

Present Status of Static Induction Thyristor (SIThy)

Naohiro Shimizu

Takayuki Sekiya

Katsuji Iida

*Jun-ichi Nishizawa

NGK Insulators, Ltd.

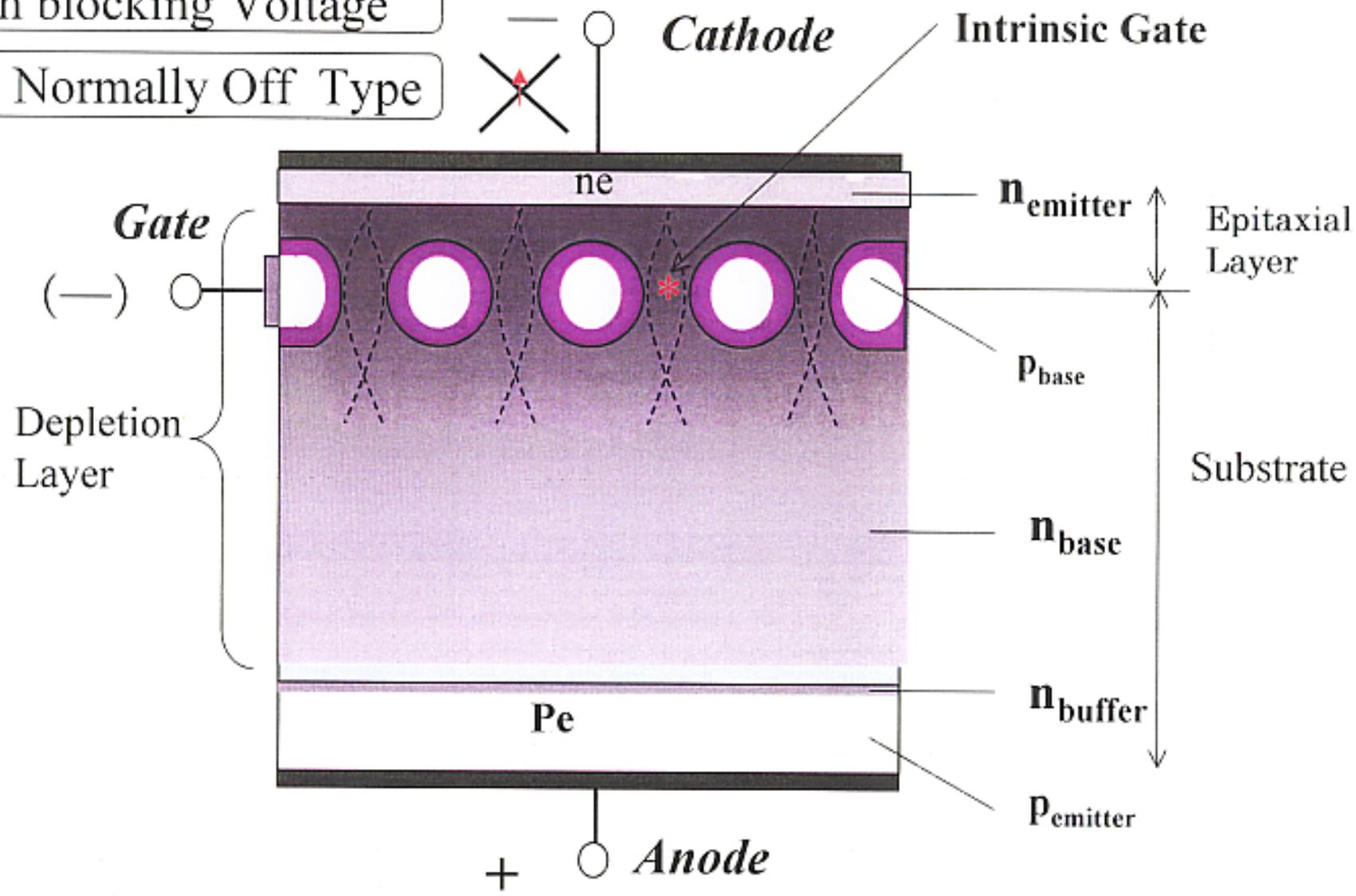
***Semiconductor Research and Institute**

