

Middle Power Transistor (60V / 2A)

Parameter	Value
V _{CEO}	60V
IC	2A

●Features

- 1)Low saturation voltage, tipically $V_{CE(sat)}$ =130mV at I_C/I_B =1A/50mA.
- 2)Collector-emitter voltage=60V
- 3)P $_D$ =2W (Mounted on a ceramic board (40×40×0.7mm)).
- 4)Complementary PNP Types: 2SB1561.

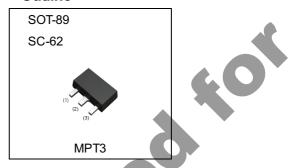
Application

LOW FREQUENCY AMPLIFIER

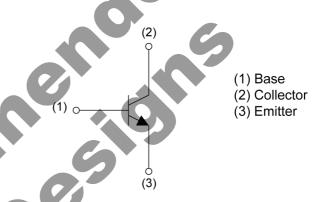
Packaging specifications

Part No.	Package	Package size	Taping code	Reel size (mm)	Tape width (mm)	Basic ordering unit.(pcs)	Marking
2SD2391	SOT-89 (MPT3)	4540	T100	180	12	1000	DT

Outline



•Inner circuit



● Absolute maximum ratings (T_a = 25°C)

Parameter	Symbol	Values	Unit
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	6	>
Collector current	I _C	2	Α
Collector current	I _{CP} *1	6	A
Dougs dissingtion	P_D^{*2}	0.5	W
Power dissipation	P _D *3	2.0	W
Junction temperature	T _j	150	°C
Range of storage temperature	T _{stg}	-55 to +150	°C

● Electrical characteristics (T_a = 25°C)

Davanastav	Currele e l	Condition	Values			1.1-34	
Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit	
Collector-base breakdown voltage	BV _{CBO}	I _C = 50μA	60	-	1	V	
Collector-emitter breakdown voltage	BV _{CEO}	I _C = 1mA	60	1	1	V	
Emitter-base breakdown voltage	BV _{EBO}	I _E = 50μA	6	1	1	V	
Collector cut-off current	I _{CBO}	V _{CB} = 50V	-	-	100	nA	
Emitter cut-off current	I _{EBO}	V _{EB} = 5V	-	-	100	nA	
Collector-emitter saturation voltage	V _{CE(sat)} *4	$I_C = 1A$, $I_B = 50mA$	-	130	350	mV	
DC current gain	h _{FE} 1*4	$V_{CE} = 2V, I_{C} = 500 \text{mA}$	120	-	270		
DC current gain	$h_{FE}2^{*4}$	$V_{CE} = 2V, I_{C} = 1.5A$	45	-	-	_	
Transition frequency	f _T *4	V _{CE} = 2V, I _E = -500mA, f = 100MHz	-	210	ı	MHz	
Output capacitance	C _{ob}	$V_{CB} = 10V$, $I_E = 0A$, $f = 1MHz$	-	21	-	pF	

hFE values are calssified as follows:

rank	Q	-	-	-	-
h _{FE} 1	120-270	-	-	-	-

^{*1} Pw=10ms, Single Pulse

^{*2} Each terminal mounted on a reference land.

^{*3} Mounted on a ceramic board.(40×40×0.7mm)

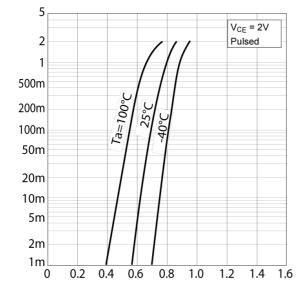
^{*4} Pulsed

COLLECTOR CURRENT : I_c [A]

DC CURRENT GAIN: hee

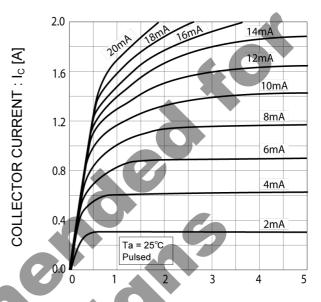
● Electrical characteristic curves(T_a = 25°C)

Fig.1 Ground Emitter Propagation Characteristics



BASE TO EMITTER VOLTAGE: VBE [V]

Fig.2 Typical Output Characteristics



COLLECTOR TO EMITTER VOLTAGE : $V_{CE}\left[V\right]$

Fig.3 DC Current Gain vs. Collector Current (I)

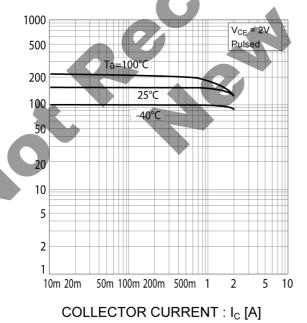
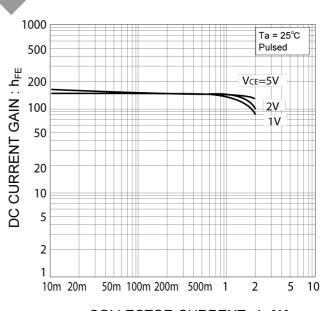


Fig.4 DC Current Gain vs. Collector Current (II)



COLLECTOR CURRENT : I_C [A]

● Electrical characteristic curves(T_a = 25°C)

Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (I)

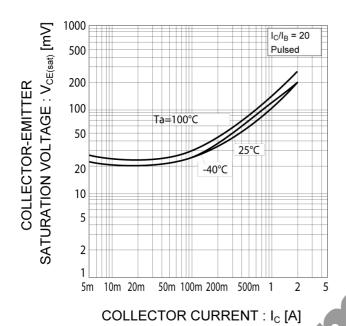


Fig.6 Collector-Emitter Saturation Voltage vs. Collector Current (II)

