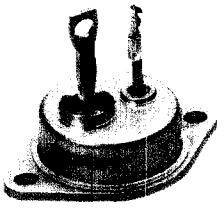
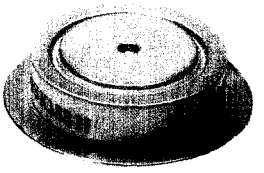
TOKIN

SIT

Another Tokin exclusive. Static Induction Transistors.





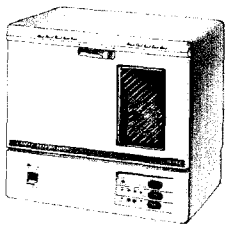
SIT (Static Induction Transistor) was invented by Professor Jun-ichi Nishizawa of Tohoku University in 1950. After several subsequent technological developments and improvements, it was first utilized in 1979 as an industrial power SIT.

SIT offers several outstanding advantages over other such devices, including large output, high speed, low noise, and negative temperature characteristics, and became utilized primarily for large-power industrial use.

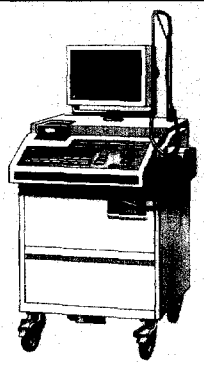
Prior to this, the elements in most high-frequency devices, including ultrasonic devices of several kilowatts or more, high-frequency induction heaters, high-frequency, large-capacity switching power supplies and broadcast transmitters, were large, inefficient and difficult-to-handle vacuum tubes.

Unlike conventional field effect transistors (FET), which handle only low electrical currents, SIT is ideal for large-power applications. And by arranging the multiple number of current-carrying portions (channel portions) in a plant with respect to the semiconductor substrate so as to flow a large current and further lowering the internal resistance in SIT, this transistor can handle large power applications while maintaining all the best features of conventional FETs.

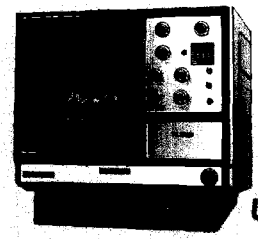
Furthermore, SIT can be readily adapted to parallel operation, so you can use up to a plenty of 1 kW- or 3 kW-type SITs in parallel. SIT is different from bipolar transistors (BPT) and thyristors (SCR) in both principle and construction.



