

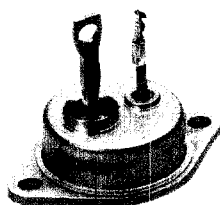
TOKIN

SIT

Home Inc.



Another Tokin exclusive. Static Induction Transistors.



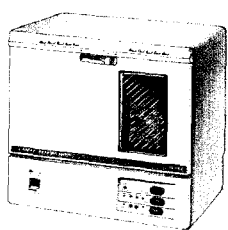
SIT (Static Induction Transistor) was invented by Professor Jun-ichi Nishizawa of Tohoku University in 1950. After several subsequent technological developments and improvements, it was first utilized in 1979 as an industrial power SIT.

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.

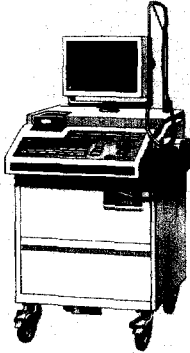
Prior to this, the elements in most high-frequency devices, including ultrasonic devices of several kilowatts or more, high-frequency induction heaters, high-frequency, large-capacity switching power supplies and broadcast transmitters, were large, inefficient and difficult-to-handle vacuum tubes.

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 1kW- or 3kW-type SITs in parallel. SIT is different from bipolar transistors (BPT) and thyristors (SCR) in both principle and construction.



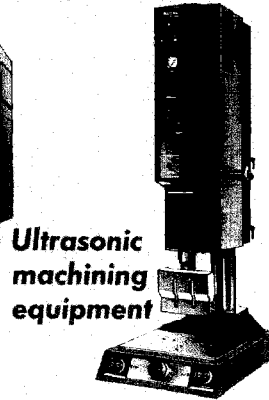
Dishwashers



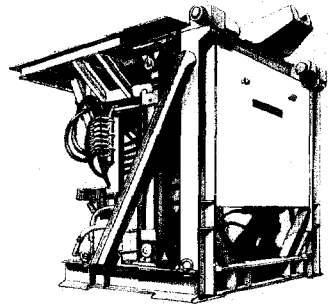
Ultrasonic diagnostic systems



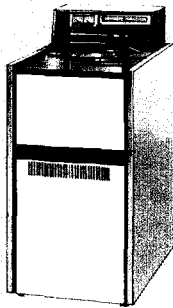
Fish finders



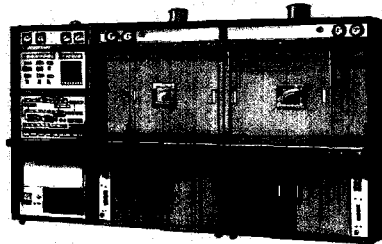
Ultrasonic machining equipment



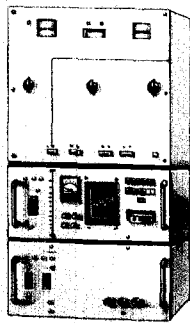
Induction heating systems



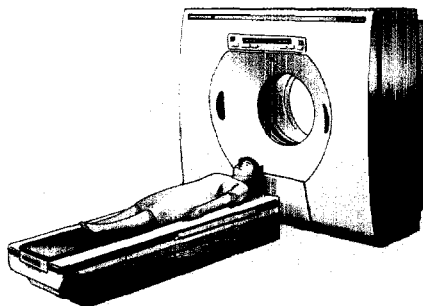
Metal melting furnaces



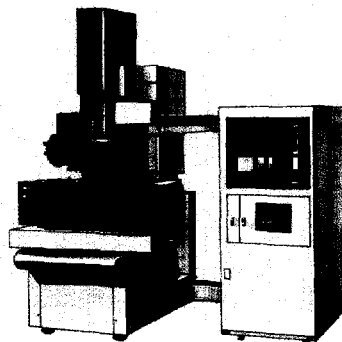
IC manufacturing systems



AM broadcasting transmitters

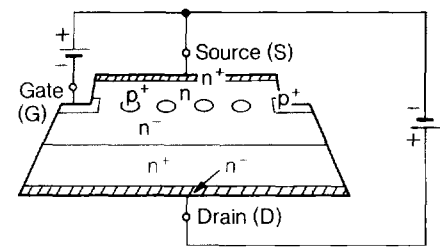


X-ray CT scanners

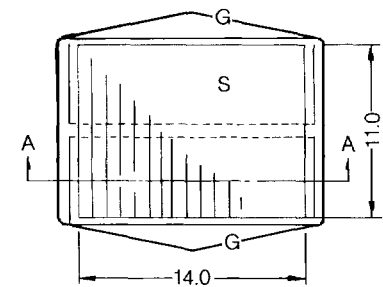


Power supplies for laser beam machining

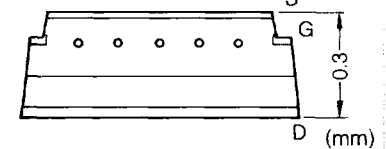
SIT N-type (cross section)



Chip (1 kW type)

