

High-voltage switching Transistor

2SC4061K / 2SC3415S / 2SC4015 / 2SC3271F

●Features

- 1) High breakdown voltage. ($BV_{CEO}=300V$)
- 2) Low collector output capacitance. (Typ. 3pF at $V_{CB}=30V$)
- 3) Ideal for surge protection on telephone lines.

●Packaging specifications and hFE

Type	2SC4061K	2SC3415S	2SC4015	2SC3271F
Package	SMT3	SPT	ATV	TO-126F
hFE	NP	NP	N	N
Marking	AN *	—	—	—
Code	T146	TP	TV2	—
Basic ordering unit (pieces)	3000	5000	2500	1000

* Denotes hFE

●Electrical characteristics ($T_a=25^\circ C$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	300	—	—	V	$I_C=50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	300	—	—	V	$I_C=100\mu A$
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	$I_E=50\mu A$
Collector cutoff current	I_{CBO}	—	—	0.5	μA	$V_{CB}=200V$
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	$V_{EB}=4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	2	V	$I_C/I_E=50mA/5mA$
DC current transfer ratio	hFE	56	—	180	—	$V_{CE}/I_C=10V/10mA$
Gain bandwidth product	f _r	50	100	—	MHz	$V_{CE}=30V$, $I_E=-10mA$, $f=100MHz$
Collector output capacitance	C _{ob}	—	3	—	pF	$V_{CB}=30V$, $I_E=0A$, $f=1MHz$

●Absolute maximum ratings ($T_a=25^\circ C$)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	300	V
Collector-emitter voltage	V_{CEO}	300	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA
Collector power dissipation	P _c	0.2	W
		0.3	
		1	
		1.2	W ($T_C=25^\circ C$)
		5	
Junction temperature	T _J	150	$^\circ C$
Storage temperature	T _{stg}	-55~150	$^\circ C$

* Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

(96-172-C52)

High-voltage Switching Transistor (Power supply)

2SC4938 / 2SC4129

●Features

- 1) Low $V_{CE(sat)}$. (Typ. 0.6V at $I_C/I_E=5/1A$)
- 3) Fast switching (t_f: Max. 1 μs at $I_C=4A$)
- 3) Wide SOA (safe operating area).

●Packaging specifications and hFE

Type	2SC4938	2SC4129
Package	PSD3	TO-220FP
hFE	B	AB
Code	TL	—
Basic ordering unit (pieces)	1000	500

●Electrical characteristics ($T_a=25^\circ C$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	400	—	—	V	$I_C=50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	400	—	—	V	$I_C=1mA$
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	$I_E=50\mu A$
Collector cutoff current	I_{CBO}	—	—	10	μA	$V_{CB}=400V$
Emitter cutoff current	I_{EBO}	—	—	10	μA	$V_{EB}=5V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1	V	$I_C/I_E=5A/1A$ *
Collector-emitter saturation voltage	$V_{BE(sat)}$	—	—	1.5	V	$I_C/I_E=5A/1A$ *
DC current transfer ratio	hFE	25	—	50	—	$V_{CE}/I_C=5V/2A$
		16	—	50	—	
Transition frequency	f _r	—	15	—	MHz	$V_{CB}=10V$, $I_E=-0.5A$, $f=5MHz$ *
Output capacitance	C _{ob}	—	80	—	pF	$V_{CE}=10V$, $I_E=0A$, $f=1MHz$
Turn-on time	t _{on}	—	—	1	μs	$I_C=4A$, $R_L=50\Omega$
Storage time	t _{stg}	—	—	2.5	μs	$I_{B1}=-I_{B2}=0.4A$
Fall time	t _f	—	—	1	μs	$V_{CC}=200V$

* Measured using pulse current.

