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Xenon Flash Light IGBT Application Note

Hyper Device Division

March. 2014

Agenda

1. Operating Precautions
2. Recommended Circuit Example
3. Evaluation Board Data

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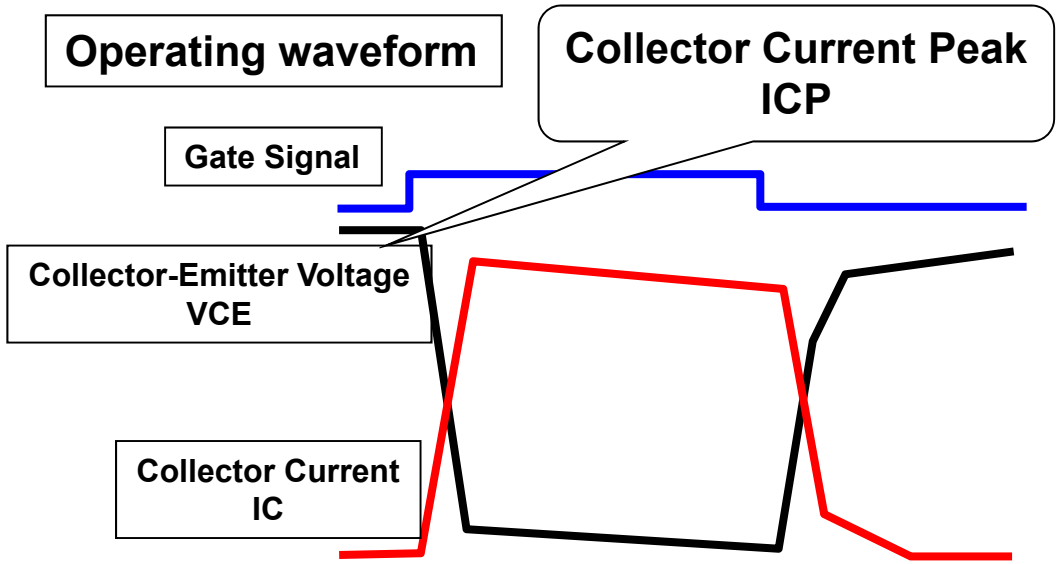
Operating Precautions

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

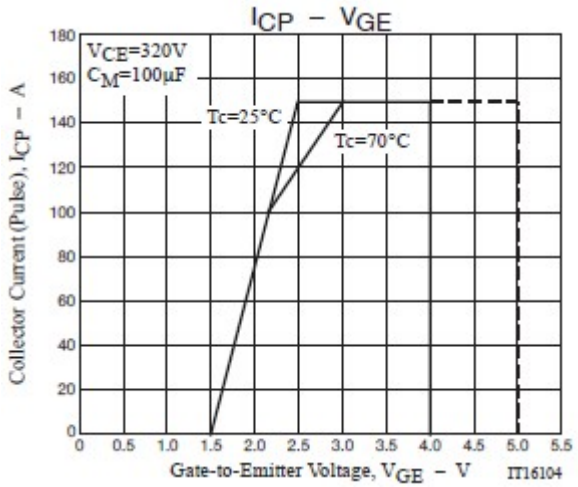
a. ICP precautions
b. dv/dt precautions
c. dv/dt adjustments
d. Wiring precautions

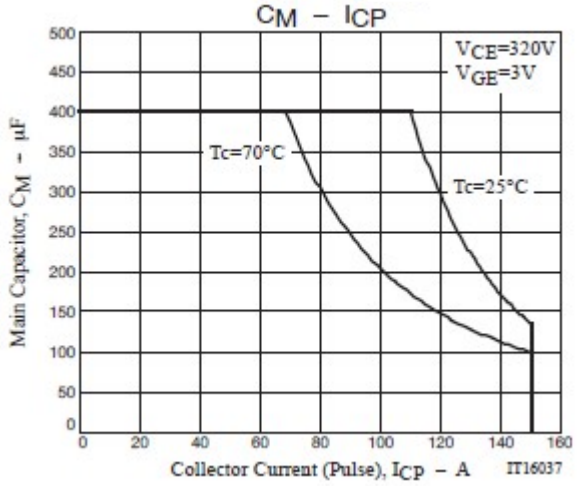
a. ICP precautions

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.