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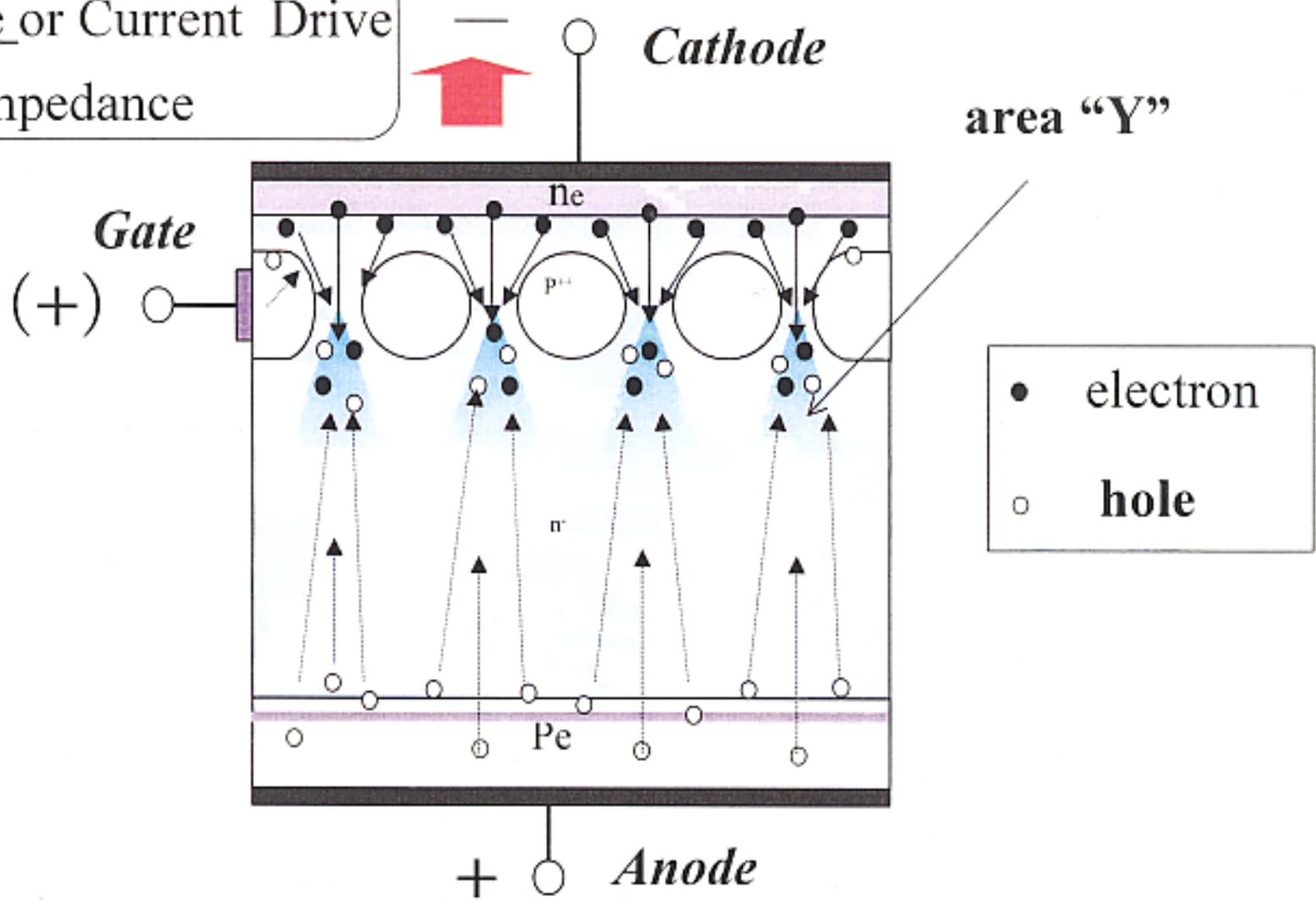
1. The basic actions of SITHy
2. Pulse semi-conduction mode and turn-off characteristics of SITHy
3. For the closing switch application;
the new pulse generating electric source,
Inductive Energy Storage (IES) circuit
4. Cathode side views of SITHys