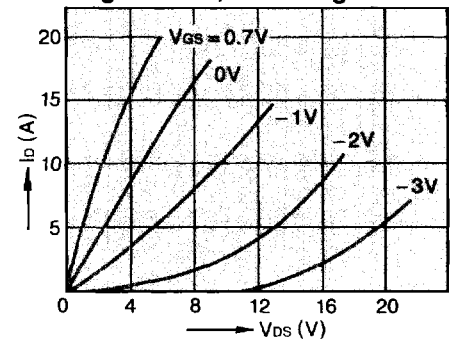


A-A cross section

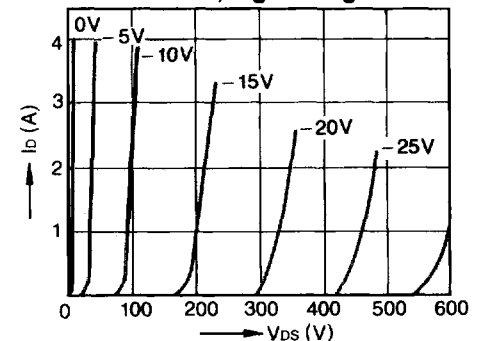


Output Characteristics Example (2SK182)

Large current, low voltage



Small current, high voltage



SIT-Applied Equipment

Ultrasonic Wave Cleaner

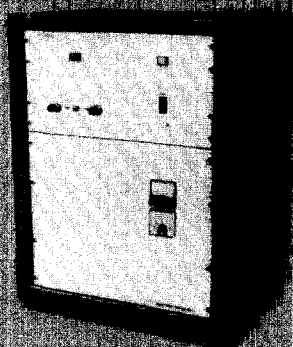


- Allows optimum cleaning immediately after switching ON.
- Increased efficiency thanks to full transistorization, use of SIT, a unique circuit, and an ideal transducer-to-oscillator matching system.
- Remarkably miniaturized and lightweight compared to conventional oscillators.
- Electrically rigid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

Induction Heating System



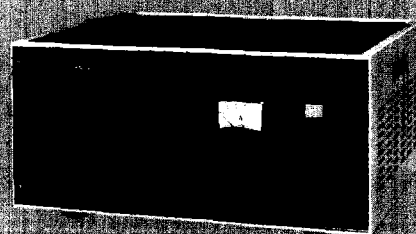
- Miniaturization and higher efficiency using high-power SIT.
- Control circuit utilizes PLL control to maintain optimum load change conditions.
- Complete protection against abnormal voltage and overcurrent.
- Built-in power control (optional 5 kW or less); optional automatic temperature control.

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

[Usages]

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

High-Power Amplifier



- 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.

Switching Power Supply



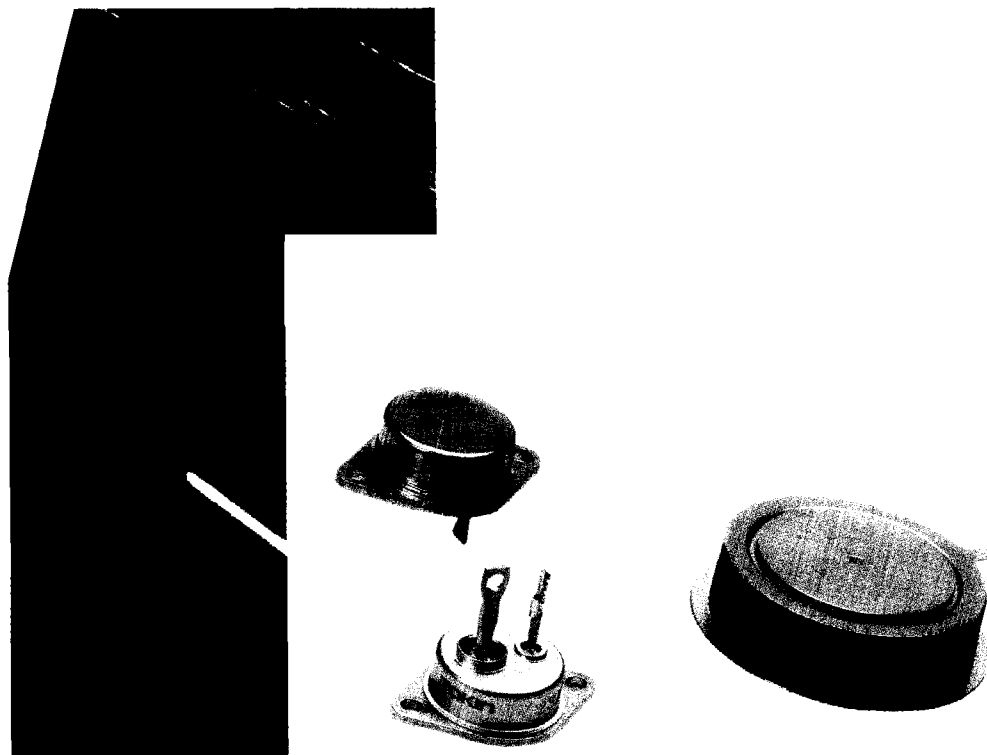
- High-power SIT makes for greater rigidity and efficiency.
- Switching capability for high-output power supply.
- Constant voltage and constant current characteristics.
- Complete protection control.
- Compact, lightweight.

