ALPHA & OMEGA SEMICONDUCTOR

# AOBS30B65LN

## 650V, 30A Alpha IGBT™
## AEC-Q101 Qualified

### General Description

- 650V breakdown voltage
- Low Vce(sat) and fast turn-on speed
- High ruggedness and temperature stable behavior
- Automotive qualified

### Product Summary

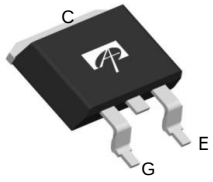
| | |
|---|---|
| $V_{CE}$ | 650V |
| $I_C$ ($T_C$=100°C) | 30A |
| $V_{CE(sat)}$ ($T_J$=25°C) | 1.86V |

### Applications

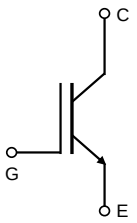
- Discharge switch
- Relay replacement
- PTC heater

RoHS Compliant

**TO-263**
**D²PAK**




**AOBS30B65LN**




| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|---|---|---|---|
| AOBS30B65LN | TO263 | Tape & Reel | 800 |

**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | AOBS30B65LN | Units |
|---|---|---|---|---|
| Collector-Emitter Voltage | | $V_{CE}$ | 650 | V |
| Gate-Emitter Voltage | | $V_{GE}$ | ±30 | V |
| Continuous Collector Current | $T_C$=25°C | $I_C$ | 60 | A |
| | $T_C$=100°C | | 30 | |
| Pulsed Collector Current, Limited by $T_{Jmax}$ | | $I_{CM}$ | 90 | A |
| Turn-Off SOA, $V_{CE}$≤650V, Limited by $T_{Jmax}$ | | $I_{LM}$ | 90 | A |
| Short Circuit Withstanding Time (1) $V_{GE}$=15V, $V_{CC}$≤400V, $T_J$≤175°C | | $t_{SC}$ | 5 | µs |
| Power Dissipation | $T_C$=25°C | $P_D$ | 227 | W |
| | $T_C$=100°C | | 114 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | | $T_L$ | 300 | °C |

**Thermal Characteristics**

| Parameter | Symbol | AOBS30B65LN | Units |
|---|---|---|---|
| Maximum Junction-to-Ambient | $R_{\theta JA}$ | 65 | °C/W |
| Maximum IGBT Junction-to-Case | $R_{\theta JC}$ | 0.66 | °C/W |

(1) Allowed number of short circuits: <1000; time between short circuits: >1s.