High blocking Voltage
Semi Normally Off Type



Statically OFF state

Gate
:Voltage or Current Drive
:Low impedance

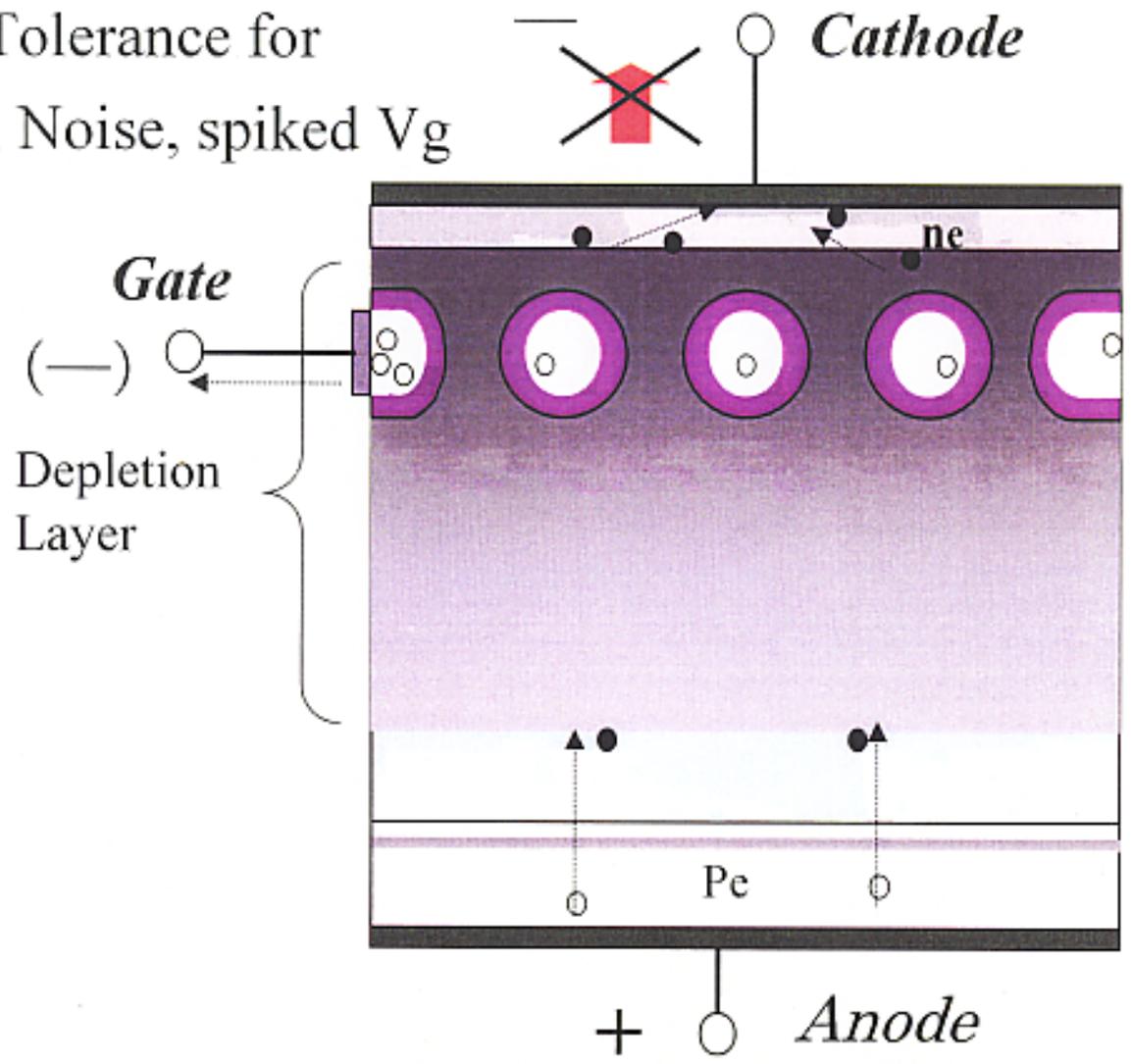


Turn-On state

Instant Current Gate Drive

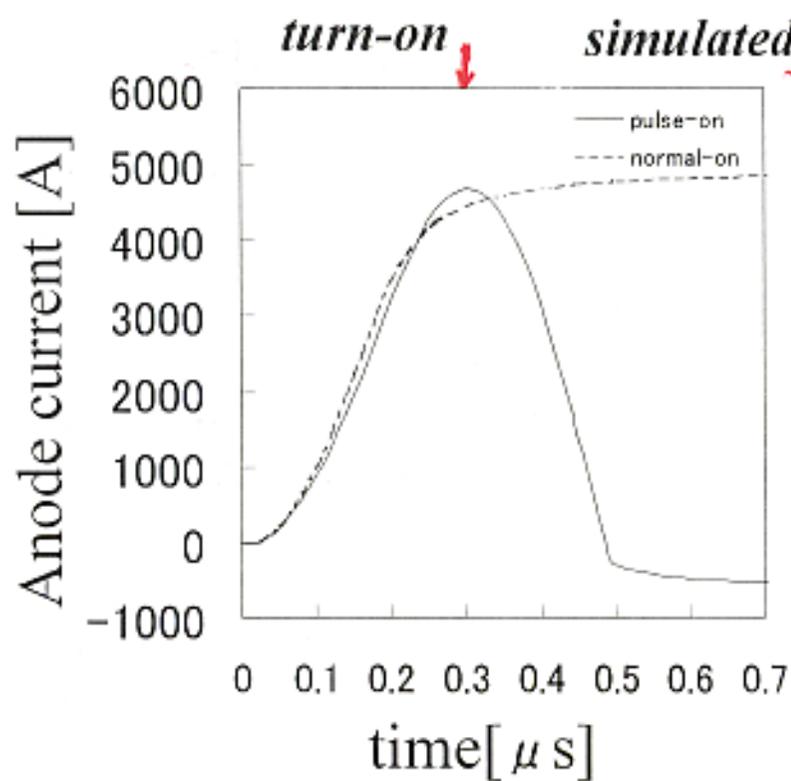
High Tolerance for

: dv/dt , Noise, spiked V_g



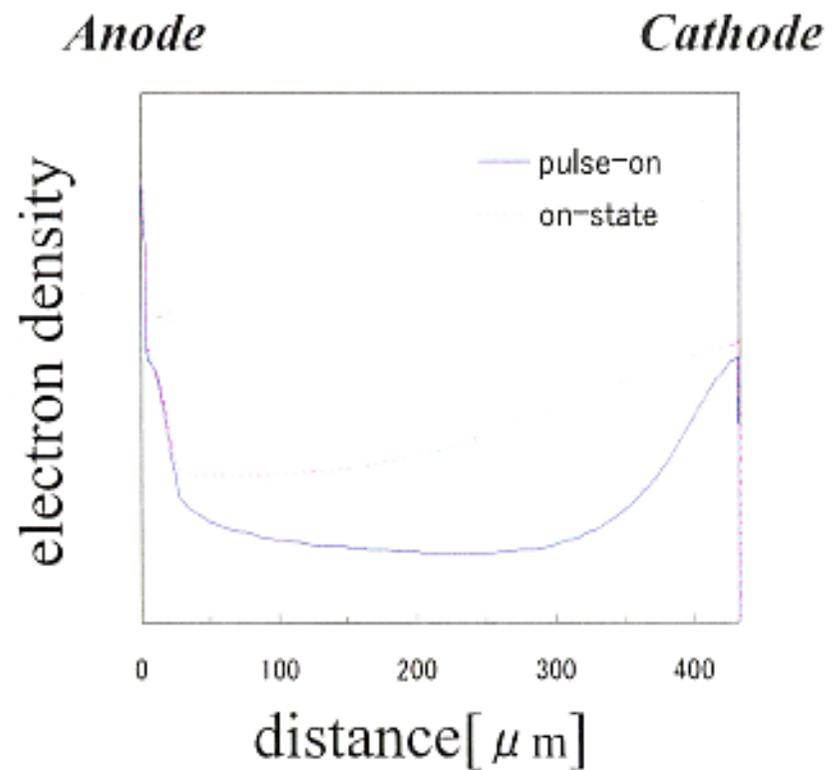
- electron
- hole

Turn-Off state



(a)

