

# POWER FET (SIT)

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## Introduction

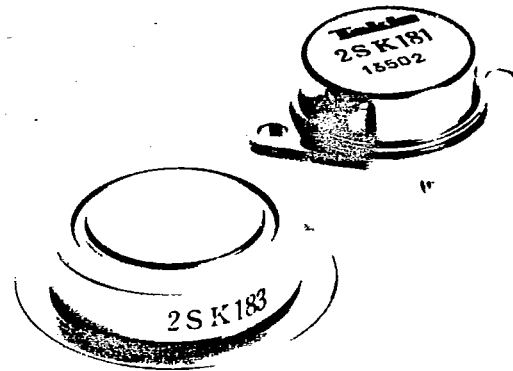
A new high-power, vertical field effect (FET), static induction transistor (SIT) has been developed by TOKIN, Tohoku Metal Industries, Ltd. In high-frequency-level and high-power applications, this TOKIN SIT offers a number of advantages over comparable transistors.

### Features

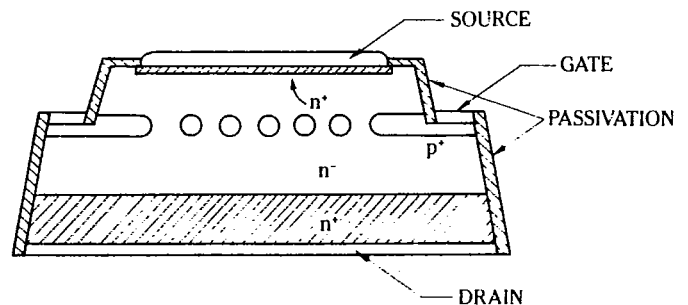
- 1. High voltage carrying capacity**  
The TOKIN SIT can carry 600 ~ 1500 V, and can be used in direct commutation equipment at 100 ~ 240 V.
- 2. Good switching characteristics**  
Due to its high-speed switching characteristics, the TOKIN SIT can be used in both high-frequency and high-power applications.
- 3. Good heat-proof design and a negative temperature coefficient**  
The TOKIN SIT's design eliminates spot concentrations of current.
- 4. High power amplification**  
The TOKIN SIT has a higher input impedance level than comparable transistors and is able to control power of over 1kW with very low power.
- 5. High reliability**  
Like all TOKIN transistors, the TOKIN SIT is designed to provide reliable, long-lasting performance.

### Main applications

- 1. Ultrasonic generators**
- 2. High-frequency power oscillators**
- 3. Power supplies**
  - a) Switching-mode regulators
  - b) Series regulators
- 4. Broadcasting equipment**
- 5. Vacuum tube replacement** (Compared to traditional vacuum tubes, the TOKIN SIT offers solid-state performance, smaller size, longer life, and higher reliability).



Power SIT



STRUCTURE OF SIT  
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# ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

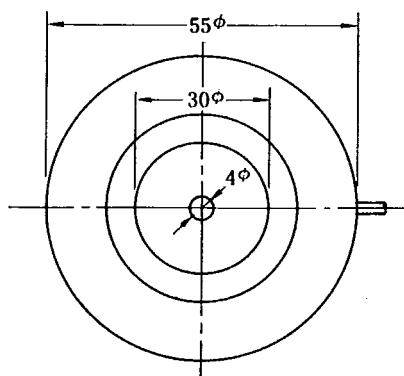
Term	Symbol	Condition	2SK180	2SK181	2SK182	2SK183	2SK183H	2SK183V
Storage Temperature	T <sub>stg</sub>		-50 ~ +150°C					
Operating Junction Temperature	T <sub>j</sub>		+150°C					
Gate to Source Voltage	V <sub>GSO</sub>		70V					
Gate to Drain Voltage	V <sub>GDO</sub>		600V	800V	600V	800V	1200V	1500V
Gate Current	I <sub>G</sub>	V <sub>GS</sub> = 1V	0.5A					
Drain Current	I <sub>D</sub>		20A			60A		
Total Power Dissipation	P <sub>T</sub>	Ta = 25°C	300W			1000W		