[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

| Application | Equipment | Application |
|--------------------------|--|---|
| 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.

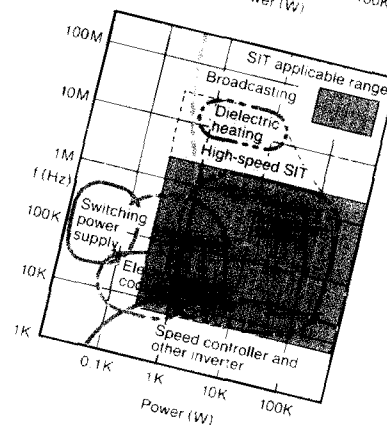
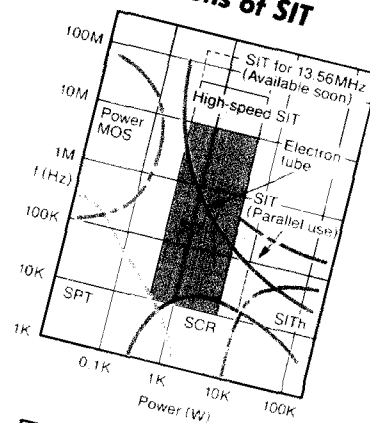
Small driving power

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

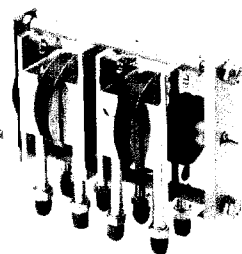
Unsaturated current-voltage characteristics

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

Applications of SIT

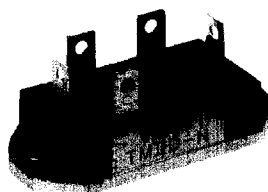


Special Components Using Built-in SITs



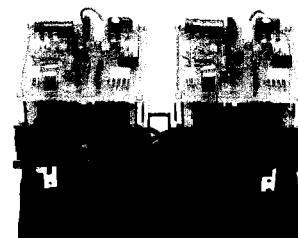
SIT Stack

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.

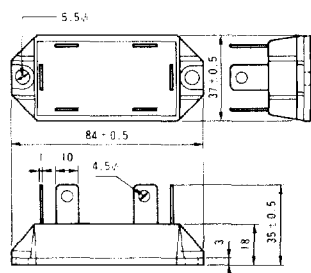


SIT Power Unit

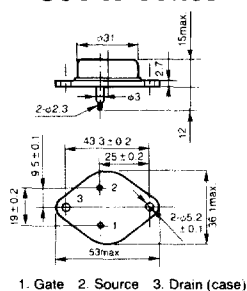
This unit consists of a SIT Stack connected to a printed wiring driving board and is used exclusively for switching. By inputting a square wave of 20 ~ 200kHz into the printed board, SIT provides a power output amplified several hundred times. A variety of configurations is available in accordance with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

Shapes and Dimensions

SIT Power Module

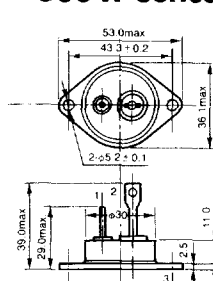


300W Series

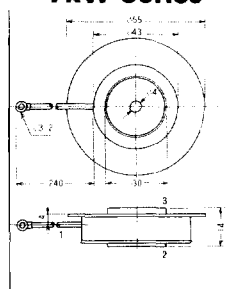


1. Gate 2. Source 3. Drain (case)

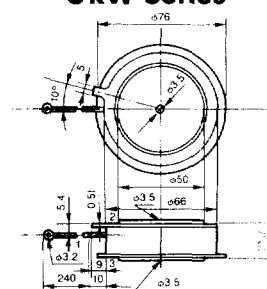
500W Series



1kW Series



3kW Series



Specifications

| Term Model | Storage Temp. range | Gate-to-Source Voltage | Gate-to-Drain Voltage | Drain Current | Total Power Dissipation | Insertion Loss Gain | Cap-ON 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 | 15* | 10MHz* | 1.0Ω max. | 250 ns* | 300 ns* |
| 2SK183E | | | 800V | | | | | 1.5Ω max. | | |
| 2SK183HE | | | 1200V | | | | | | | |
| 2SK183VE | | | 1500V | | | | | | | |
| 2SK182 | | | 600V | 60A | 1000W | 15* | 10MHz* | 1.0Ω max. | 250 ns* | 300 ns* |
| 2SK183 | | | 800V | | | | | 1.5Ω max. | | |
| 2SK183H | | | 1200V | | | | | | | |
| 2SK183V | | | 1500V | | | | | | | |
| TS300 | | | 600V | 200A | 3000W | 15* | 7MHz* | 0.3Ω max. | 350 ns* | 350 ns* |
| TS300H | | | 1200V | 180A | | 20* | | 0.5Ω max. | | |
| TS300V | | | 1500V | | | | | | | |
| 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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