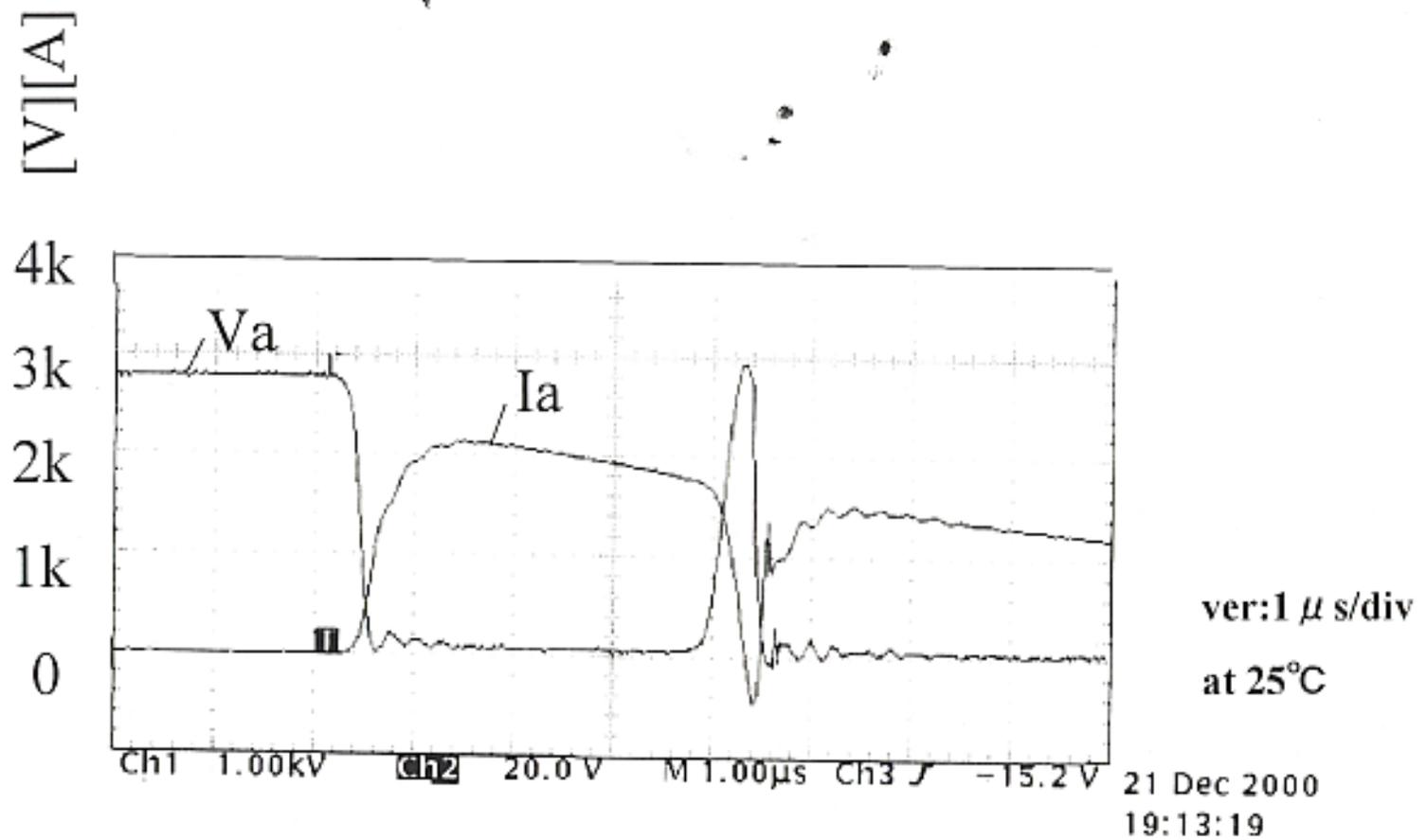
Calculated Pulse turn-on and normal turn-on waveforms



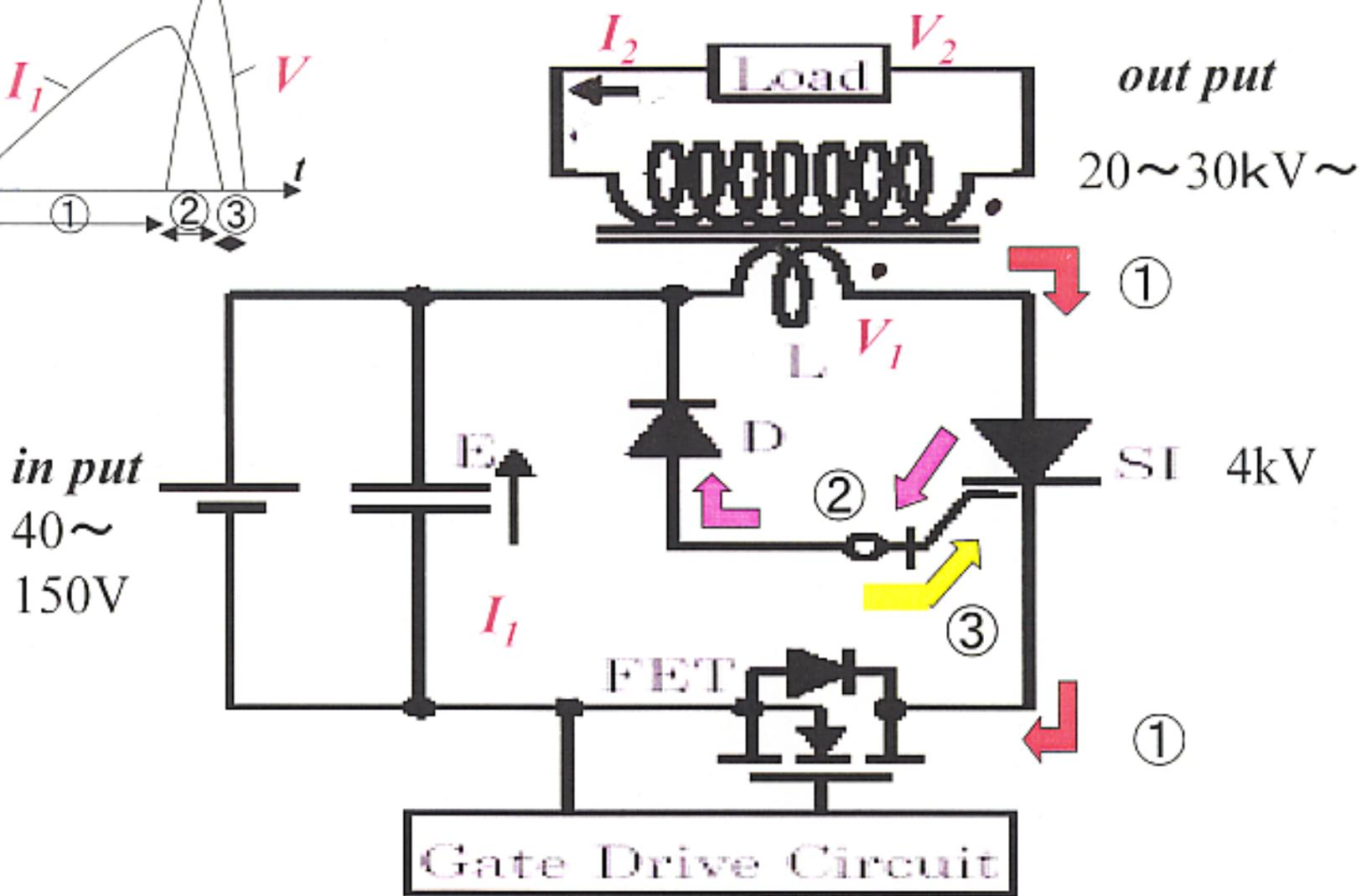
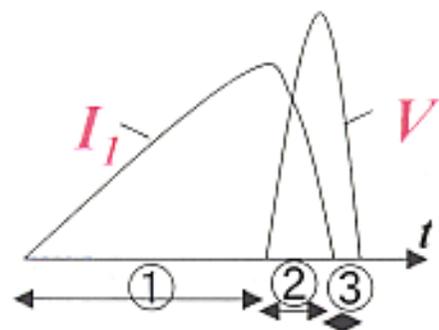
(b)

