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Xenon Flash Light IGBT Application Note

Hyper Device Division

March. 2014

Agenda

1. Operating Precautions

2. Recommended Circuit Example

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1. Operating Precautions

2. Recommended Circuit Example

Operating Precautions

**Please note the followings when you use the devices
because flash IGBTs handle high current.
Please evaluate the following points when designing.**

a. ICP precautions
b. dv/dt precautions
c. dv/dt adjustments
d. Wiring precautions

a. ICP precautions

The ICP, collector current peak is restricted by VGE, gate-emitter voltage.
Please use the device within the ICP-VGE safe operation area described in each product's specification.
Please note that the ICP is also restricted by the main condenser capacity.
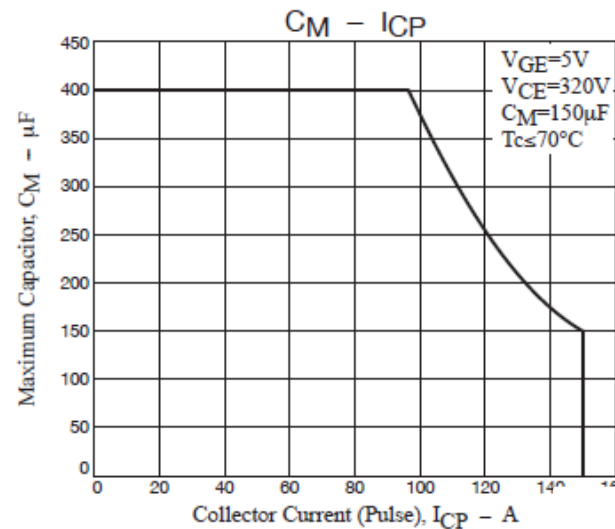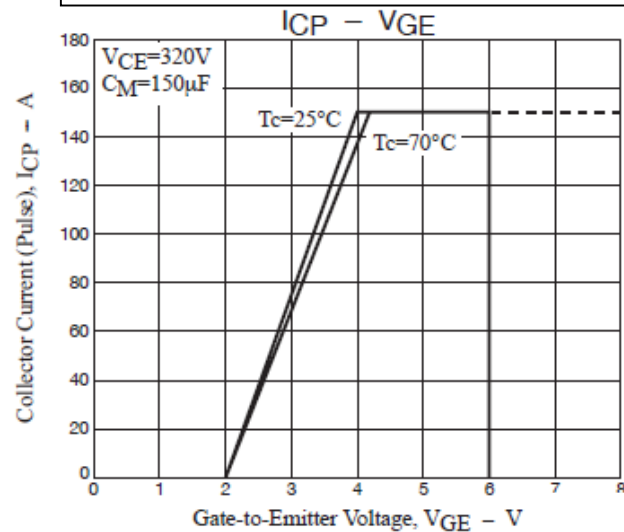
Operating waveform

Collector Current Peak ICP

Gate Signal

Collector-Emitter Voltage VCE

Collector Current IC

Example: TIG058E8's ASO

I_{CP} − VGE

V_{CE}=320V
C_M=150μF
T_c=25℃
T_c=70℃

Collector Current (Pulse), I_{CP} − A

Gate-to-Emitter Voltage, V_{GE} − V

C_M − I_{CP}

V_{GE}=5V
V_{CE}=320V
C_M=150μF
T_c≤70℃

Maximum Capacitor, C_M − μF

Collector Current (Pulse), I_{CP} − A

※Left chart shows the ASO for single-shot pulse.
Considering heat generation, please use the device with channel temperature Tch≦150℃ in continuous operating

b. dv/dt precautions

Please use the device with <u>400V/µs or less</u> of dv/dt , inclination of collector-emitter voltage in turn-off section. Using with dv/dt>400V/µs is not guaranteed.