Example: TIG065E8's ASO

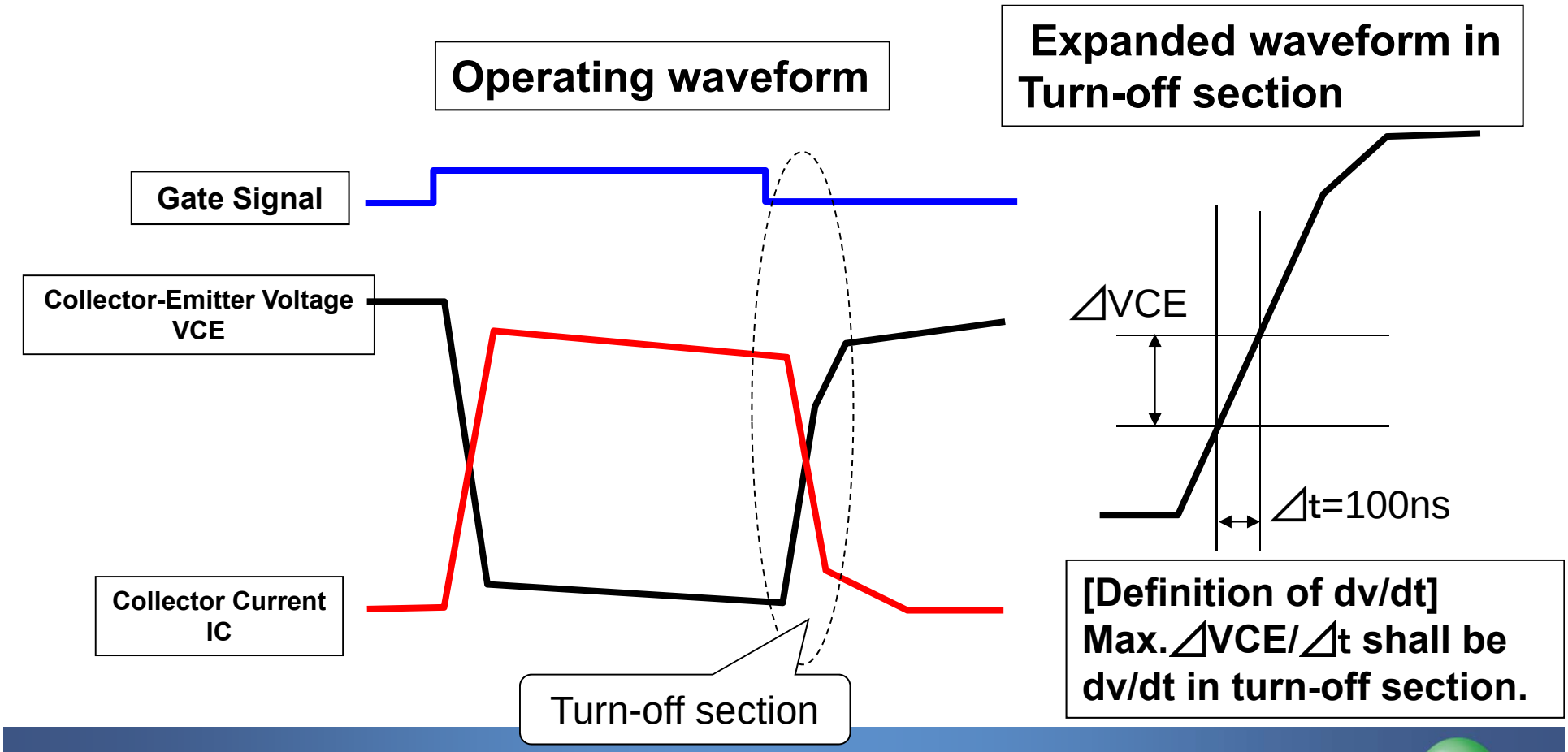




※Left chart shows the ASO for single-shot pulse. Considering heat generation, please use the device with channel temperature Tch≦150℃ in continuous operating