Carrier distributions in the substrate, under pulse turn-on and normal turn-on states after $0.3 \mu s$ since turn-on gate signal is applied

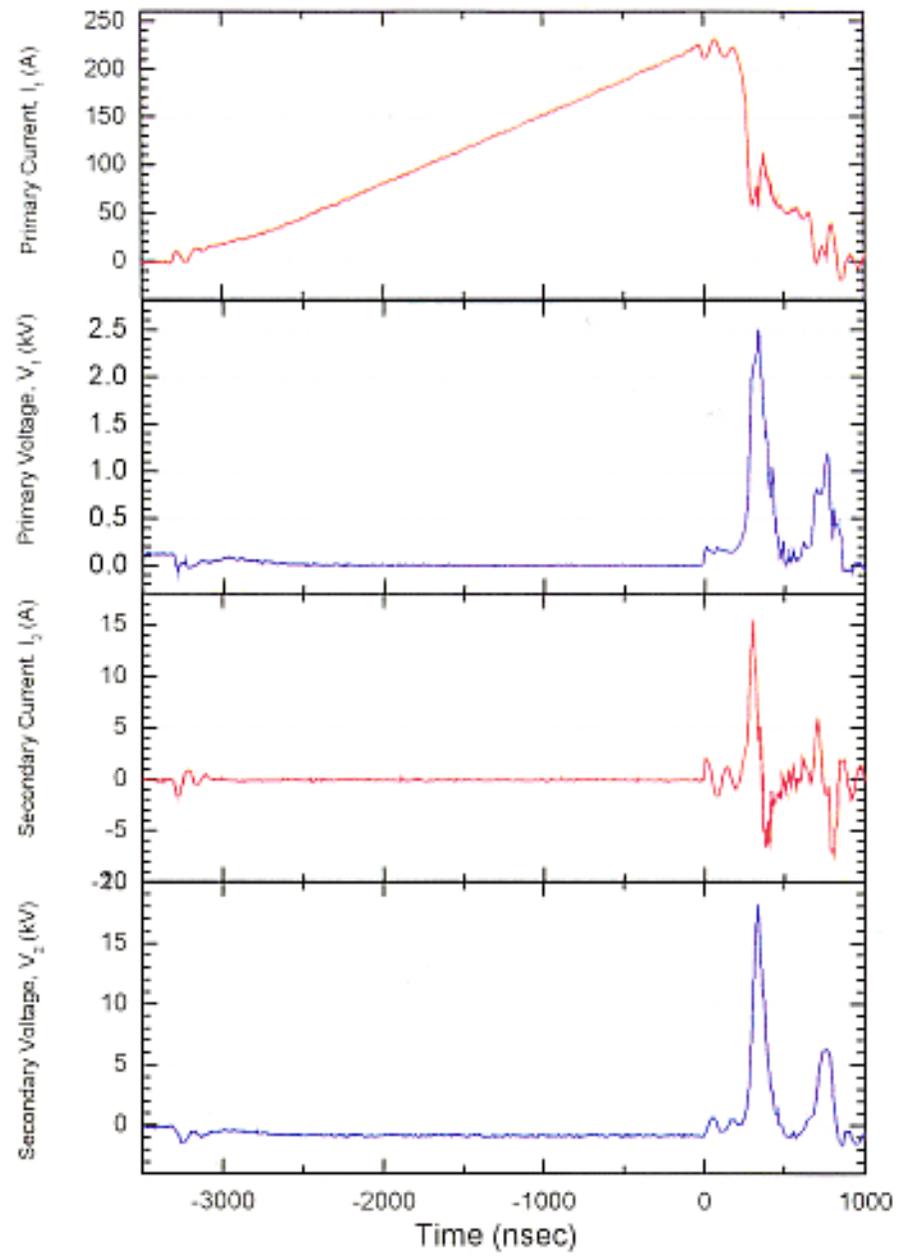
2.5ms, respectively



Pulse turn-off characteristics of 4000V/600A SiThy