**Electrical Characteristics ($T_J$=25°C unless otherwise noted)**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | | |
| $BV_{CES}$ | Collector-Emitter Breakdown Voltage | $I_C$=1mA, $V_{GE}$=0V, $T_J$=25°C | | 650 | - | - | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}$=15V, $I_C$=30A | $T_J$=25°C | - | 1.86 | 2.35 | V |
| | | | $T_J$=125°C | - | 2.32 | - | |
| | | | $T_J$=175°C | - | 2.58 | - | |
| $V_{GE(th)}$ | Gate-Emitter Threshold Voltage | $V_{CE}$=5V, $I_C$=1mA | | 4 | 4.7 | 5.4 | V |
| $I_{CES}$ | Zero Gate Voltage Collector Current | $V_{CE}$=650V, $V_{GE}$=0V | $T_J$=25°C | - | - | 10 | µA |
| | | | $T_J$=125°C | - | - | 500 | |
| | | | $T_J$=175°C | - | - | 10000 | |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{CE}$=0V, $V_{GE}$=±30V | | - | - | ±100 | nA |
| $g_{FS}$ | Forward Transconductance | $V_{CE}$=20V, $I_C$=30A | | - | 20 | - | S |
| **DYNAMIC PARAMETERS** | | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{GE}$=0V, $V_{CC}$=25V, f=1MHz | | - | 1246 | - | pF |
| $C_{oes}$ | Output Capacitance | | | - | 77 | - | pF |
| $C_{res}$ | Reverse Transfer Capacitance | | | - | 38 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{GE}$=15V, $V_{CC}$=520V, $I_C$=30A | | - | 52 | - | nC |
| $Q_{ge}$ | Gate to Emitter Charge | | | - | 14 | - | nC |
| $Q_{gc}$ | Gate to Collector Charge | | | - | 22 | - | nC |
| $I_{C(SC)}$ | Short Circuit Collector Current | $V_{GE}$=15V, $V_{CC}$=400V, $t_{sc}\leqslant$5us, $T_J\leqslant$175°C | | - | 150 | - | A |
| $R_g$ | Gate Resistance | $V_{GE}$=0V, $V_{CC}$=0V, f=1MHz | | - | 11 | - | Ω |
| **SWITCHING PARAMETERS, (Load Inductive, $T_J$=25°C)** | | | | | | | |
| $T_{d(on)}$ | Turn-On Delay Time | $T_J$=25°C<br>$V_{GE}$=15V, $V_{CC}$=400V, $I_C$=30A,<br>$R_G$=10Ω<br>Eon and Etotal include diode (AOTF30B65LN2) reverse recovery | | - | 24 | - | ns |
| $T_r$ | Turn-On Rise Time | | | - | 28 | - | ns |
| $T_{d(off)}$ | Turn-Off Delay Time | | | - | 109 | - | ns |
| $T_f$ | Turn-Off Fall Time | | | - | 13 | - | ns |
| $E_{on}$ | Turn-On Energy | | | - | 0.74 | - | mJ |
| $E_{off}$ | Turn-Off Energy | | | - | 0.33 | - | mJ |
| $E_{total}$ | Total Switching Energy | | | - | 1.07 | - | mJ |
| **SWITCHING PARAMETERS, (Load Inductive, $T_J$=175°C)** | | | | | | | |
| $T_{d(on)}$ | Turn-On Delay Time | $T_J$=175°C<br>$V_{GE}$=15V, $V_{CC}$=400V, $I_C$=30A,<br>$R_G$=10Ω<br>Eon and Etotal include diode (AOTF30B65LN2) reverse recovery | | - | 22 | - | ns |
| $T_r$ | Turn-On Rise Time | | | - | 31 | - | ns |
| $T_{d(off)}$ | Turn-Off Delay Time | | | - | 130 | - | ns |
| $T_f$ | Turn-Off Fall Time | | | - | 28 | - | ns |
| $E_{on}$ | Turn-On Energy | | | - | 0.82 | - | mJ |
| $E_{off}$ | Turn-Off Energy | | | - | 0.62 | - | mJ |
| $E_{total}$ | Total Switching Energy | | | - | 1.44 | - | mJ |