b. dv/dt precautions

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

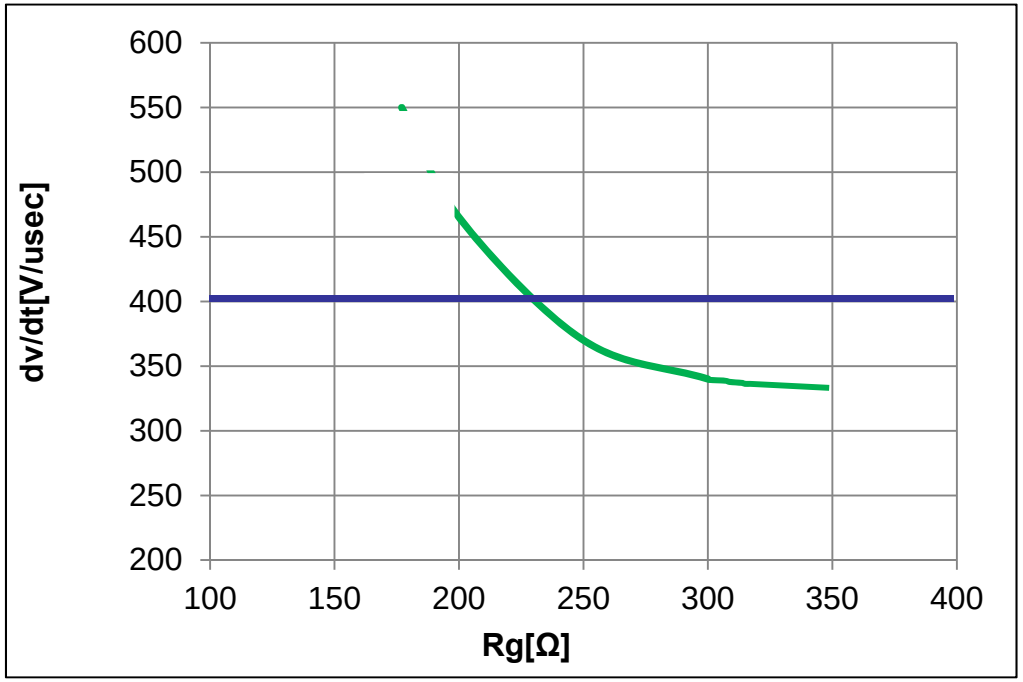


c. dv/dt adjustments

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：TIG065E8's dv/dt-Rg dependency graph

