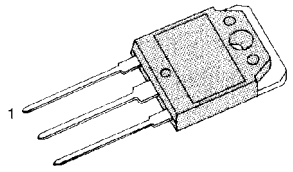
# SGH40N60UF

## *N-CHANNEL IGBT*

### FEATURES

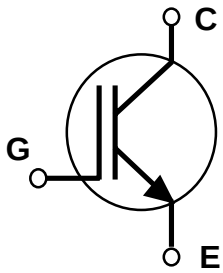
* High Speed Switching
* Low Saturation Voltage
  : $V_{CE}$(sat) = 2.0 V (@ Ic=20A)
* High Input Impedance

**TO-3P**




### APPLICATIONS

* AC & DC Motor controls
* General Purpose Inverters
* Robotics , Servo Controls
* Power Supply
* Lamp Ballast




## ABSOLUTE MAXIMUM RATINGS

| Symbol | Characteristics | Rating | Units |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 600 | V |
| $V_{GES}$ | Gate-Emitter Voltage | ±20 | V |
| $I_C$ | Collector Current @ Tc = 25°C | 40 | A |
| | Collector Current @ Tc = 100°C | 20 | A |
| $I_{CM\ (1)}$ | Pulsed Collector Current | 160 | A |
| $P_C$ | Maximum Power Dissipation @Tc = 25°C | 160 | W |
| | Maximum Power Dissipation @Tc = 100°C | 64 | W |
| Tj | Operating Junction Temperature | -55 ~ 150 | °C |
| Tstg | Storage Temperature Range | -55 ~ 150 | °C |
| $T_L$ | Maximum Lead Temp. For Soldering Purposes, 1/8” from case for 5 seconds | 300 | °C |

**Notes:**(1) Repetitive rating : Pulse width limited by max. junction temperature



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## ELECTRICAL CHARACTERISTICS)
**($T_C$=25°C,Unless Otherwise Specified)**

| Symbol | Characteristics | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $BV_{CES}$ | C - E Breakdown Voltage | $V_{GE}$ = 0V , $I_C$ = 250uA | 600 | - | - | V |
| $\Delta V_{CES}/\Delta T_J$ | Temperature Coeff. of Breakdown Voltage | $V_{GE}$ = 0V , $I_C$ = 1mA | - | 0.6 | - | V/°C |
| $V_{GE(th)}$ | G - E threshold voltage | $I_C$ = 20mA , $V_{CE}$ = $V_{GE}$ | 4.5 | 5.5 | 7.5 | V |
| $I_{CES}$ | Collector cutoff Current | $V_{CE}$ = $V_{CES}$ , $V_{GE}$ = 0V | - | - | 250 | uA |
| $I_{GES}$ | G - E leakage Current | $V_{GE}$ = $V_{GES}$ , $V_{CE}$ = 0V | - | - | 100 | nA |
| $V_{CE}$(sat) | Collector to Emitter saturation voltage | Ic=20A, $V_{GE}$ = 15V | - | 2.0 | 2.6 | V |
| | | Ic=40A, $V_{GE}$ = 15V | - | 2.6 | - | V |
| Cies | Input capacitance | $V_{GE}$ = 0V , f = 1MHz | - | 1430 | - | pF |
| Coes | Output capacitance | $V_{CE}$ = 30V | - | 120 | - | pF |
| Cres | Reverse transfer capacitance | | - | 50 | - | pF |
| td(on) | Turn on delay time | $V_{CC}$ = 300V , $I_C$ = 20A | - | 12 | - | ns |
| tr | Turn on rise time | $V_{GE}$ = 15V | - | 20 | - | ns |
| td(off) | Turn off delay time | $R_G$ = 10Ω | - | 68 | 100 | ns |
| tf | Turn off fall time | Inductive Load | - | 50 | 100 | ns |
| Eon | Turn on Switching Loss | | - | 0.08 | - | mJ |
| Eoff | Turn off Switching Loss | | - | 0.19 | - | mJ |
| Ets | Total Switching Loss | | - | 0.27 | 0.47 | mJ |
| Qg | Total Gate Charge | Vcc = 300V | - | 92 | 138 | nC |
| Qge | Gate-Emitter Charge | $V_{GE}$ = 15V | - | 21 | 31 | nC |
| Qgc | Gate-Collector Charge | Ic = 20A | - | 28 | 42 | nC |
| Le | Internal Emitter Inductance | Measured 5mm from PKG | - | 14 | - | nH |