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

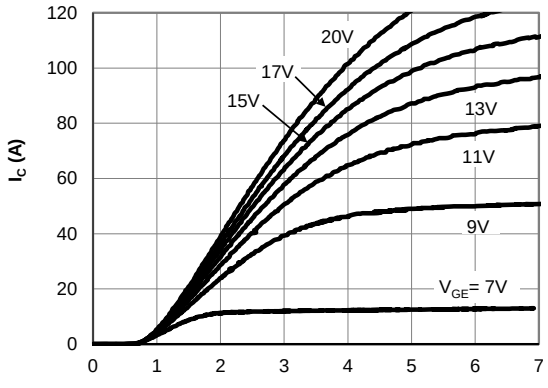



**Figure 1: Output Characteristic ($T_j$=25°C)**

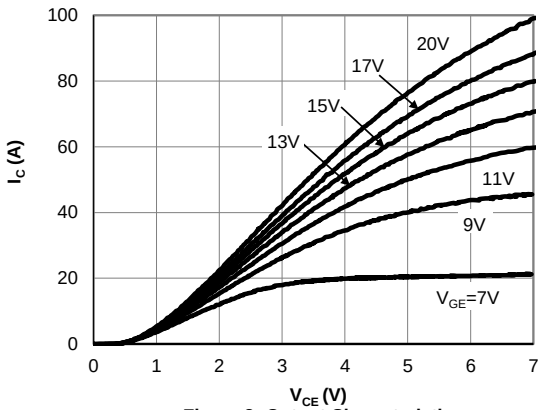



**Figure 2: Output Characteristic ($T_j$=175°C)**

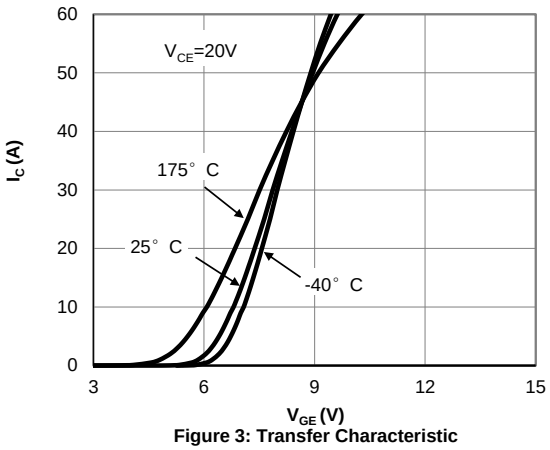



**Figure 3: Transfer Characteristic**

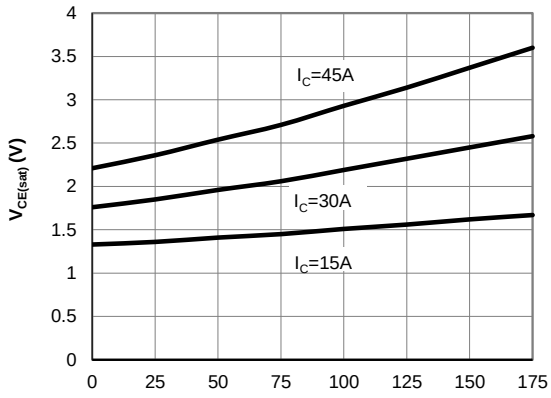



**Figure 4: Collector-Emitter Saturation Voltage vs. Junction Temperature**

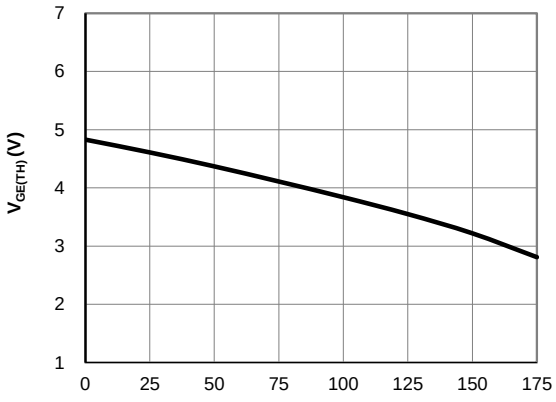



**Figure 5: $V_{GE(TH)}$ vs. $T_j$**

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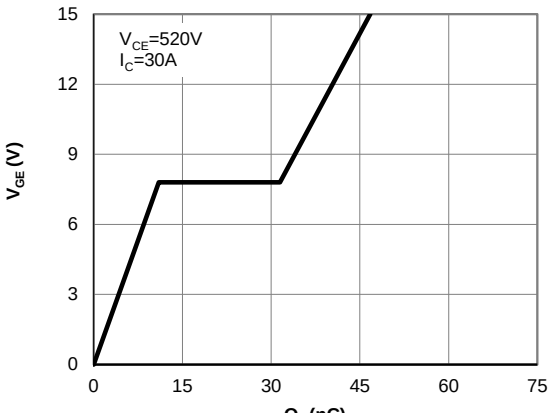