Operating waveform

Expanded waveform in Turn-off section

Gate Signal

Collector-Emitter Voltage VCE

Collector Current IC

Turn-off section

⊿VCE

⊿t=100ns

**[Definition of dv/dt]
Max.⊿VCE/⊿t shall be dv/dt in turn-off section.**
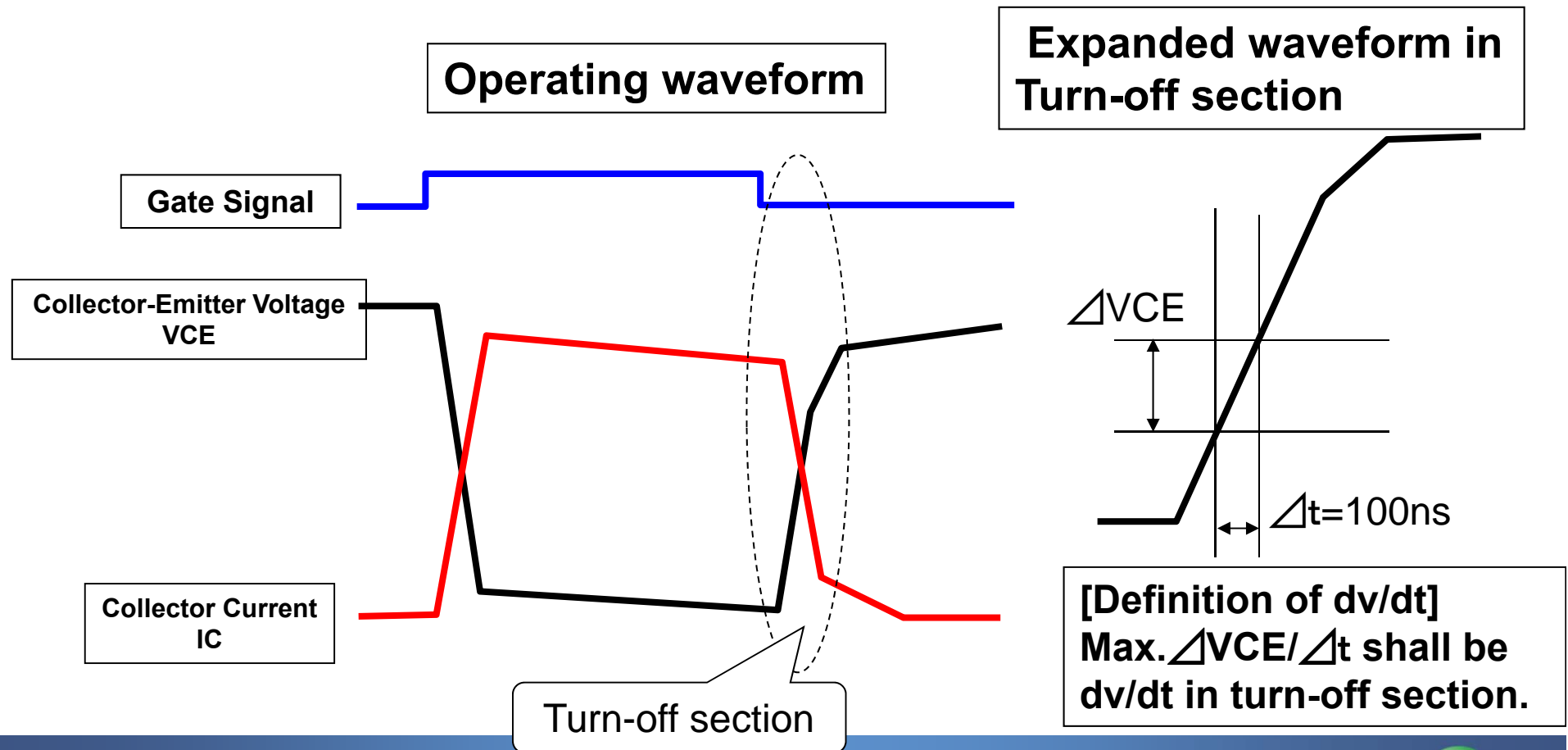
c. dv/dt adjustments

Please adjust the gate series resistance RG to keep dv/dt to <u>400V/µs or less.</u>
There is no restriction for Rg.
Though the dv/dt-Rg dependency differs according to the mount conditions,
for your reference, we provide the dv/dt-Rg dependency graphs in each
product's specification.