## THERMAL RESISTANCE

| Symbol | Characteristics | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| $R_{\theta}JC$ | Junction-to-Case | - | - | 0.77 | °C/W |
| $R_{\theta}JA$ | Junction-to-Case | - | - | 40 | °C/W |
| $R_{\theta}CS$ | Case-to-Sink | - | 0.24 | - | °C/W |

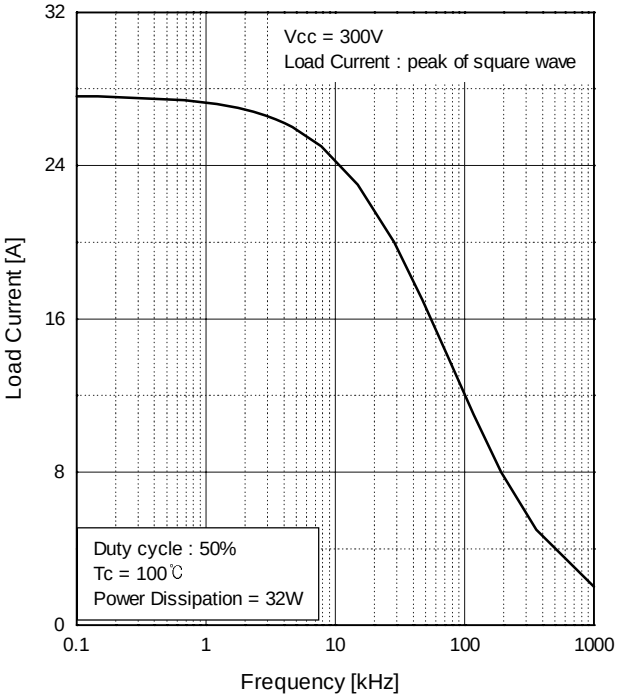