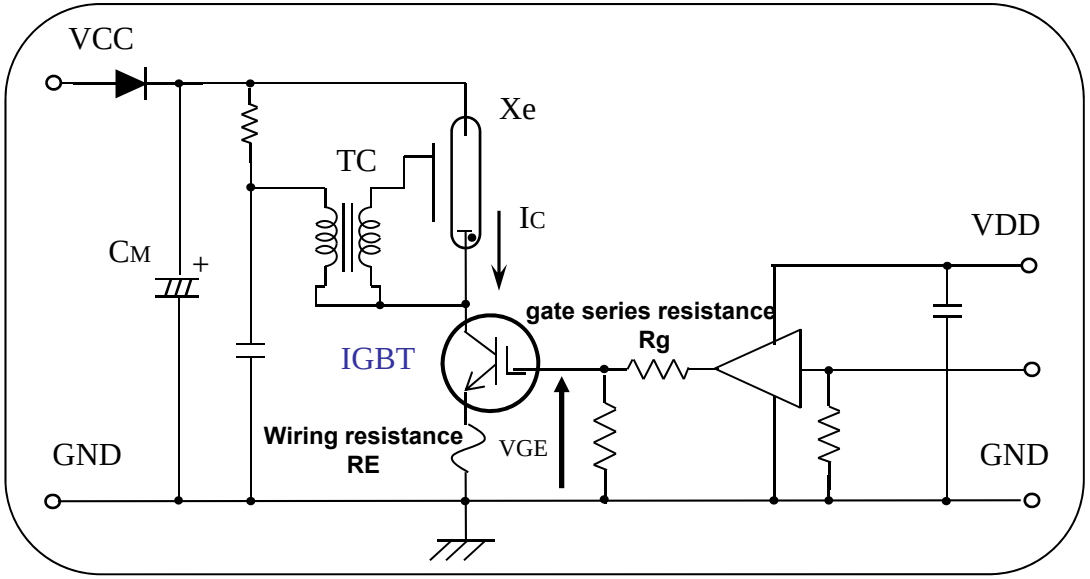
Measurement condition VCC=320V,Ic=100A



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 × RE

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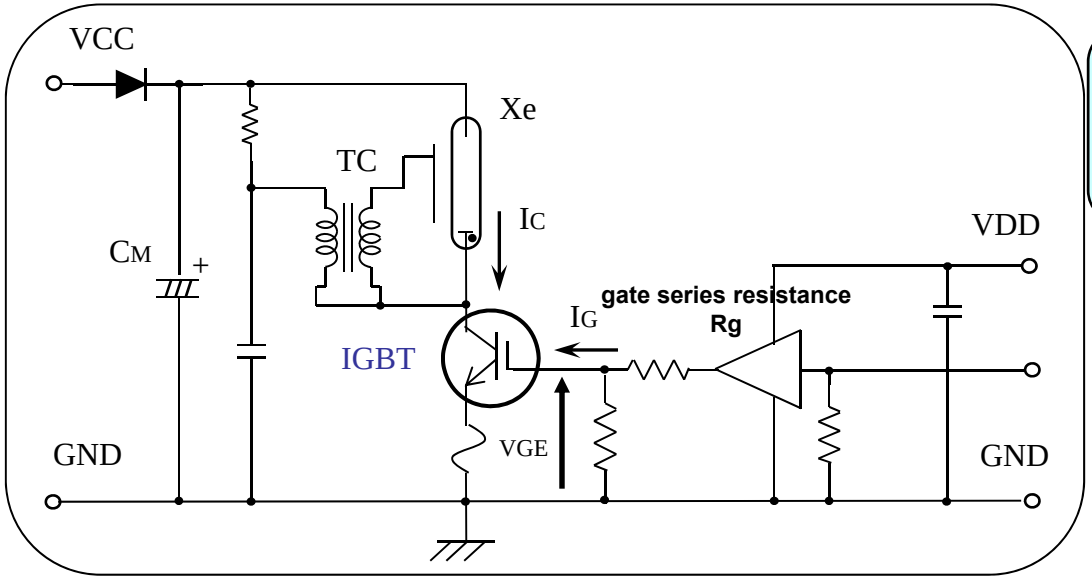
1. Operating Precautions