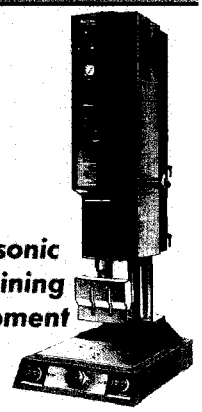
Dishwashers



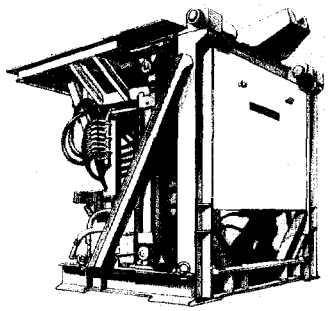
Ultrasonic diagnostic systems



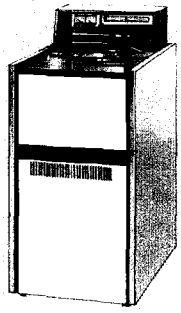
Fish finders



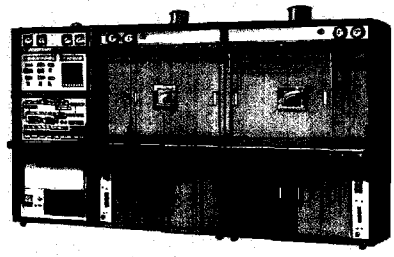
Ultrasonic machining equipment



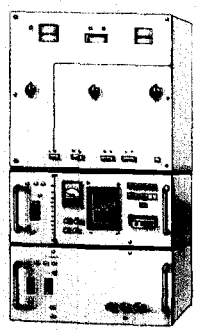
Induction heating systems



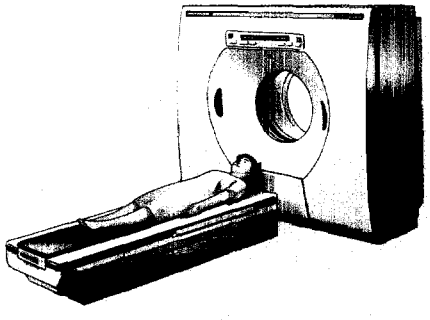
Metal melting furnaces



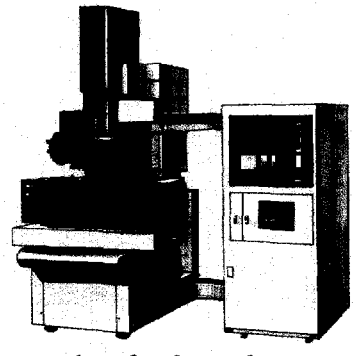
IC manufacturing systems



AM broadcasting transmitters

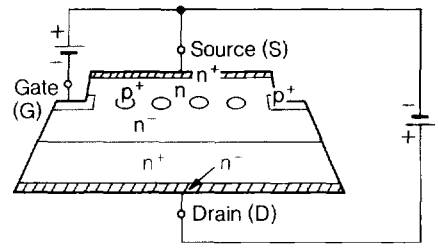


X-ray CT scanners

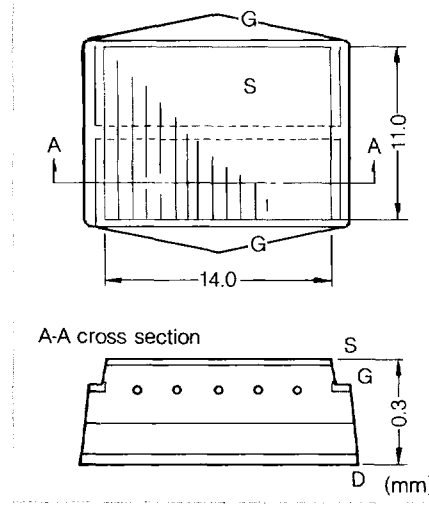


Power supplies for laser beam machning

SIT N-type (cross section)

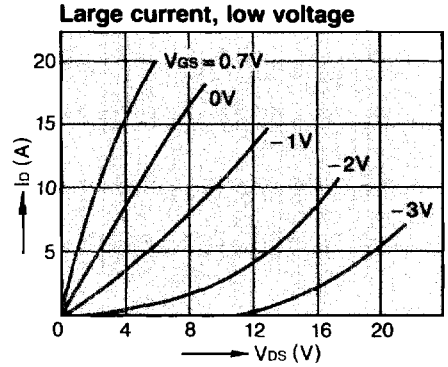


Chip (1 kW type)

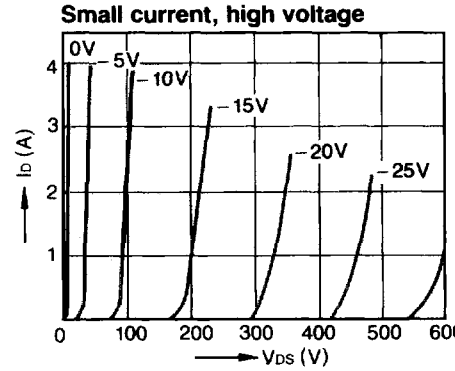


Output Characteristics Example (2SK182)

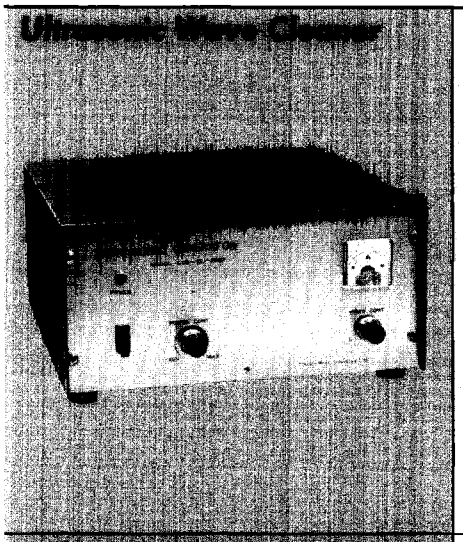
Large current, low voltage



Small current, high voltage



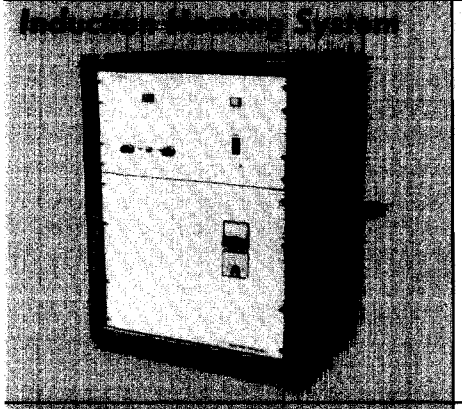
SIT-Applied Equipment



- Allows optimum cleaning immediately after switching ON.
- Increased efficiency thanks to full transistorization, use of SIT, a unique circuit, and an ideal transducer-to-oscillator matching system.
- Remarkably miniaturized and lightweight compared to conventional oscillators.
- Electrically rigid thanks to ample current margin and use of SIT in final stage.