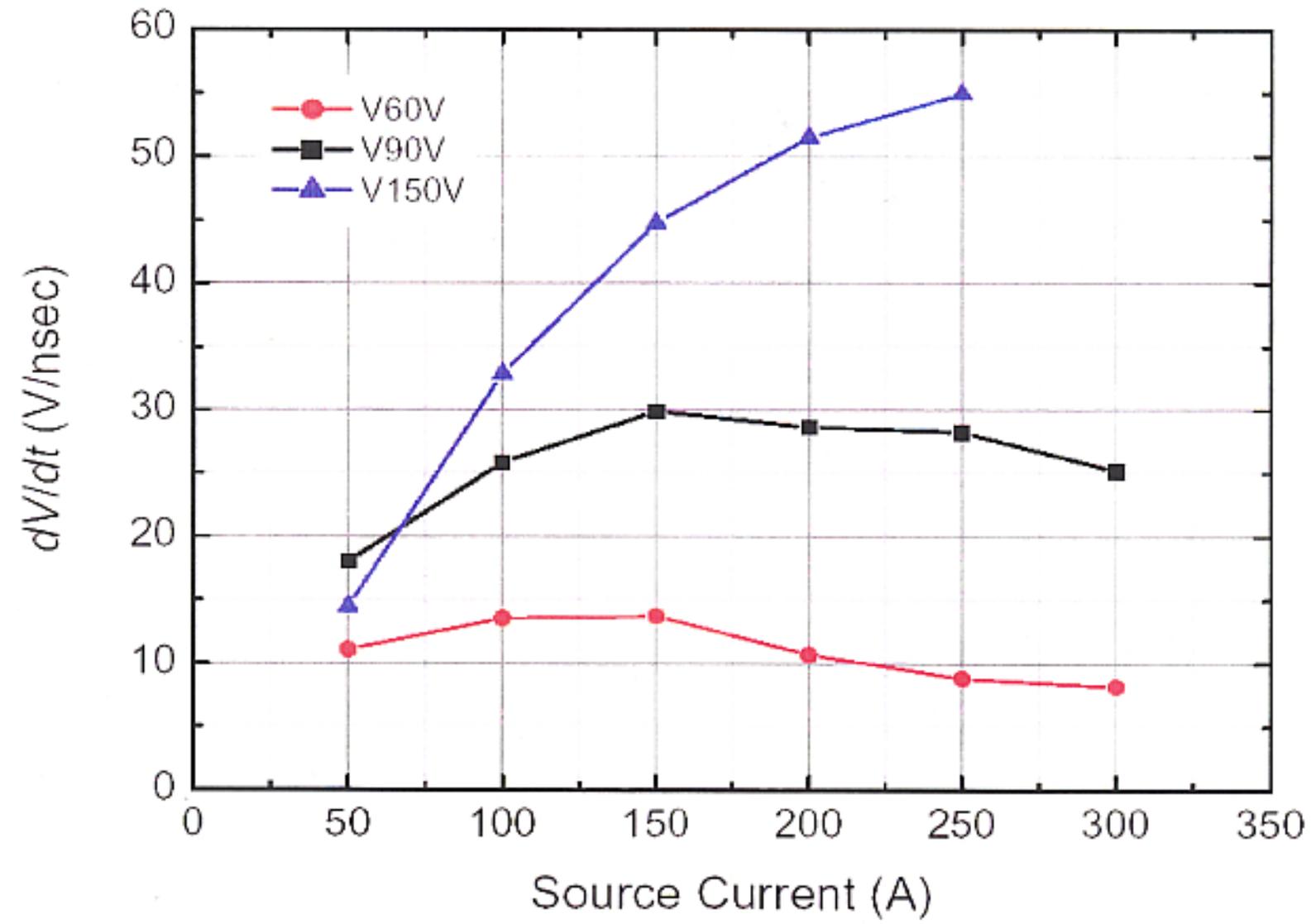


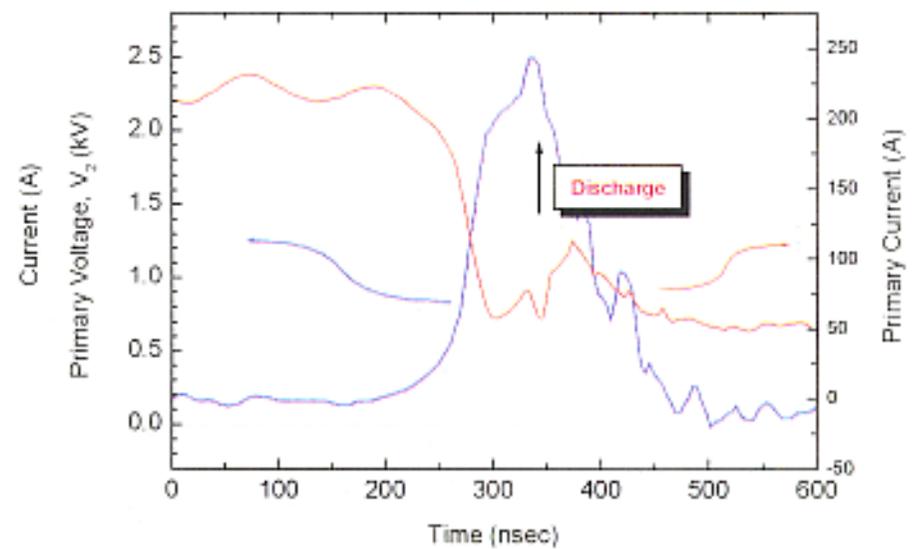
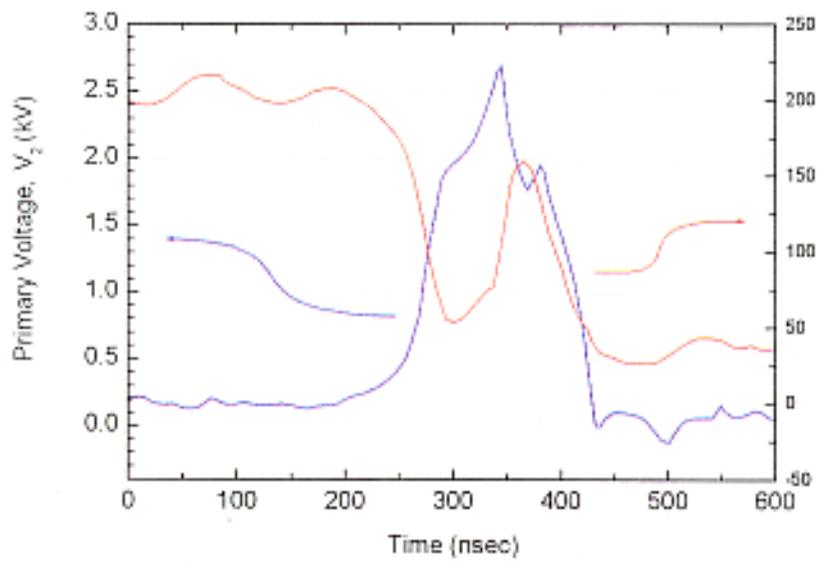
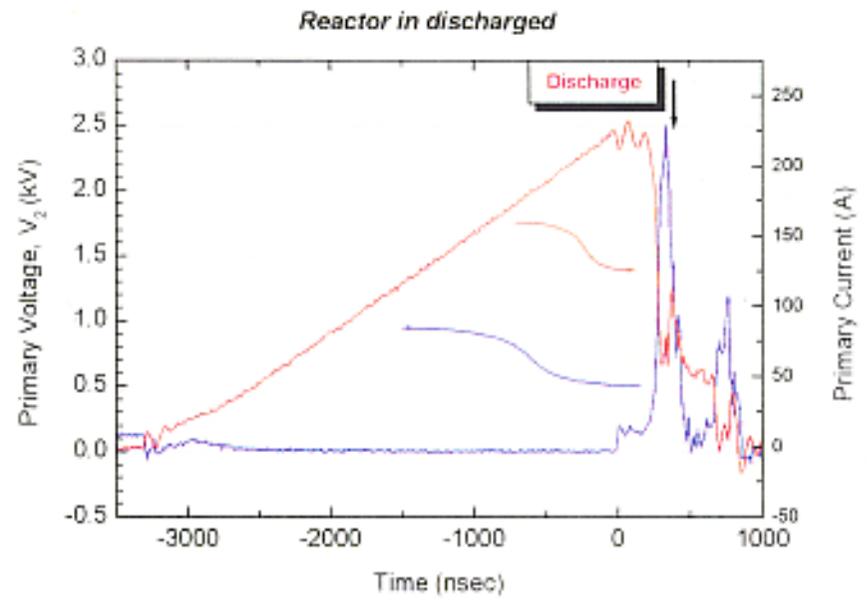
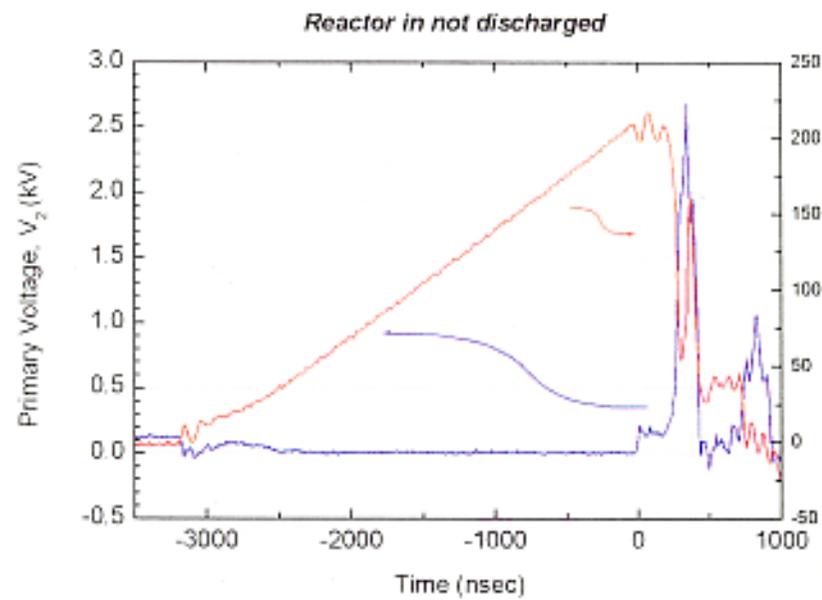
IES Circuit