**Figure 6: Gate-Charge Characteristics**

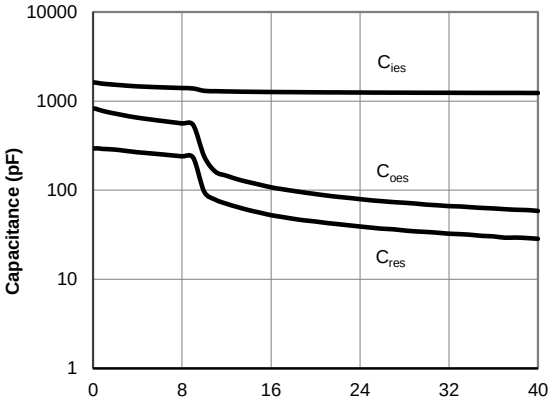


**Figure 7: Capacitance Characteristic**

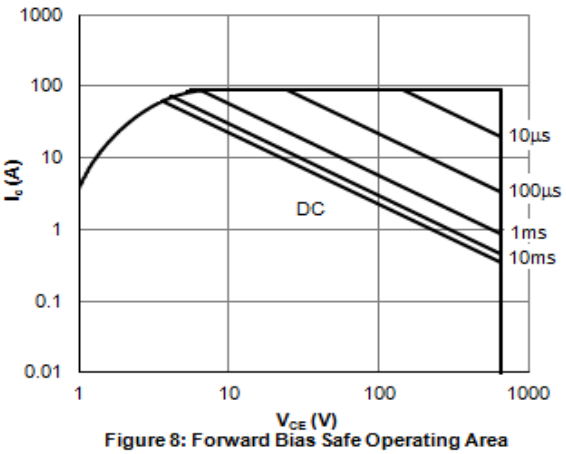


**Figure 8: Forward Bias Safe Operating Area ($T_C$=25°C, $V_{GE}$=15V)**

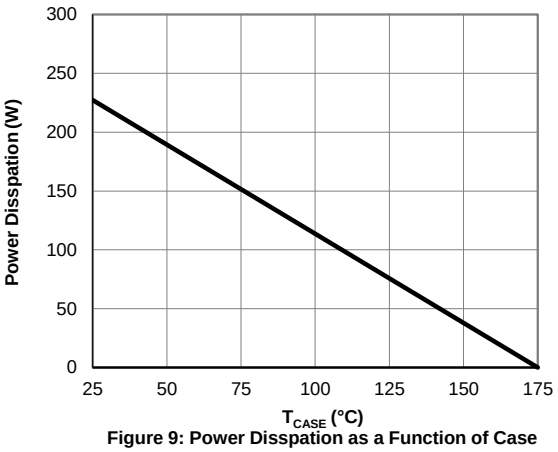


**Figure 9: Power Disspation as a Function of Case**

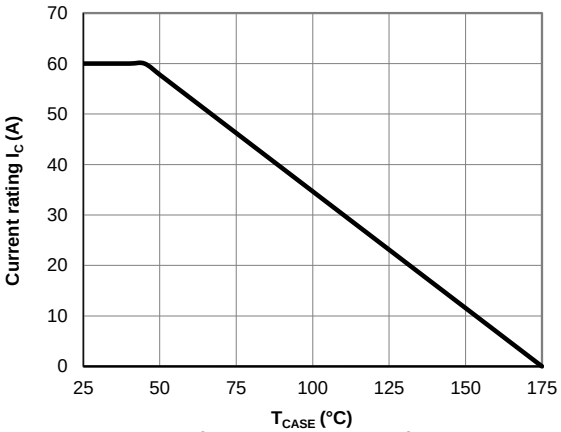


**Figure 10: Current De-rating**

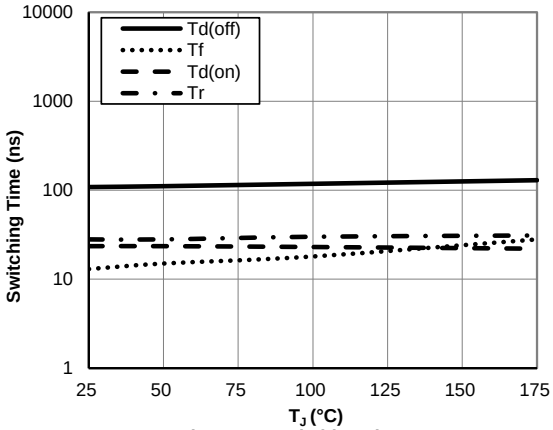


**Figure 11: Switching Time vs.$T_j$ ($V_{GE}$=15V, $V_{CE}$=400V, $I_C$=30A, $R_g$=10Ω)**

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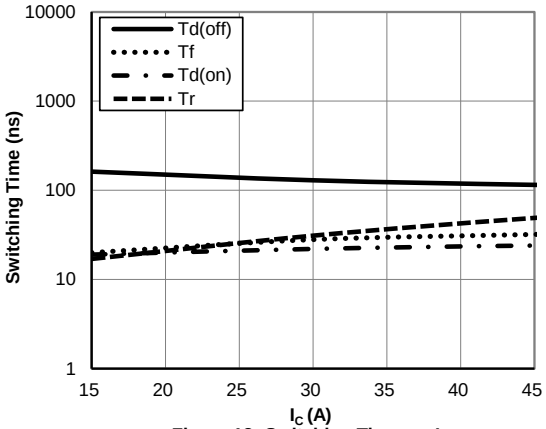