●Absolute maximum ratings ($T_a=25^\circ C$)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	400	V
Collector-emitter voltage	V_{CEO}	400	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	5	A
	I_{CP}	7	A *
Collector power dissipation	P _c	1.5	W ($T_C=25^\circ C$)
		35	
		30	
Junction temperature	T _J	150	$^\circ C$
Storage temperature	T _{stg}	-55~150	$^\circ C$

* Single pulse P_W=100ms

(96-188-C55)

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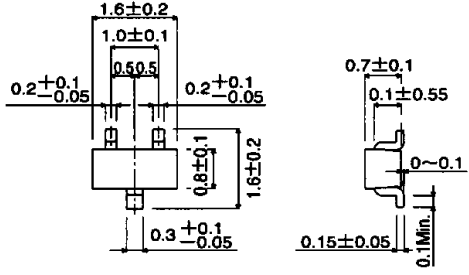
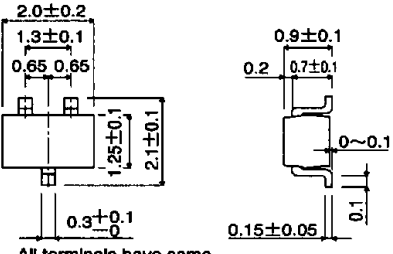
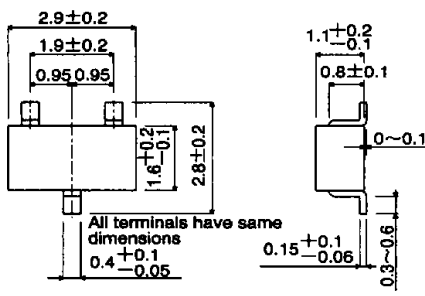
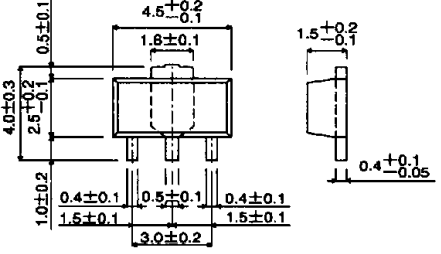
ROHM

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Packages

ROHM has been manufacturing transistors since 1975. In the development of products, we constantly strive to anticipate the needs of our customers. Regarding packages, the demands of the market for compactness, low power consumption, low power dissipation and automatic mounting support are becoming ever greater, and we are strengthening our product development system to meet these needs.

●Types and features of surface-mount packages

Type	External dimensions (Units : mm)	Features
EMT3 SC-75A type		A more compact version of the UMT3 (SC-70), the EMT3 is the world's smallest transistor with a mold size of 1.6×0.8 mm. The mounting area is approximately 60% of the UMT3 and 30% of the SMT3, making it ideal for ultra-high density mounting. Mounting is possible with the same type of automatic mounting machine as the UMT3.
UMT3 SC-70 type	 All terminals have same dimensions	The UMT3 is a smaller version of the SMT3 (SC-59). The mounting area is approximately 60% of the SMT3, making it optimum for high density mounting. The taping size is the same as the SMT3, allowing use of conventional automatic mounting machines. Electrical characteristics and reliability are the same as the SMT3.
SMT3 SC-59 type	 All terminals have same dimensions	The SMT3 is a compact package suitable for small electronic devices and hybrid IC applications. With proven performance, this is one of the most basic small packages. With the exception of P_c (collector power dissipation), electrical characteristics are similar to leaded packages. Reliability is on the same level as the TO-92.
MPT3 SC-62 type		By itself the MPT3 has a P_c of 0.5 W ($T_a = 25^\circ\text{C}$), but when used on a $40 \times 40 \times 0.7$ mm ceramic board, $P_c = 2$ W ($T_c = 25^\circ\text{C}$), allowing high power to be obtained with a small package. The flat package makes it suitable for applications requiring compactness such as hybrid ICs. Available on tape for automatic mounting.