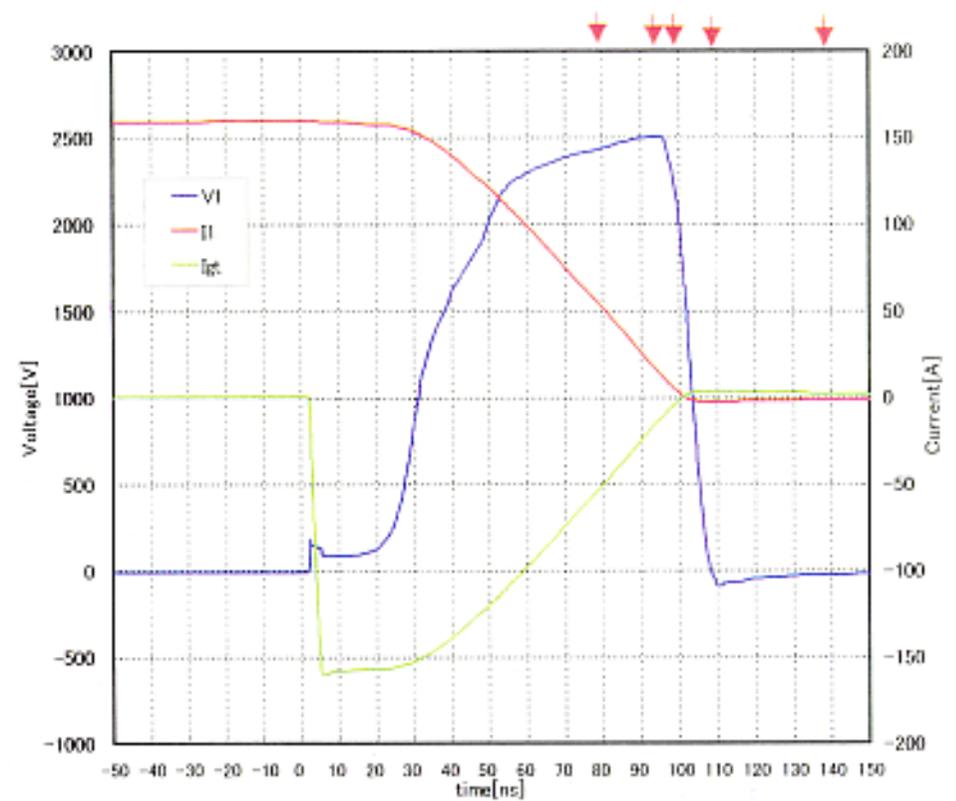
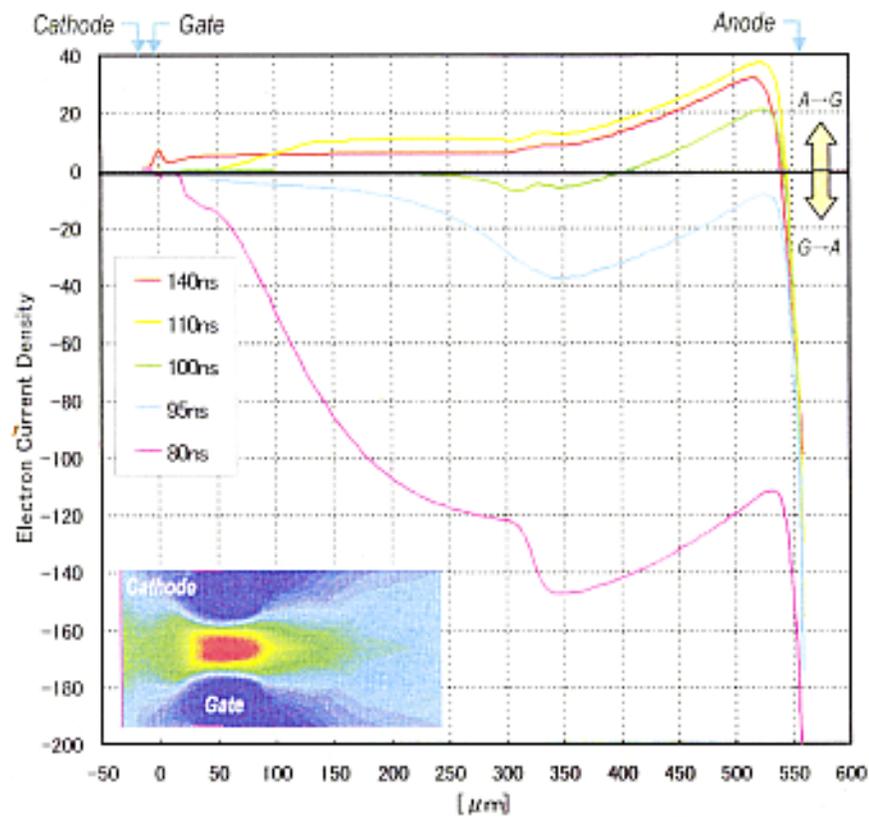
Pulse Waveform of IES at discharge mode