**Figure 12: Switching Time vs. $I_C$**
**($T_j$=175°C, $V_{GE}$=15V, $V_{CE}$=400V, $R_g$=10Ω)**

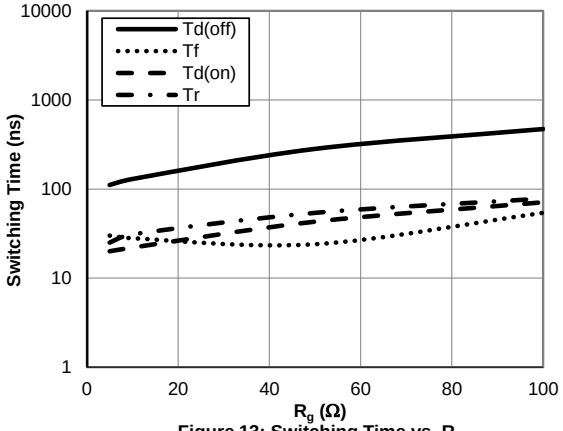


**Figure 13: Switching Time vs. $R_g$**
**($T_j$=175°C, $V_{GE}$=15V, $V_{CE}$=400V, $I_C$=30A)**

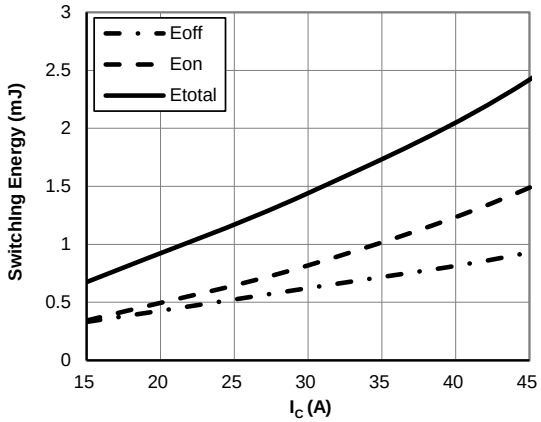


**Figure 14: Switching Loss vs. $I_C$**
**($T_j$=175°C, $V_{GE}$=15V, $V_{CE}$=400V, $R_g$=10Ω)**

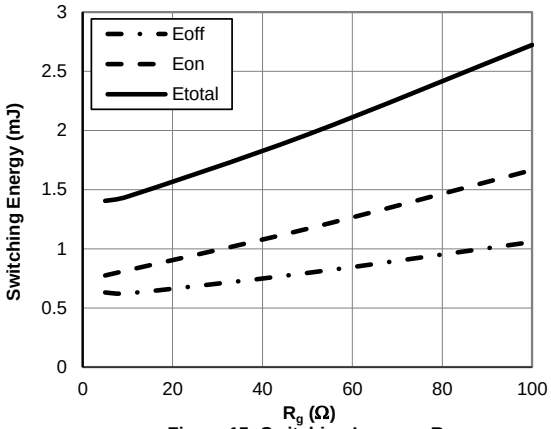