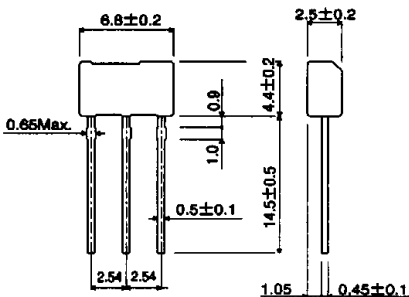
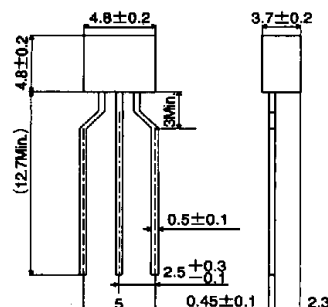
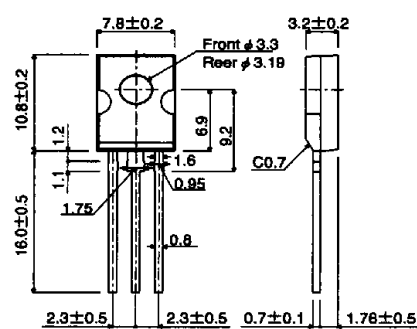
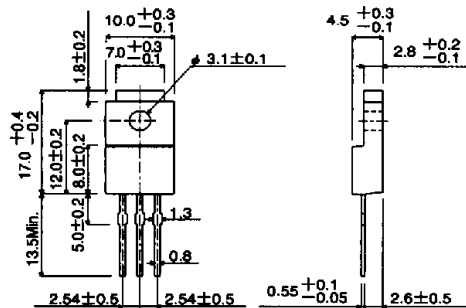
Type	External dimensions (Units : mm)	Features
CPT 3 SC-63 type		By itself the CPT3 has a P_c of 1 W ($T_a = 25^\circ\text{C}$), but a large P_c of several watts can be obtained with an appropriate mounting surface. At the same time the CPT3 is compact, making it suitable for high density mounting and hybrid ICs. Available on tape for automatic mounting. For vertical high density mounting, the leaded CPT (SC-64) type with the same mold size is also available.
PSD3		The PSD3 is a TO-220 class surface-mount package. A high P_c can be obtained with an appropriate mounting surface. Surface mounting allows a high vertical density, enabling the design of slim and compact devices. The PSD3 is available on tape for automatic mounting, and it helps improve mounting efficiency and reduce mounting cost.
SMT5 SC-74A type		The SMT5 consists of two connected transistors or digital transistors in an SMT3 (SC-59) package. The mounting area can be reduced by 50% compared to the SMT3 and the internal circuitry is complete, making this package ideal for high density mounting at half the assembly cost.
SMT6 SC-74 type		The SMT6 consists of two independent transistors or two independent digital transistors in an SMT3 (SC-59) package. The mounting area and mounting cost can be reduced by 50% compared to the SMT3, and the two transistors are independent to allow free configuration of a high density circuit.

Type	External dimensions (Units : mm)	Features
UMT5 SC-88A type	2.0±0.2 1.3±0.1 0.65 0.65 0.2±0.1 1.25±0.1 2.1±0.1 0.15±0.05 0.9±0.1 0.7 0~0.1 0.1 Min. All terminals have same dimensions	The UMT5 consists of two connected transistors or digital transistors in a UMT3 (SC-70) package. The mounting area can be reduced by 50% compared to the UMT3 and the internal circuitry is completed, making this package ideal for high density mounting at half the assembly cost.
UMT6 SC-88 type	2.0±0.2 1.3±0.1 0.65 0.65 0.2±0.1 1.25±0.1 2.1±0.1 0.15±0.05 0.9±0.1 0.7 0~0.1 0.1 Min. All terminals have same dimensions	The UMT6 consists of two independent transistors or two independent digital transistors in a UMT (SC-70) package. The mounting area and mounting cost can be reduced by 50% compared to the UMT3, and the two transistors are independent to allow free configuration of a high density circuit.