[Usages]

- Thorough cleaning of electronic parts.
- Thorough washing and degreasing of precision machinery and parts.
- Removing burrs and cleaning machined parts.
- Removing polishing powder and finish cleaning of polished products.
- Complete cleaning of medical equipment.
- Cleaning glass bottles and other containers.
- Precision cleaning of semiconductor wafers, lenses, etc.

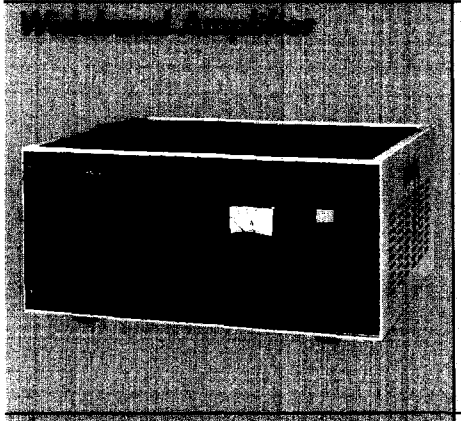


- Miniaturization and higher efficiency using high-power SIT.
- Control circuit utilizes PLL control to maintain optimum load change conditions.
- Complete protection against abnormal voltage and overcurrent.
- Built-in power control (optional 5 kW or less); optional automatic temperature control.

- Controls can be changed to meet specific purposes by changing the output circuit.

[Usages]

- Quenching metal.
- Melting various metals.
- Brazing and welding.
- Others



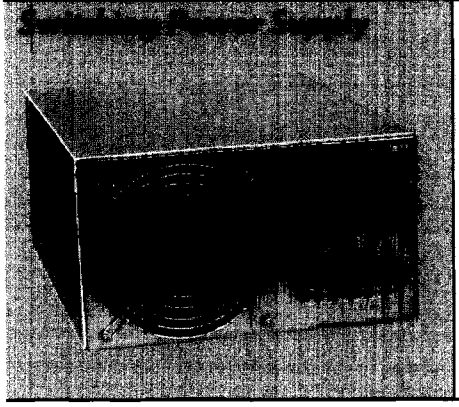
- Enables change in output impedance via rotary switch (for WB-500 only).
- Possible to apply power to either capacitive or inductive load.
- Safe with various built-in protection circuits.
- Low cost, small size, high efficiency.

[Usages]

- Power supply for a variety of high-frequency measurements.
- Power supply for ultrasonic wave tests.
- Power amplifiers for other tests.

[Application examples]

- Testing the power of ultrasonic transducers.
- Testing the core loss of transformer core materials.
- Output test of transformers.
- Power supply for induction heating.
- Various power amplifiers.



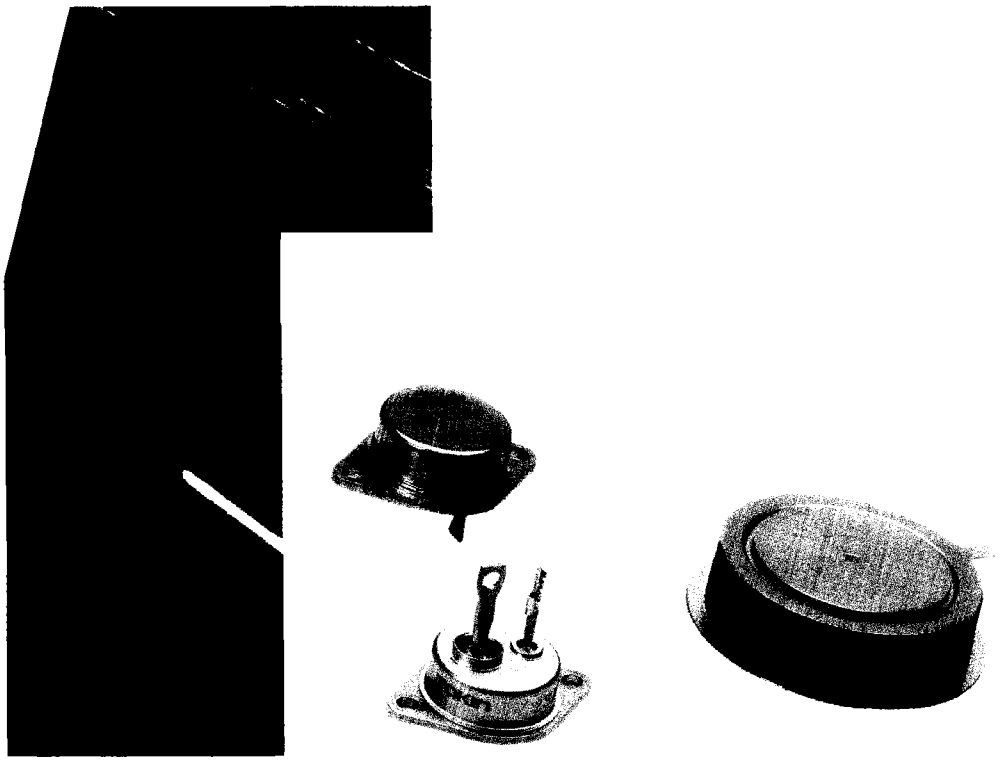
- High-power SIT makes for greater rigidity and efficiency.
- Switching capability for high-output power supply.
- Constant voltage and constant current characteristics.
- Complete protection control.
- Compact, lightweight.