# ELECTRICAL CHARACTERISTICS (Ta = 25°C)

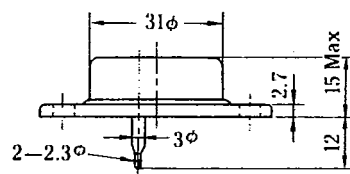
Gate to Source Breakdown Voltage	V(BR)GSO	I <sub>G</sub> = 0.1mA	80V min.					
Gate Leak Current	I <sub>GSS</sub>	V <sub>GS</sub> = -40V	100μA max.					
Drain Cut-Off Current	I <sub>D</sub> (off)	V <sub>GS</sub> = -50V	100μA max.					
Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V <sub>DS</sub> = 10V	8A*	5A*	18A*	10A*		
Gate to Source Cut-Off Voltage	V <sub>GS</sub> (off)	V <sub>DS</sub> = 300V I <sub>D</sub> = 1mA	30V*					
Gate to Drain Breakdown Voltage	V(BR)GDO	I <sub>D</sub> = 0.1mA	600V min.	800V min.	600V min.	800V min.	1200V min.	1500V min.
Insertion Gain	μ	V <sub>DS</sub> = 50V I <sub>DS</sub> = 2A	10*				12*	
Input Capacitance	C <sub>iss</sub>	V = 10V f = 1MHz	2500PF*			8000PF*		
Cut-Off Frequency	f <sub>T</sub>	V = 20V I <sub>D</sub> = 2A	10MHz*			10MHz*		
Drain to Source ON Resistance	r <sub>on</sub>	V <sub>GS</sub> = 0 I <sub>D</sub> = 2A	1.5Ω max.	2Ω max.	1.0Ω max.	1.5Ω max.		
Drain to Source OFF Resistance	r <sub>off</sub>	V <sub>DS</sub> = 300V V <sub>GS</sub> = -50V	1MΩ min.					
Turn-On TIME	t <sub>on</sub>	I <sub>D</sub> = 1.5A V <sub>DS</sub> = 50V	200 ns*			250 ns*		
Turn-Off TIME	t <sub>off</sub>		250 ns*			300 ns*		

Note: \* nominal value

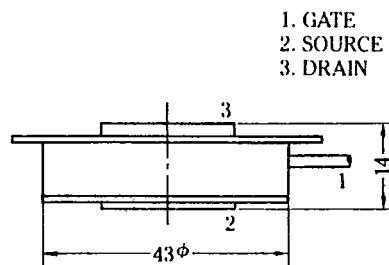
# PACKAGE DIMENSIONS (in mm)



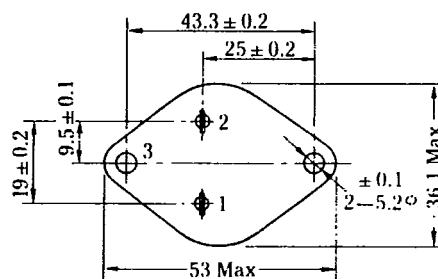
2SK 182, 183 series



2SK 180, 181



1. GATE  
2. SOURCE  
3. DRAIN

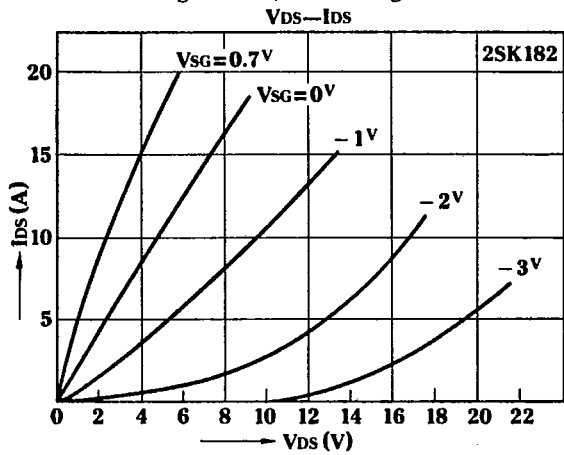


1. GATE  
2. SOURCE  
3. DRAIN (CASE)

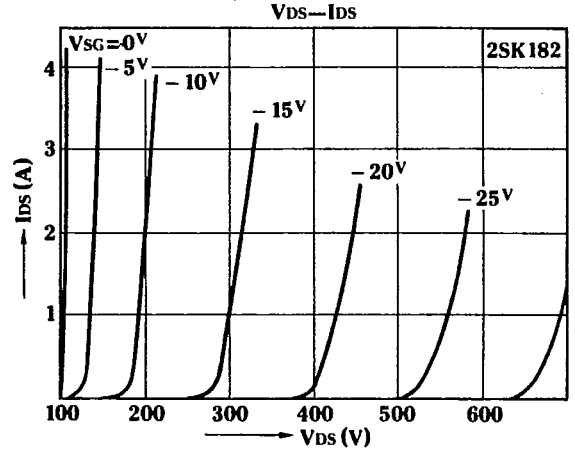
# TYPICAL OUTPUT CHARACTERISTICS

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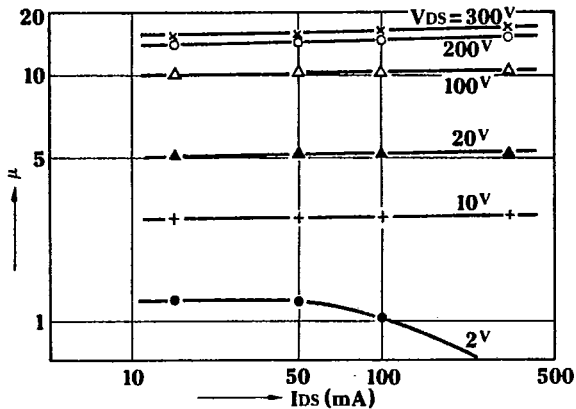
Big Current, Low Voltage Area