dV/dt characteristic of IES_Power_Source

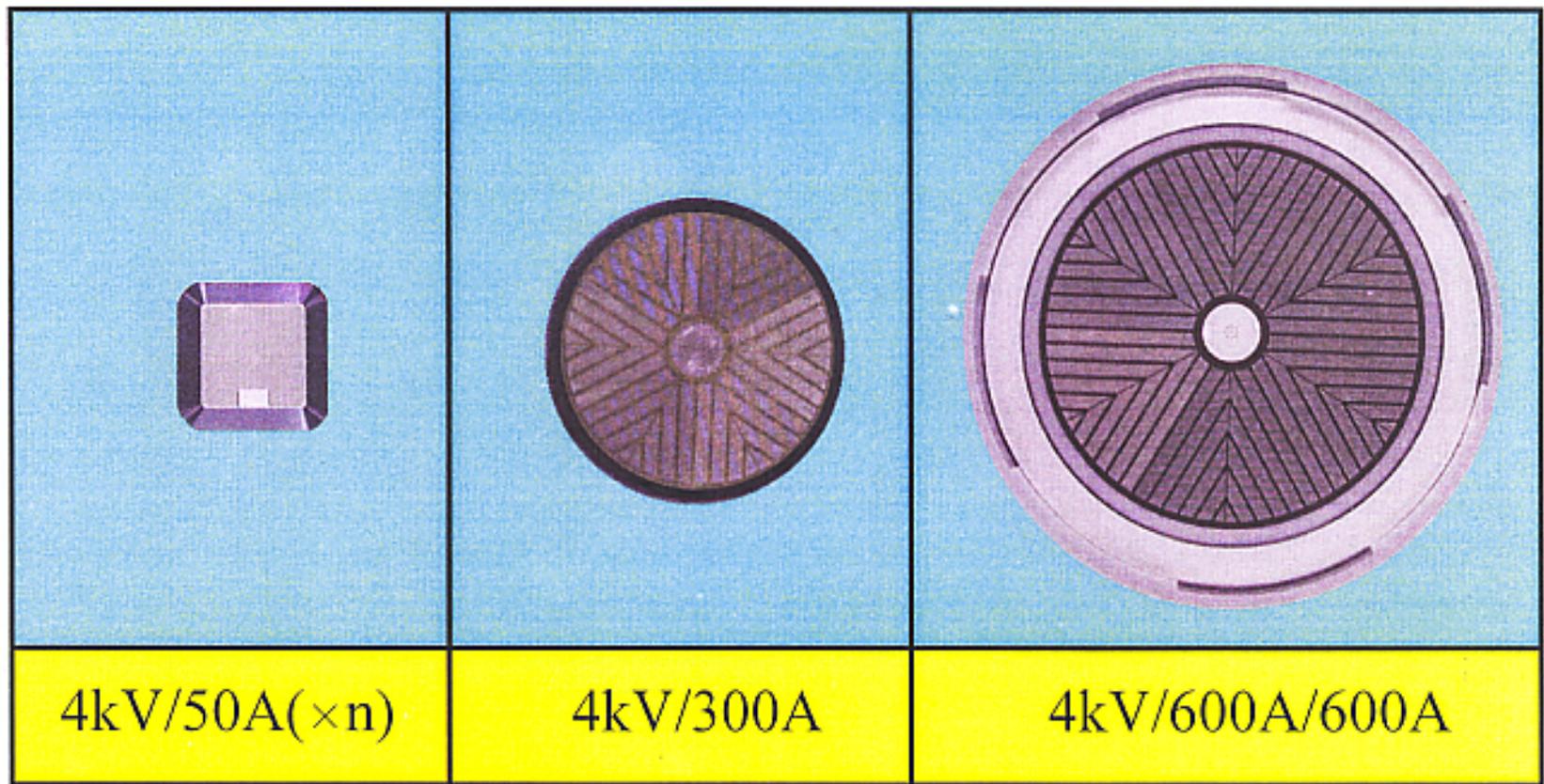




Pulse Waveforme of IES



Simulated electron current at the intrinsic gate of SITHy per transient of time



Cathode side views of SI Thyristors

●—● 1cm

Conclusion

- SITHy has superior pulse switching characteristics of turn-off, besides of turn-on.
- By making the most of switching features of SITHy, short and high dv/dt pulse waves can be simply got by **IES circuit**. The pulse, a half pulse width is 100ns and peak voltage is over 20kV, had been got. The working frequency, 1 to 2kHz, are realized.
- IES circuit needs only low voltage electric source, 40 to 150V which is determined by the latching voltage of SITHy.