[Usages]

- Power supply for discharging.
- Power supply for laser oscillation.
- Power supply for vacuum equipment.
- Power supply for high-power amplifiers.
- Power supply for gastrocamera endoscope.

Applications

Ultrasonic wave	Cleaners	Cleaning semiconductors, lens cores, printed wiring boards, and before/after plating
	Processing	Plastic welding, and sealing and removing dental calculus
	Applied equipment	Sonar, fish finders, and medical equipment
	Other	Various experiments and ultrasonic wave tests
Induction heating	Heating	Canning, annealing, and electromagnetic cooking devices
	Melting, casting	Dental clinics, noble metal casting, melting metal, and amorphous production
	Quenching	Quenching rails and wheels, quenching automotive parts
	Other	Powder coating and crystallizing growth
Amplification	High-frequency amplifier	AM broadcasting transmitters, transformer core testers, and condenser ripple test.
	Wideband amplifier	Induction heating tests, ultrasonic wave driving tests
	Other	Audio amplifiers
Power supply	High-voltage power supply	Electric discharge machining, lasers, X-rays, and ion implantations
	Large power supply	Constant voltage power supply, rheostat power supply, and large-power switching regulator
	Semiconductor manufacturing power supply	MOCVDs, plasma CVDs, film forming systems, and heating wafers



High-speed operation, high-speed switching and high frequency.

- No carrier injection from the gate is required and high-speed operation is possible (no storage effect).
- Small gate resistance value and less high-frequency signal loss.

No electric current concentration and large anti-breakdown capacity.

- Negative temperature coefficient of the electric current, due to residual channel resistance, makes it difficult for thermal runaway to occur.

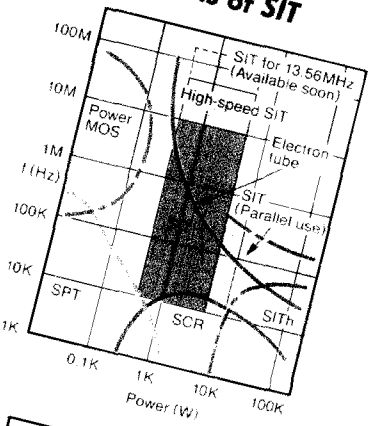
Small driving power

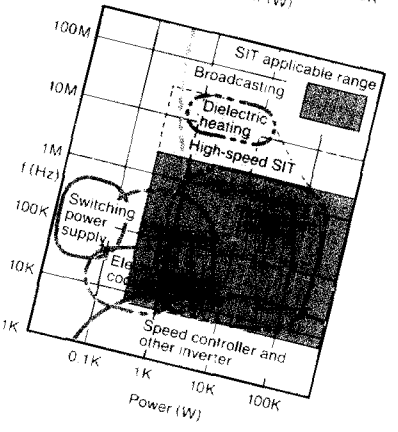
- SIT has high input impedance and is a voltage control device, therefore, less driving power is required.

Unsaturated current-voltage characteristics

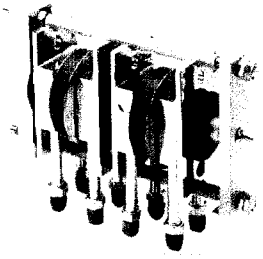
- Reduced negative feedback values make SIT suitable for large-power applications.

