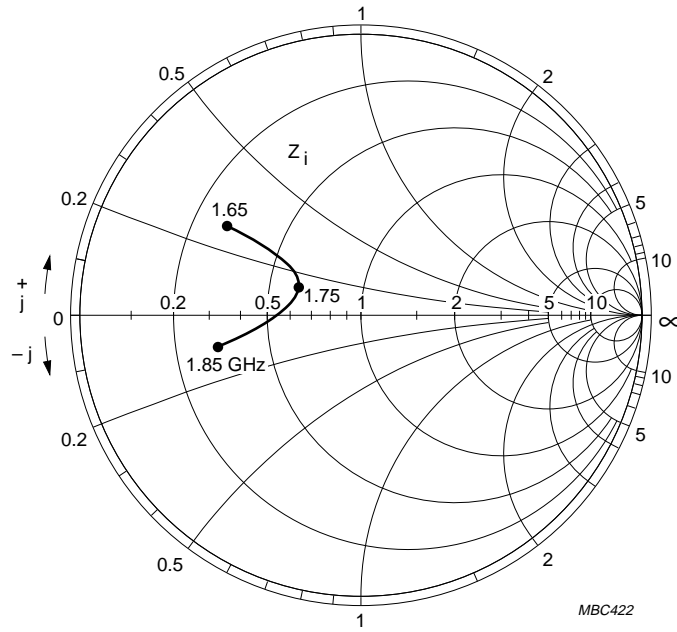
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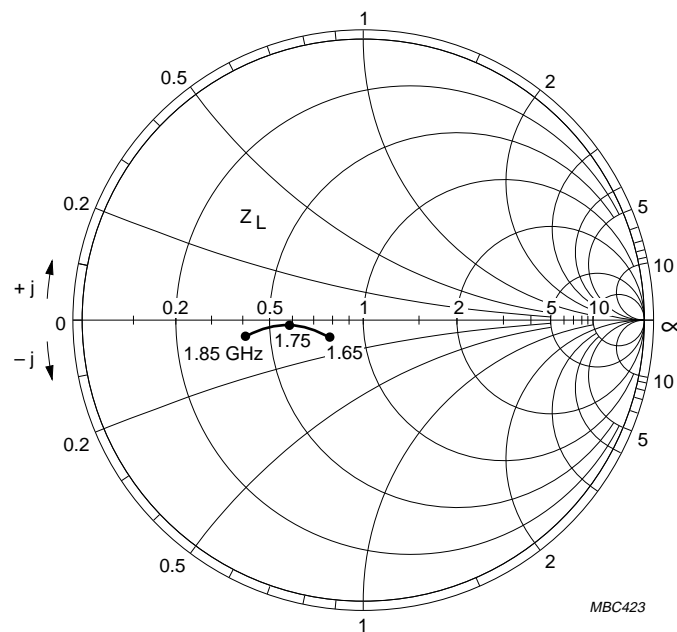
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$V_{CE} = 24 \text{ V}; Z_0 = 10 \Omega; I_{CQ} = 0.3 \text{ A}.$

Fig.8 Input impedance as a function of frequency; typical values.



$V_{CE} = 24 \text{ V}; Z_0 = 10 \Omega; I_{CQ} = 0.3 \text{ A}.$

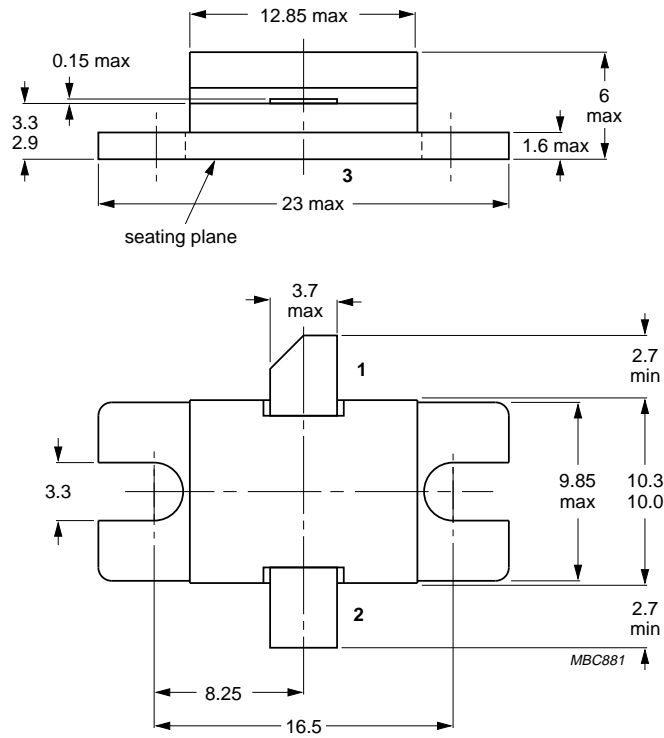
Fig.9 Optimum load impedance as a function of frequency; typical values.



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PACKAGE OUTLINE



Dimensions in mm.  
 Torque on screws: max. 0.4 Nm.  
 Recommended screw: M3.  
 Recommended pitch for mounting screw: 19 mm.

Fig.10 SOT439A.

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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.	

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