Fig.1 Typical Load Current vs. Frequency

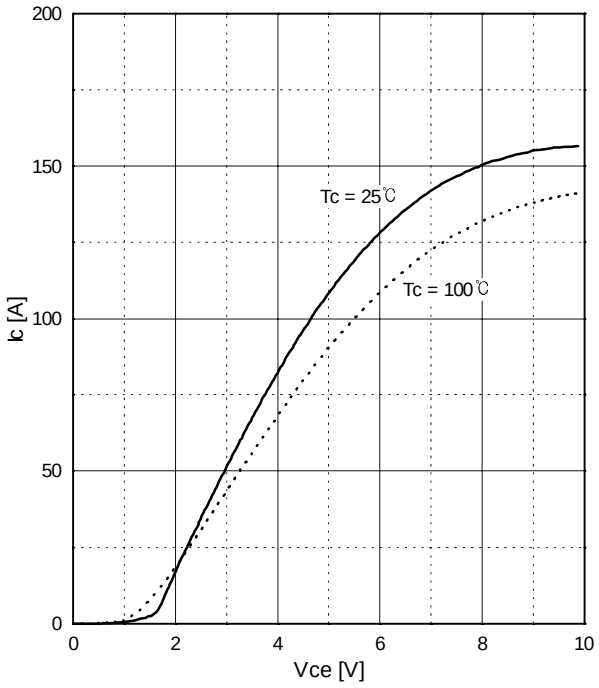


Fig.2 Typical Output Characteristics

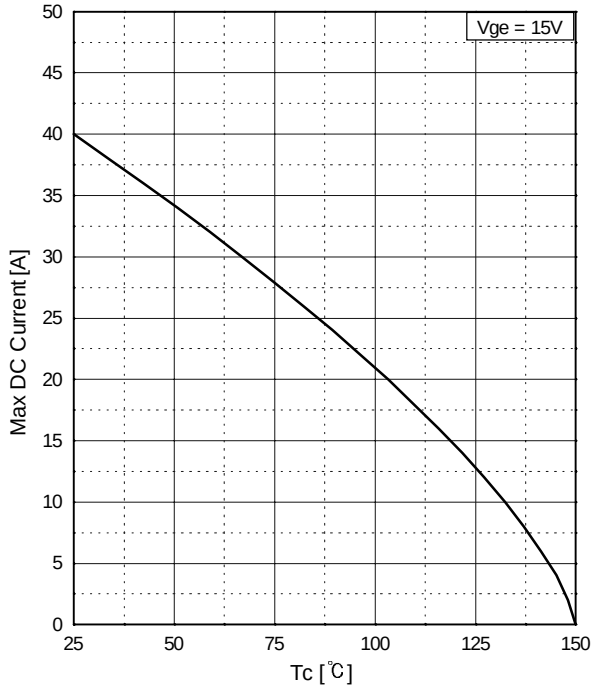


Fig.3 Maximum Collector Current vs. Case Temperature

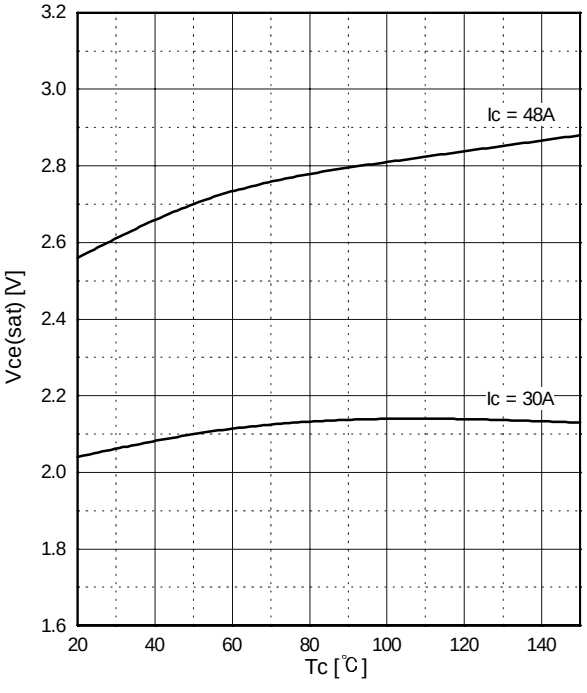


Fig.4 Collector to Emitter Voltage vs. Case Temperature

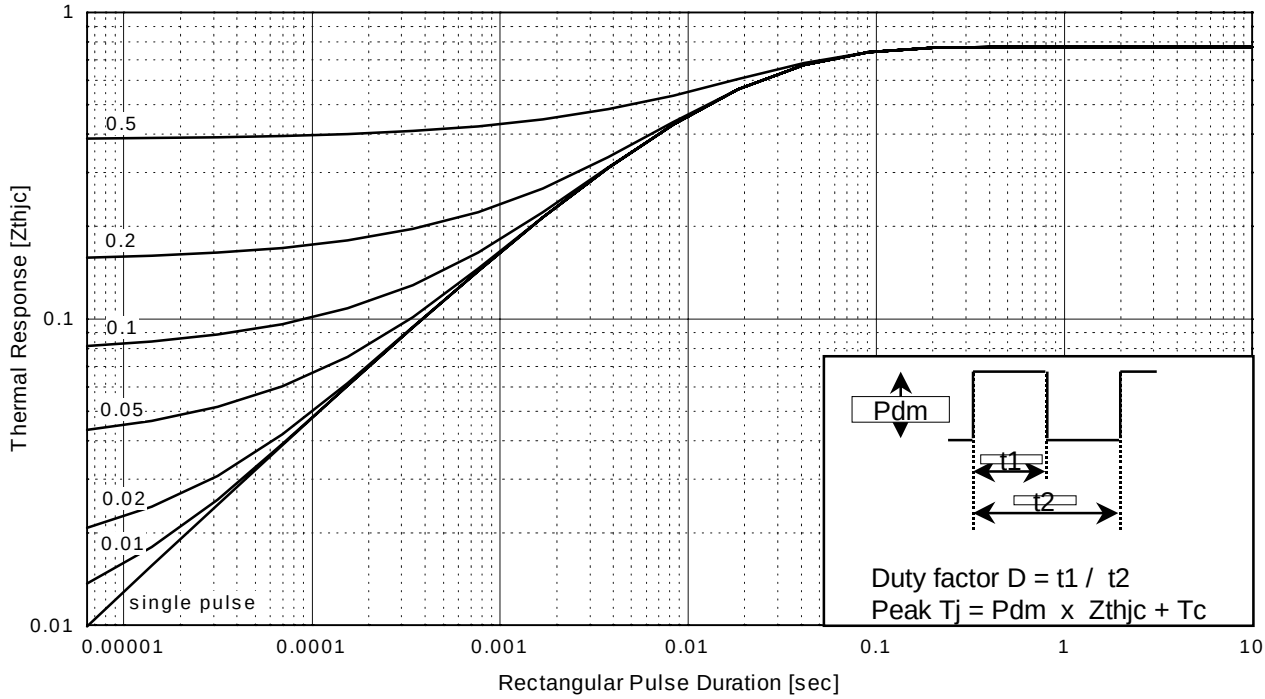