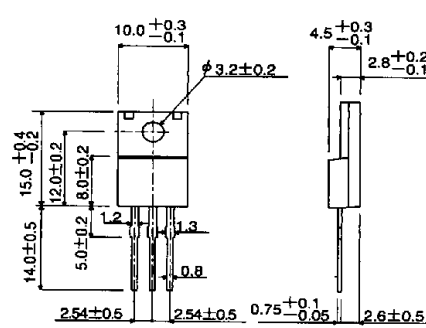
●Types and features of leaded packages

Type	External dimensions (Units : mm)	Features
SPT (SC-72 type)		The SPT is a smaller version of the conventional TO-92 type. The body size (3×4×2 mm ³) has been reduced to 1/4 that of the TO-92 (5×5×4 mm ³). The SPT is available on tape for automatic insertion, and less space is occupied on the printed circuit board than the TO-92. Reliability is the same as the TO-92.
FTR		SIL type with a height of 3.4 mm and a lead pitch of 2.54 mm.
FTL		The FTL is a radial tapping version of the highly popular FTR. This enables automatic high-density mounting with a radial insertion machine.
ATR (SC-71 type)		SC-71 type with a height of 4.4 mm and a P _c =1W type.

EXPLANATION

Type	External dimensions (Units : mm)	Features
ATV	 Diagram showing the external dimensions of the ATV package. Key dimensions include: width 6.8±0.2, height 2.5±0.2, lead spacing 2.54, lead width 0.45±0.1, and total length 14.5±0.5.	The ATV is a radial tapering version of the highly popular ATR. This enables automatic high-density mounting with a radial insertion machine.
TO-92 (SC-43 type)	 Diagram showing the external dimensions of the TO-92 (SC-43 type) package. Key dimensions include: width 4.8±0.2, height 3.7±0.2, lead spacing 2.5±0.3, and lead width 0.45±0.1.	The SC-43 is for general purpose small signals.
TO-126FP	 Diagram showing the external dimensions of the TO-126FP package. Key dimensions include: width 7.8±0.2, height 10.8±0.2, lead spacing 2.3±0.5, and lead width 0.7±0.1. It also specifies front and rear diameters of 3.3 and 3.18 respectively.	The TO-126FP is an isolation type package based on a TO-126 full mold. In addition to the features of the TO-126, molded heat sink fins allow easy isolation of the heat sink.
TO-220FP (SC-67 type)	 Diagram showing the external dimensions of the TO-220FP (SC-67 type) package. Key dimensions include: width 10.0±0.3, height 17.0±0.2, lead spacing 2.54±0.5, and lead width 0.55±0.1. It also specifies a lead diameter of 3.1±0.1.	The TO-220FP is an isolation type package based on a TO-220 full mold. In addition to the features of the TO-126 and TO-220, molded heat sink fins allow easy isolation of the heat sink.

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Type	External dimensions (Units : mm)	Features
TO-220FN	 Technical drawing of the TO-220FN transistor package showing three views: top, side, and front. Dimensions are in mm with tolerances. Top view dimensions: 10.0 (+0.3/-0.1), $\phi 3.2 \pm 0.2$, 4.5 (+0.3/-0.1), 2.8 (+0.2/-0.1). Side view dimensions: 15.0 (+0.4/-0.2), 12.0 (+0.2/-0.2), 8.0 (+0.2/-0.2), 14.0 (+0.5/-0.5), 5.0 (+0.2/-0.2), 1.2, 1.3, 0.8, 2.54 (+0.5/-0.5), 0.75 (+0.1/-0.05), 2.6 (+0.5/-0.5). Front view dimensions: 2.54 (+0.5/-0.5), 0.75 (+0.1/-0.05), 2.6 (+0.5/-0.5).	The TO-220FN features the same performance as the TO-220FP with approximately 2 mm less height, allowing the design of slimmer devices. Furthermore, the elimination of support pins in the fin (collector electrode) solves short-circuiting problems with neighboring components and the chassis. To make the height to the installation hole the same as the TO-220FP, it can be replaced as is from the TO-220FP.

EXPLANATION