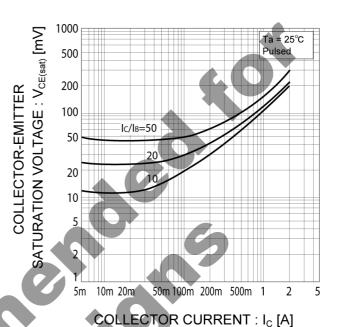


Fig.7 Base-Emitter Saturation Voltage vs. Collector Current

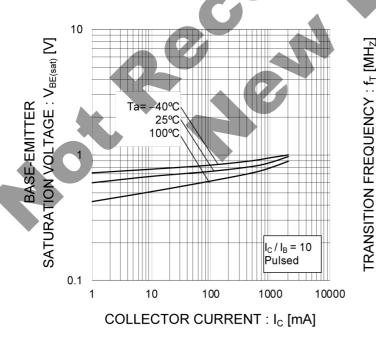
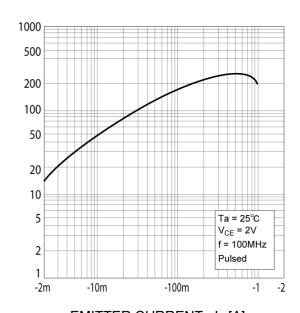


Fig.8 Gain Bandwidth Product vs.
Emitter Current



EMITTER CURRENT : I_E [A]

● Electrical characteristic curves(T_a = 25°C)

Fig.9 Emitter Input Capacitance vs.
Emitter-Base Voltage
Collector Output Capacitance vs.
Collector-Base Voltage

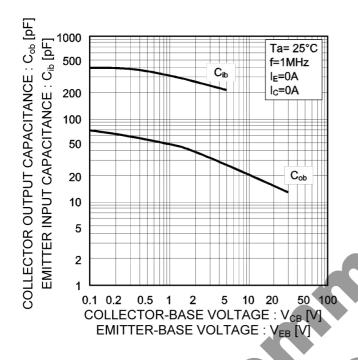
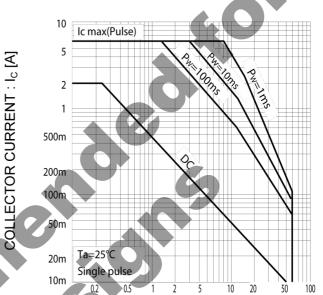


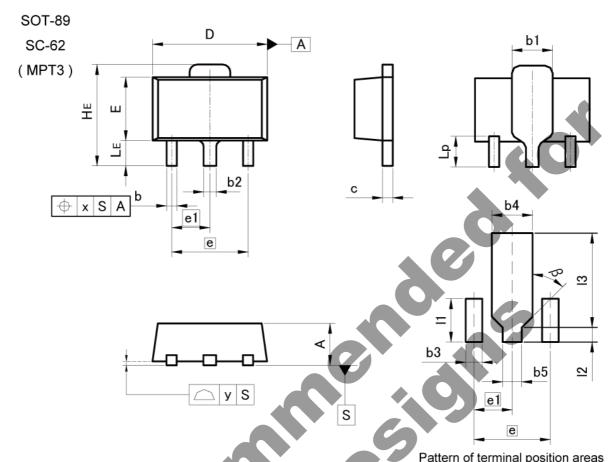
Fig.10 Safe Operating Area



COLLECTOR TO EMITTER VOLTAGE: VCE [V]



Dimensions



			of soldering pads]
MILIMETERS		INCHES	

DIM			INCHES		
DIN	MIN	MAX	MIN	MAX	
Α	1.40	1.50	0.055	0.059	
b	0.30	0.50	0.012	0.020	
b1	1.50	1.70	0.059	0.067	
b2	0.40	0.60	0.016	0.024	
С	0.35	0.50	0.014	0.020	
D	4.40	4.70	0.173	0.185	
E	2.40	2.70	0.094	0.106	
е	3.0	00	0.118		
e1	1.	50	0.059		
HE	3.70	4.30	0.146	0.169	
LE	0.80	1.20	0.031	0.047	
Lp	1.01	1.41	0.040	0.056	
x	0-0	0.15	-	0.006	
У	-	0.10	-	0.004	

DIM	MILIM	ETERS	INCHES				
DIM	MIN	MAX	MIN	MAX			
b3	-	0.65		0.026			
b4	_	1.70	-	0.067			
b5	-	0.75		0.030			
11	_	1.71	_	0.067			
12	0-0	0.58	_	0.023			
13	_	3.72	_	0.146			
R	45	0	45	0			

Dimension in mm/inches

Notice

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1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CL ACCIII	CLASS II b	СГУССШ
CLASSIV	CLASSⅢ	CLASSⅢ	CLASSII

- 2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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 - [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
 - [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
 - [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
 - [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
 - [f] Sealing or coating our Products with resin or other coating materials
 - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
 - [h] Use of the Products in places subject to dew condensation
- 4. The Products are not subject to radiation-proof design.
- 5. Please verify and confirm characteristics of the final or mounted products in using the Products.
- 6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power, exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.
- 8. Confirm that operation temperature is within the specified range described in the product specification.
- 9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

- 1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- 2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

- 1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
- 2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of lonizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

- 1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
 - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
 - [b] the temperature or humidity exceeds those recommended by ROHM
 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
- 2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
- 3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

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