Fig.5 Maximum Effective Transient Thermal Impedance, Junction to Case

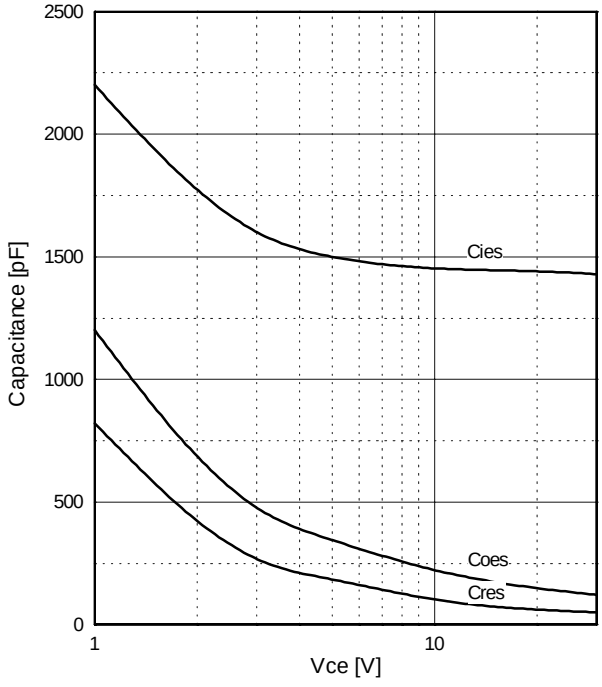


Fig.6 Typical Capacitance vs.
Collector to Emitter Voltage

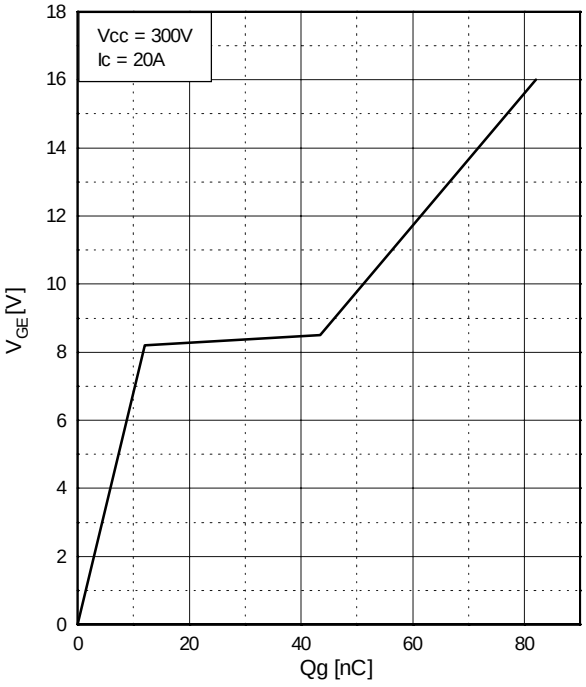


Fig.7 Typical Gate Charge vs.
Gate to Emitter Voltage

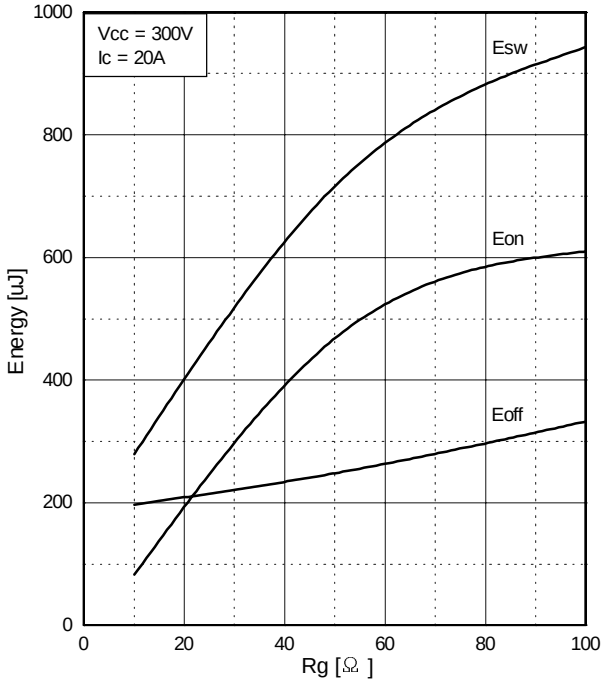


Fig.8 Typical Switching Loss vs. Gate Resistance