**Figure 15: Switching Loss vs. $R_g$**
**($T_j$=175°C, $V_{GE}$=15V, $V_{CE}$=400V, $I_C$=30A)**

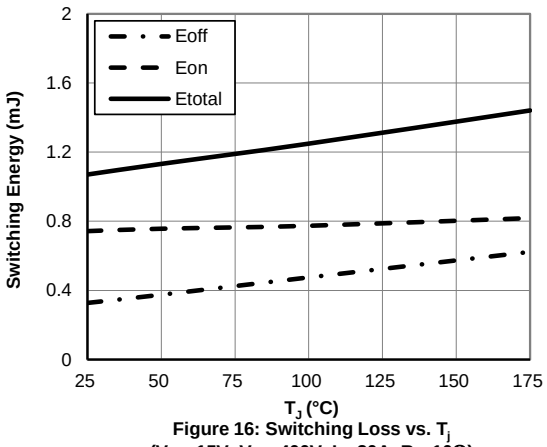


**Figure 16: Switching Loss vs. $T_j$**
**($V_{GE}$=15V, $V_{CE}$=400V, $I_C$=30A, $R_g$=10Ω)**

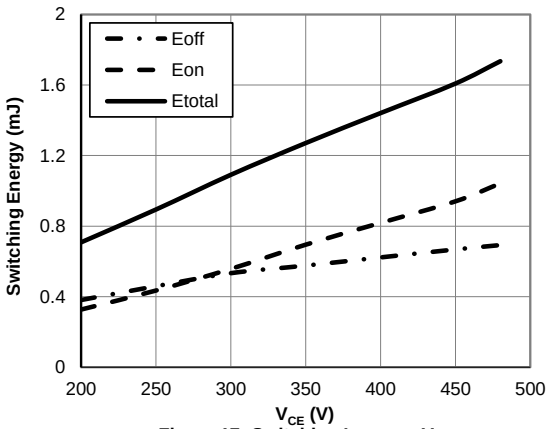


**Figure 17: Switching Loss vs. $V_{CE}$**
**($T_j$=175°C, $V_{GE}$=15V, $I_C$=30A, $R_g$=10Ω)**

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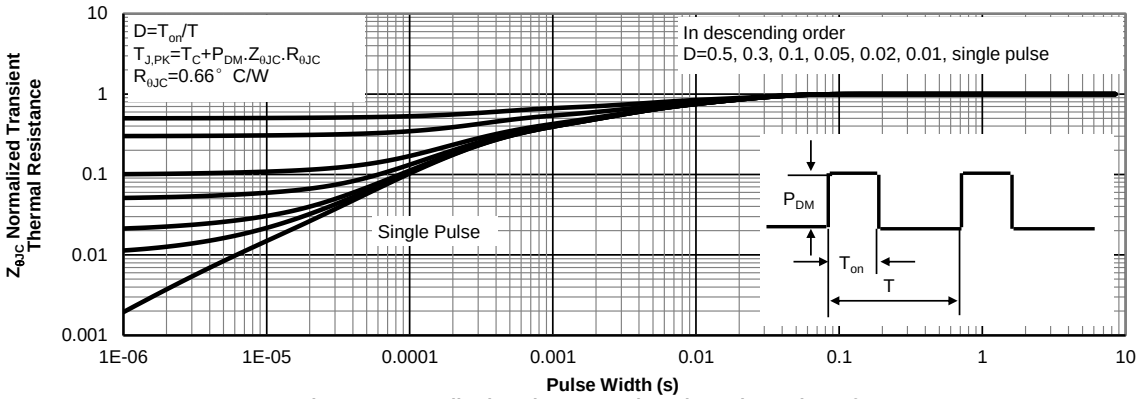