2. **Recommended Circuit Example**

3. Evaluation Board Data

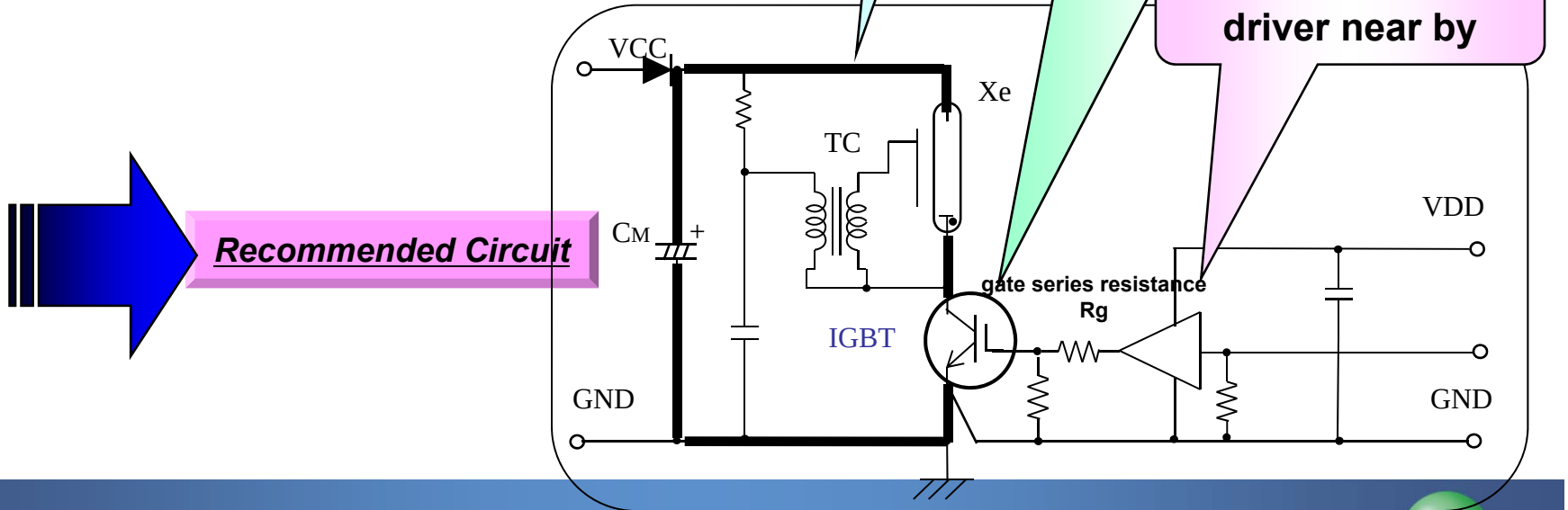
Recommended Circuit Example



①High current path should be thick and short

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