Applications of SIT



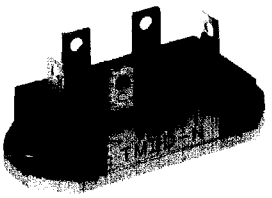


Special Components Using Built-in SITs



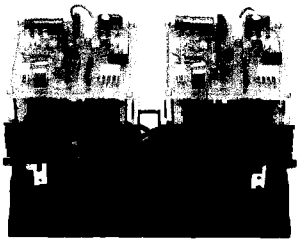
SIT Stack

SIT must be used with a heat sink. Since the SIT Stack is made by mounting one or two SITs with a water- or air-cooling heat dissipation system, there is no need to be concerned about external pressure.



SIT Power Module

This unit has a pair of SIT chips sealed inside, which have various voltage resistance ranging from 600V to 1500V. It is ideal for use with small devices such as inverters, ultrasonic cleaners, and induction heating systems for precious metals and frames for eyeglasses.

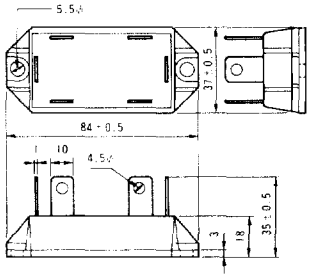


SIT Power Unit

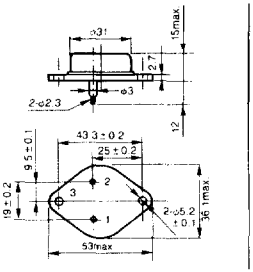
This unit consists of a SIT Stack connected to a printed wiring driving board and is used exclusively for switching. By inputting a square wave of 20 ~ 200kHz into the printed board, SIT provides a power output amplified several hundred times. A variety of configurations is available in accordance with intended power supply voltage and required power output.

Shapes and Dimensions

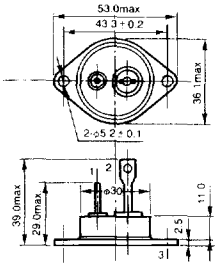
SIT Power Module



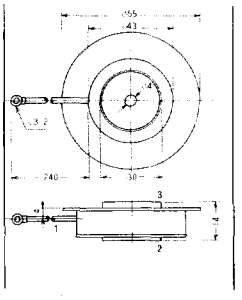
300W Series



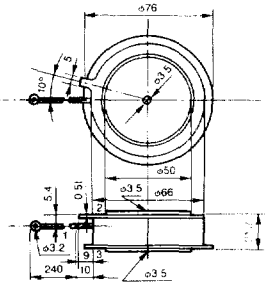
500W Series



1kW Series



3kW Series



Specifications

Item / Model	Storage temperature	Gate-to-Source Voltage	Drain-to-Source Voltage	Drain Current	Total Power Dissipation	Input-Set Gate	Cut-Off Frequency	Drain-to-Source ON Resistance	Turn-On Time	Turn-Off Time
2SK180	−50 ~ +150°C	70V	600V	20A	300W	15*	10MHz	1.5Ω max.	200 ns*	250 ns*
2SK181			800V					2Ω max.		
2SK182E			600V	60A	500W		10MHz*	1.0Ω max.	250 ns*	300 ns*
2SK183E			800V					1.5Ω max.		
2SK183HE			1200V							
2SK183VE			1500V			20*				
2SK182			600V	60A	1000W	15*	10MHz*	1.0Ω max.	250 ns*	300 ns*
2SK183			800V							
2SK183H			1200V					1.5Ω max.		
2SK183V			1500V			20*				
TS300			600V	200A	3000W	15*	7MHz*	0.3Ω max.	350 ns*	350 ns*
TS300H			1200V	180A				0.5Ω max.		
TS300V			1500V			20*				
THF-50		50V	450V	30A	400W	15*	50MHz*	0.6Ω max.	50 ns* max.	50 ns* max.
THF-51			600V					0.7Ω max.		
THF-52			800V					1.0Ω max.		
THF-53			1000V					1.2Ω max.		
TM II-M	−50 ~ +125°C	70V	600V	60A	500W×2	15*	10MHz*	1.0Ω max.	250 ns*	300 ns*
TM II-N			800V					1.5Ω max.		
TM II-H			1200V							
TM II-V			1500V			20*				

*Nominal value

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