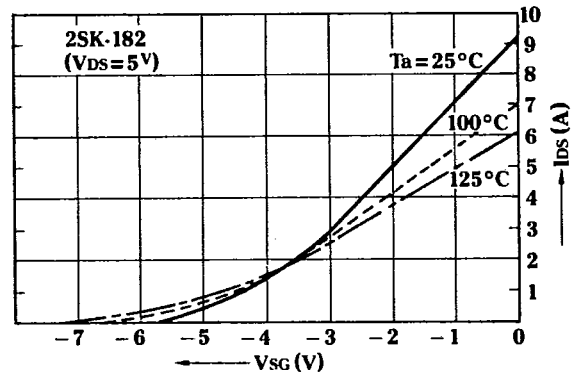
Small Current, High Voltage Area



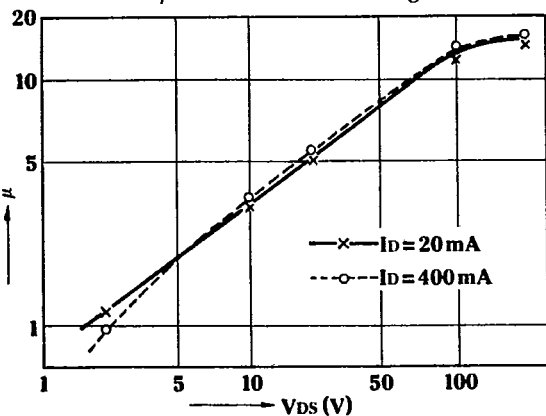
Drain Current vs.  $\mu$



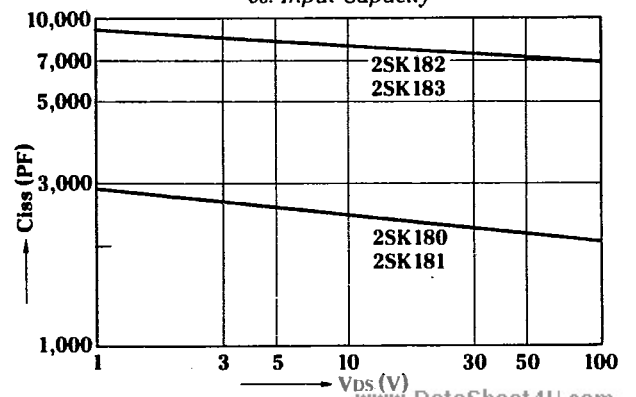
Gate Bias  $V_{SG}$  (V)  
 Temperature Dependency of  
 Drain Current vs. Gate Bias



Drain Voltage  $V_{DS}$  (V)  
 $\mu$  vs. Drain-Source Voltage



Drain Voltage  $V_{DS}$  (V)  
 Drain-Source Voltage  
 vs. Input Capacity



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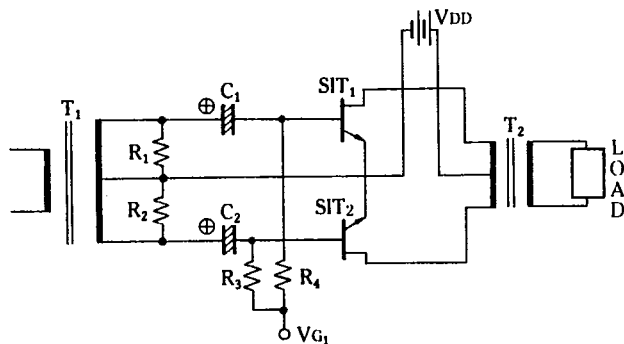
**Before using the TOKIN SIT, please note the following points:**

1. When there is no voltage to the gate bias, it will become a short-circuit between the source and the drain. If any voltage is added to the drain at that time, the current will be too high. Therefore, voltage must be added to the gate bias before it is added to the drain.
2. The voltage to the gate bias must be fully applied in order to be able to cut off the drain current.
3. When a flat-type case is being used, the fasten-pressure between the source and drain must be approximately 200 ~ 300 kg.

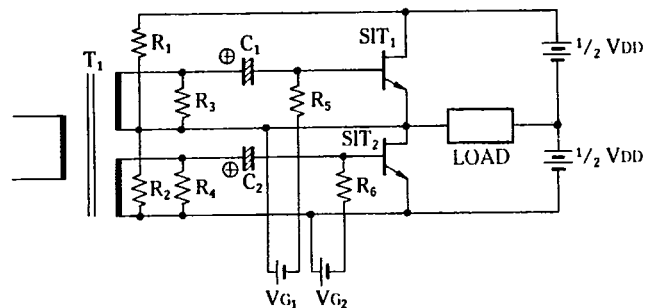
4. When the TOKIN SIT is being used as a voltage-control element, its high-speed switching characteristics produce voltage spikes while switching. Therefore, special precautions must be taken.
5. When the TOKIN SIT is to be used with very high power, proper heat dissipation must be ensured.

## STANDARD CIRCUITRY

(a) DEPP CIRCUIT



(b) SEPP CIRCUIT



## APPLICATION CIRCUITRY