③Place IGBT & driver near by



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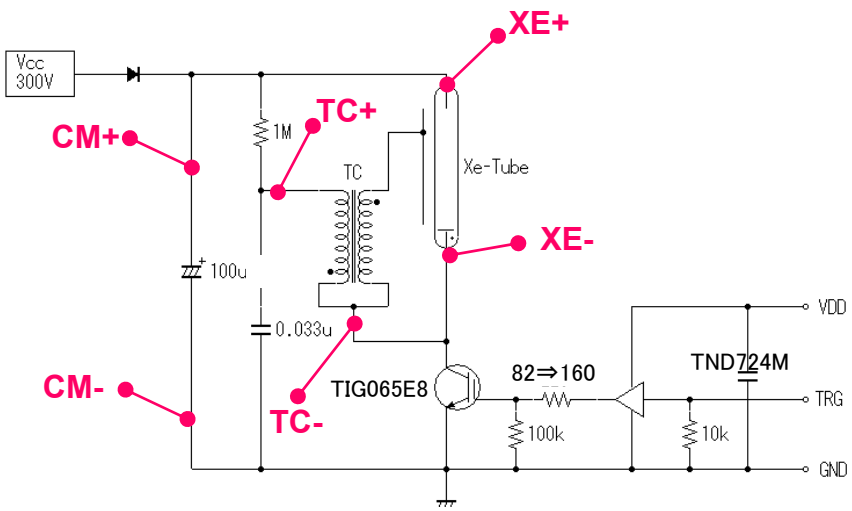
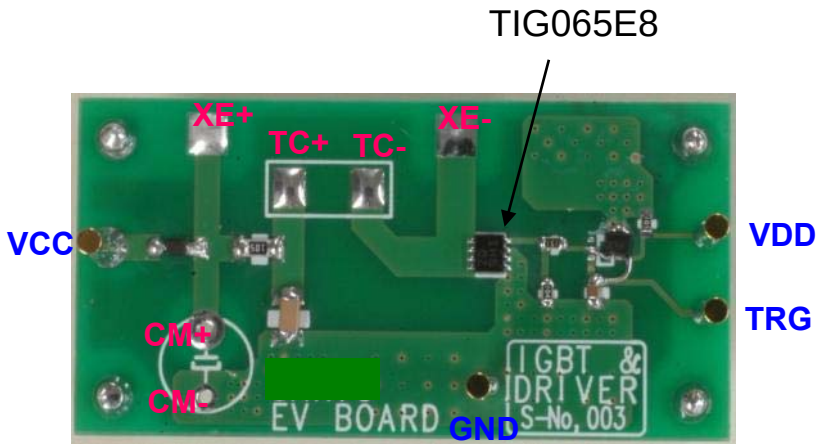
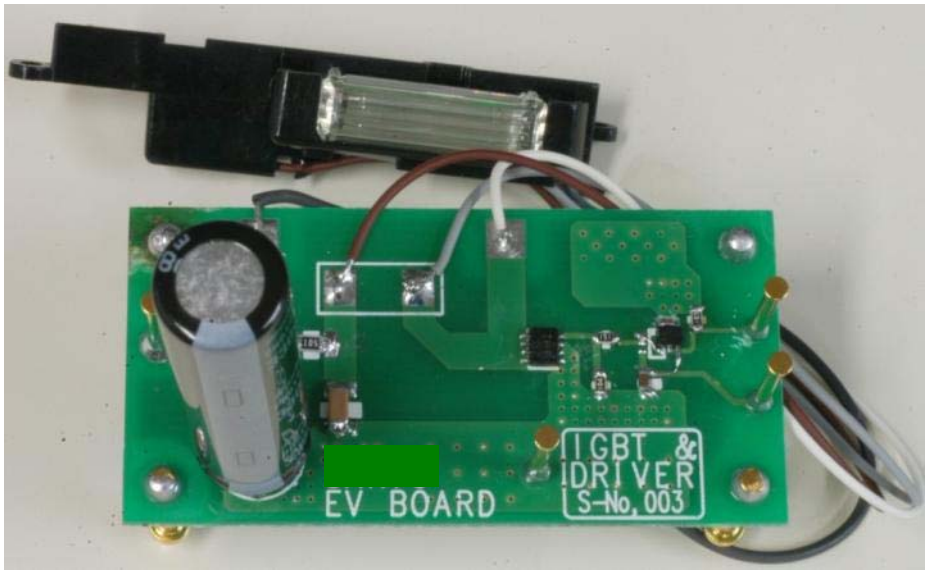
Evaluation Board





[Conditions]