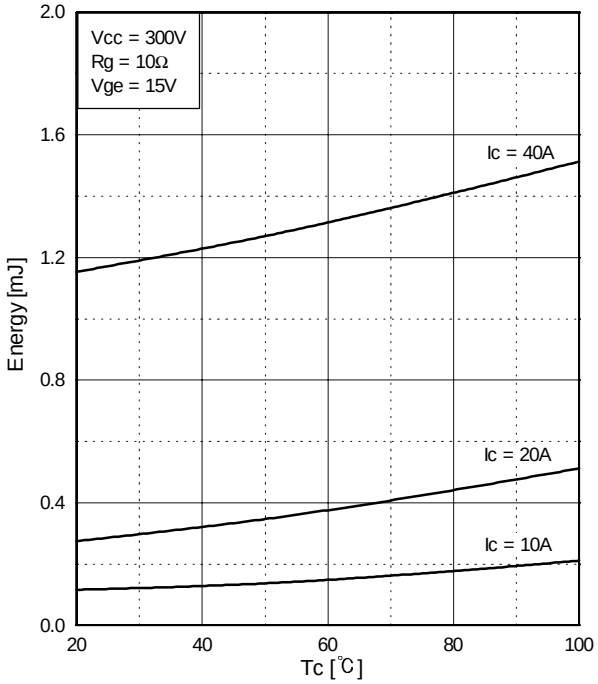


Fig.9 Typical Switching Loss vs. Case Temperature

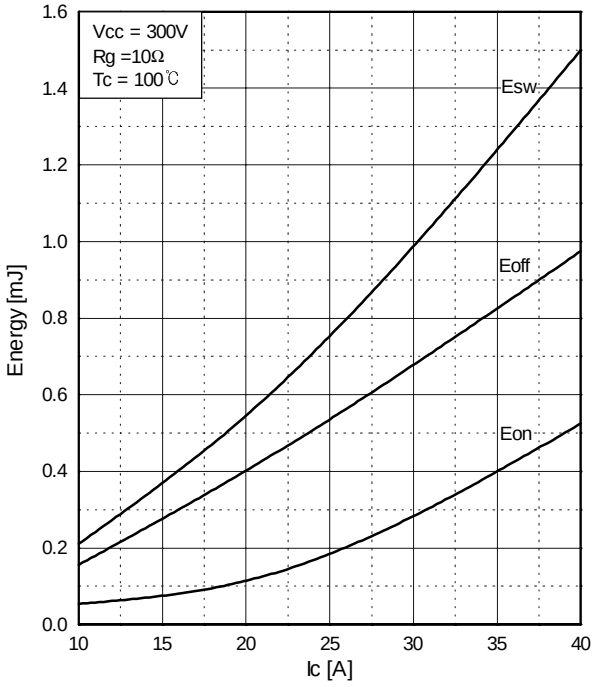


Fig.10 Typical Switching loss vs. Collector to Emitter Current

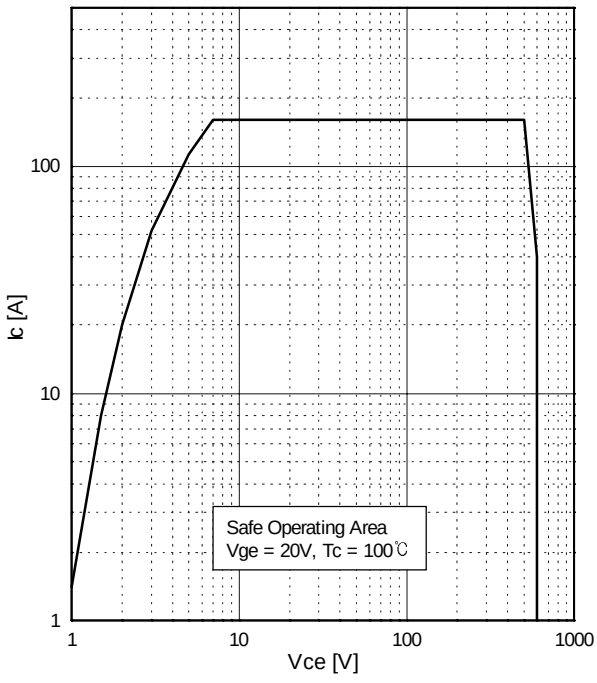


Fig.11 Turn-off SOA

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