**Figure 18: Normalized Maximum Transient Thermal Impedance for IGBT**

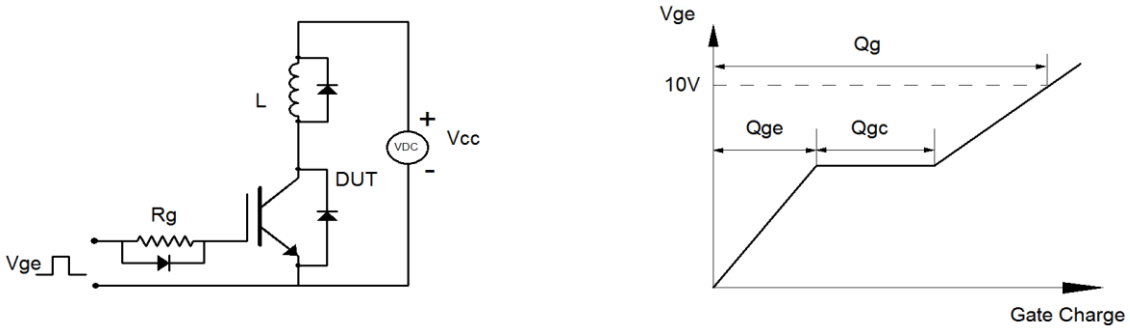


Figure A: Gate Charge Test Circuit & Waveforms

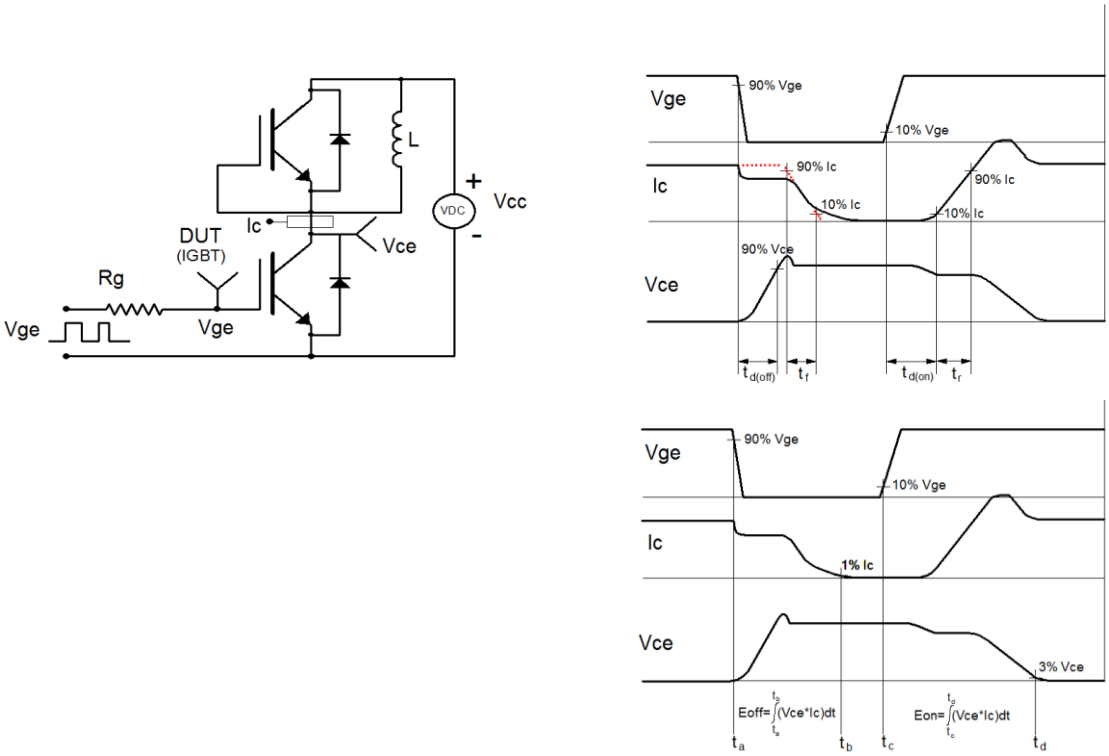


Figure B: Inductive Switching Test Circuit & Waveforms