VCC=300V(MAX320V)
VDD=2.5～4.0V
TRG=VDD



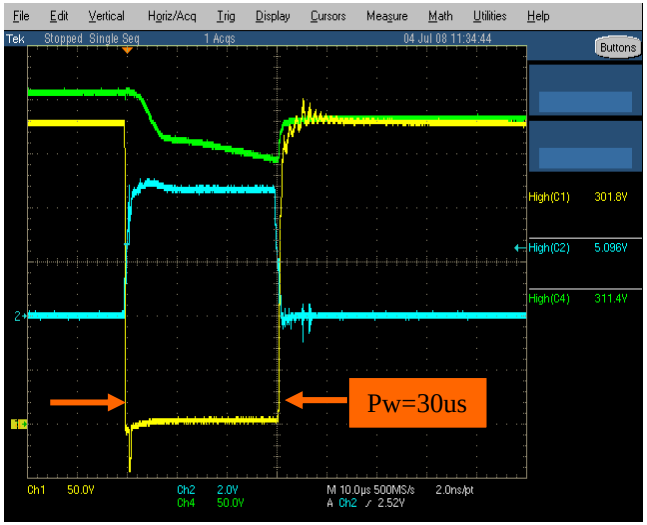
TIG065E8 Measured Data

Pulse width in 30us operation
10us/div

VCM:50V/div

VCE:50V/div

VGE:2V/div

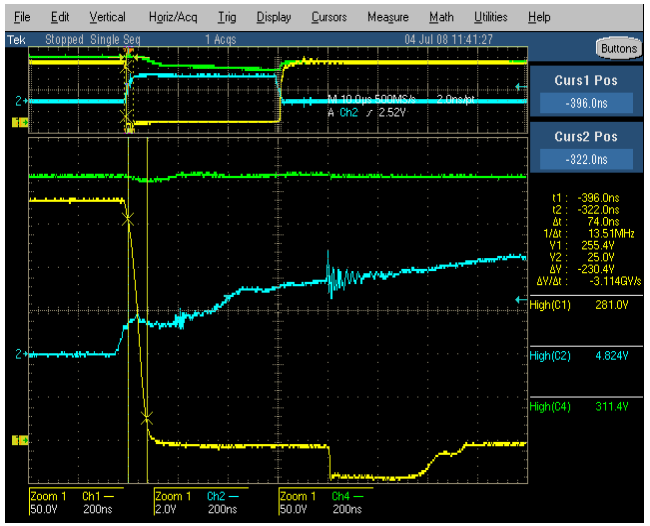


Turn-on expanded waveform
200ns/div

VCM:50V/div

VCE:50V/div

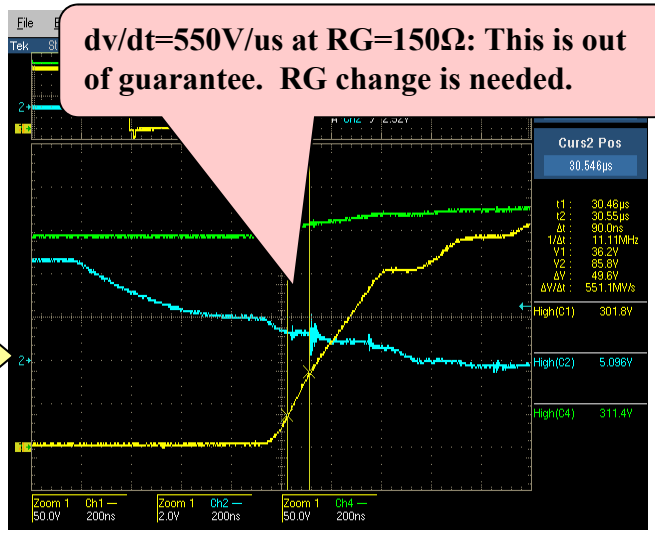
VGE:2V/div



Turn-off expanded waveform
200ns/div

dv/dt=550V/us at RG=150Ω: This is out of guarantee. RG change is needed.

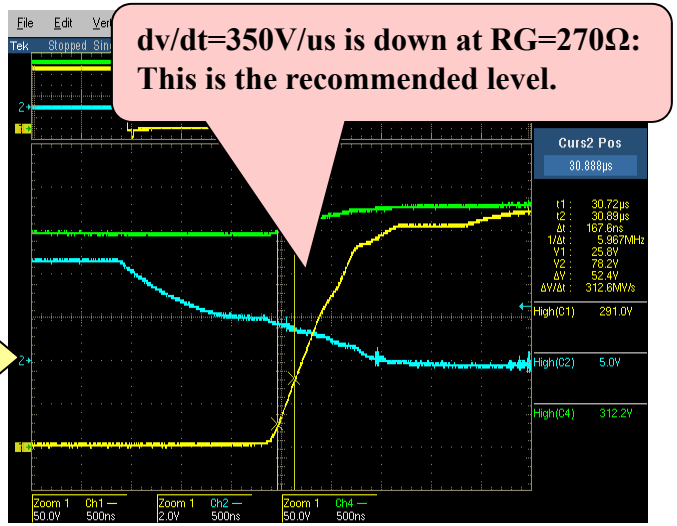
VCE toff
dv/dt=550V/ns



Turn-off expanded waveform
200ns/div

dv/dt=350V/us is down at RG=270Ω: This is the recommended level.

VCE toff
dv/dt=310V/ns



RG=270Ω(Recommended Condition)