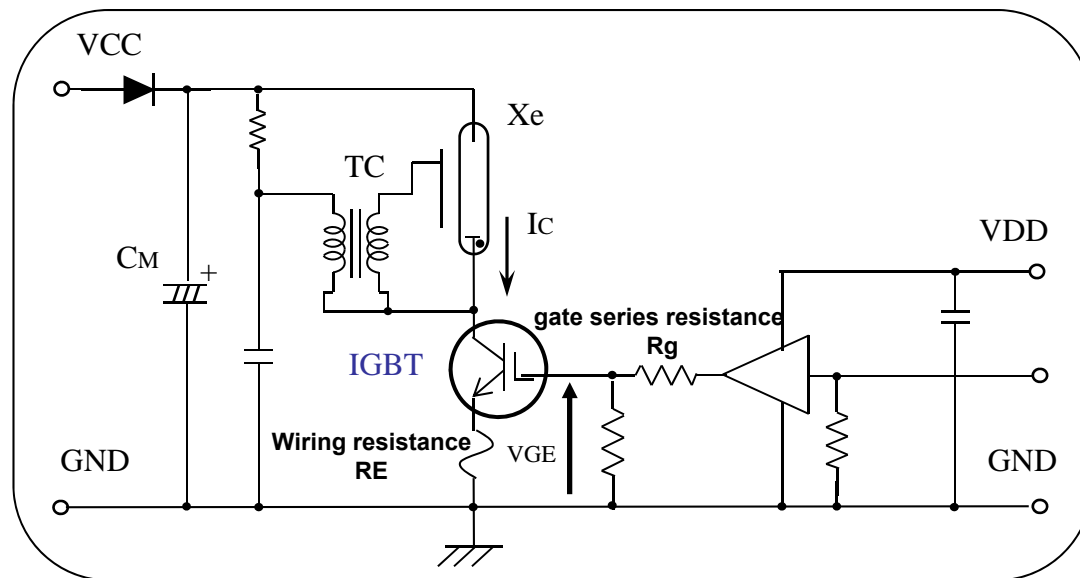**Example：TIG058E8's dv/dt-Rg dependency graph**
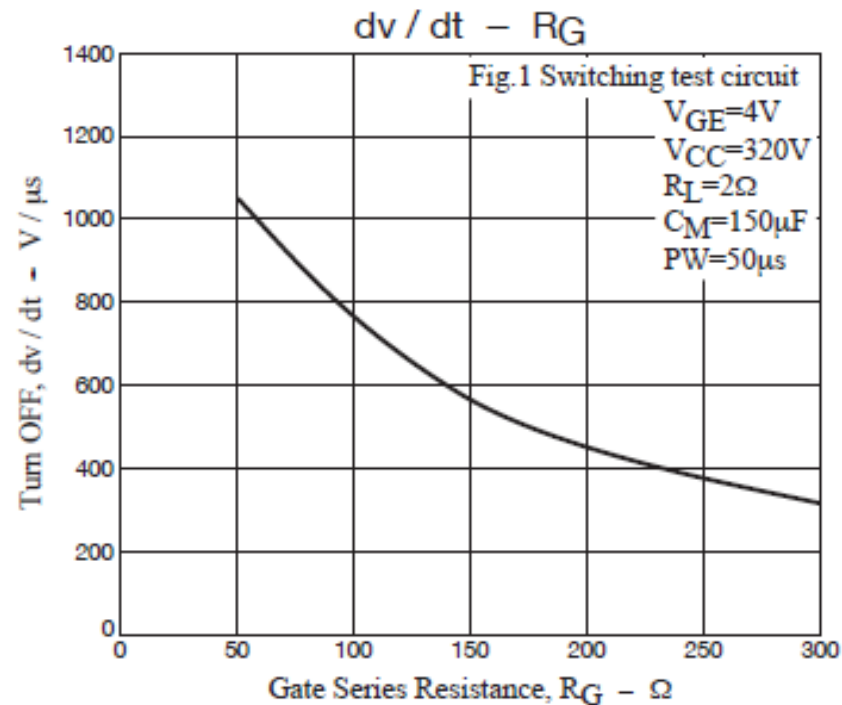
d. Wiring precautions

If the wiring resistance between IGBT's emitter terminal and GND is high, there will be rise in emitter terminal potential and lack in actual gate voltage during high current operation.
This may cause the breakdown of IGBT.

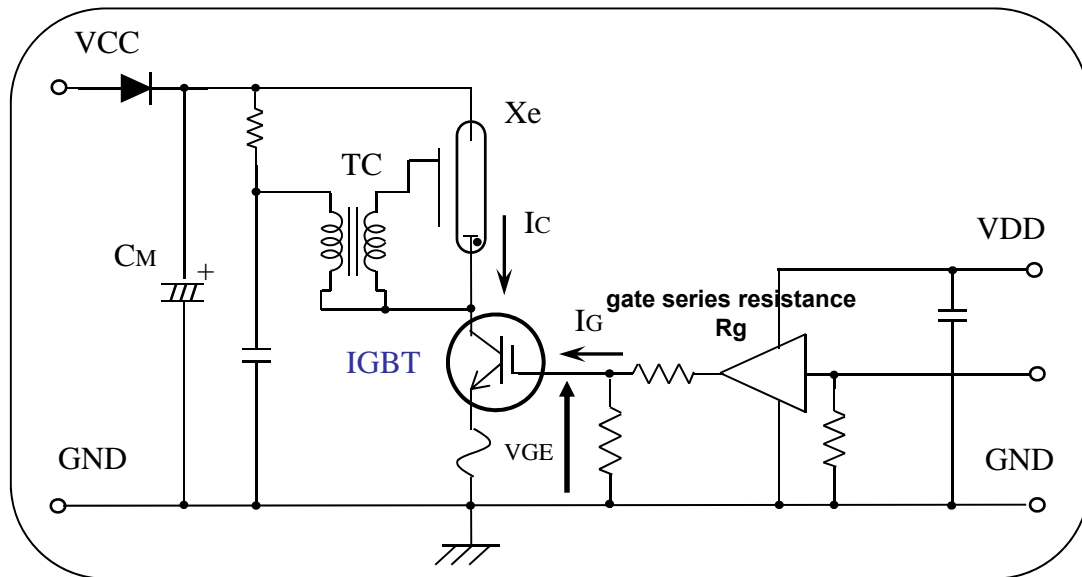**Flash Unit Application Circuit**

Gate Voltage during high current operation will be:

$$VGE - IC \times RE$$

Agenda

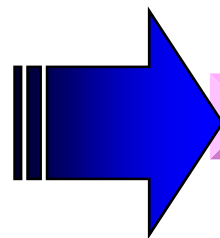1. Operating Precautions

2. Recommended Circuit Example

Recommended Circuit Example

①High current path should be thick and short

②Keep low impedance between IGBT-GND (3mΩ or less is recommended)

③Place IGBT & driver near by

Recommended Circuit