# CGWT40N65F2KAD

## CGWT40N65F2KAD

| $V_{CE}$ | Ic (Tc=100℃) | $V_{CE(sat)}$ |
|---|---|---|
| 650V | 40A | 1.7V |

**TO-247**

## DESCRIPTION

The CGWT40N65F2KAD is used JSCJ's second generation IGBT technology, has advanced Trench and FS(Field Stop) Structure，it's with high application frequent, low Collector-Emitter Saturation Voltage and switching loss, can easy to use in parallel.

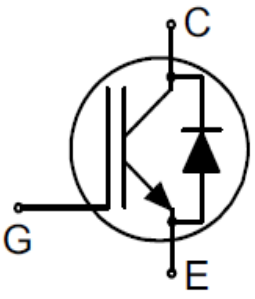
## Features

- 650V breakdown Voltage
- Low Vce(sat) and positive temperature coefficient
- High speed switching，Low switching loss
- With fast and soft recovery freewheeling diode
- Good EMI behavior

## Application

- UPS & FPC applications
- Solar Inverter
- EV Charger
- Power Storage
- Welder

## EQUIVALENT CIRCUIT




## MARKING


WT40N65F2KAD = Device code

Solid dot = Green molding compound device, if none, the normal device

XXXXX = Code

| Order Code | Package | Marking | Parking |
|---|---|---|---|
| CGWT40N65F2KAD | TO-247 | WT40N65F2KAD | Tube |

## Absolute Maximum Ratings ($T_C$=25°C unless otherwise noted)

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 650 | V |
| $V_{GES}$ | Gate-Emitter Voltage | ±20 | V |
| | Gate-Emitter transient voltage | ±30 | V |
| $I_C$ | Collector Current(2) | 80 | A |
| | Collector Current @$T_C$=100℃ | 40 | |
| $I_{Cpluse}$ | Plused Collector Current, tp limited by $T_{Jmax}$ | 120 | A |
| $I_{LM}$(1) | Turn-off latching current | 120 | A |
| $I_F$ | Continuous Diode Forward Current(2) | 80 | A |
| | Continuous Diode Forward Current @$T_C$=100℃ | 40 | A |
| $I_{FM}$ | Diode Pulsed Current, Limited by $T_{Jmax}$ | 120 | A |
| tsc | Short Circuit Withstand Time,<br>$V_{GE}$=15V, $V_{CE}$≤400V,<br>Allowed number of short circuits＜1000,<br>Time between short circuits ≥1.0s,$T_J$=150℃ | 5 | us |
| $P_D$ | Power Dissipation @$T_C$=25℃ | 250 | W |
| | Power Dissipation @$T_C$ =100℃ | 125 | |
| $T_J$ | Junction Temperature | -40 to 175 | ℃ |
| $T_{STG}$ | Storage Temperature | -55 to 150 | ℃ |
| $T_L$ | Maximum lead temperature for soldering | 260 | ℃ |

(1) $V_{cc}$ =400V, $V_{GE}$ = 15 V, $T_J$ ≤ 150 °C.
(2) value limited by bondwire

## Thermal Characteristics

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $R\theta_{JC}$ | Maximum IGBT Junction-to-Case | 0.6 | ℃/W |
| $R\theta_{JC}$ | Maximum Diode Junction-to-Case | 1.8 | ℃/W |
| $R\theta_{JA}$ | Maximum Junction-to-Ambient | 40 | ℃/W |

## Electrical Characteristics (TJ=25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Ration | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| **STATIC PARAMETERS** | | | | | | |
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage | $V_{GE}$=0V,$I_{CE}$=250uA | 650 | -- | -- | V |
| $I_{CES}$ | Zero Gate Voltage Collector Current | $V_{GE}$=0V,$V_{CE}$=650V | -- | -- | 1.0 | mA |
| $I_{GES}$ | Gate-Emitter leakage current | $V_{GE}$=±20V | -- | -- | ±250 | nA |
| | | $V_{GE}$=±30V | -- | -- | ±500 | nA |
| $V_{GE(th)}$ | Gate-Emitter Threshold Voltage | $I_C$=1mA ,$V_{CE}$=$V_{GE}$ | 4 | -- | 6.5 | V |
| $V_F$ | Diode Forward Voltage | $I_F$=40A,Tc=25℃ | -- | 1.56 | -- | V |
| | | $I_F$=40A,Tc=125℃ | -- | 1.30 | -- | V |
| | | $I_F$=40A,Tc=150℃ | -- | 1.23 | -- | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$=40A,$V_{GE}$=15V,$T_J$=25℃ | -- | 1.7 | -- | V |
| | | $I_C$=40A,$V_{GE}$=15V,$T_J$=125℃ | -- | 2.0 | -- | V |
| | | $I_C$=40A,$V_{GE}$=15V,$T_J$=150℃ | -- | 2.1 | -- | V |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=30V,$V_{GE}$=0V f=1MHz | -- | 1819 | -- | pF |
| $C_{oes}$ | Output Capacitance | | -- | 175 | -- | |
| $C_{res}$ | Reverse Transfer Capacitance | | -- | 22 | -- | |
| Rg | Gate Resistance | $V_{GE}$=0V, CE short, f=1MHz | -- | 1.6 | -- | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CE}$=400V,$I_C$=40A,$R_g$=10Ω, $V_{GE}$=15V, Inductive Load $T_J$=25℃ | -- | 21 | -- | ns |
| $t_r$ | Current Rise Time | | -- | 46 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 67 | -- | |
| $t_f$ | Current Fall Time | | -- | 34 | -- | |
| $E_{on}$ (3) | Turn-On Switching Energy | | -- | 1.23 | -- | mJ |
| $E_{off}$ | Turn-Off Switching Energy | | -- | 0.34 | -- | |
| $E_{ts}$ | Total Switching Energy | | -- | 1.57 | -- | |
| $Q_G$ | Total Gate Charge | VCE = 480 V, IC = 40 A, VGE = 15 V | -- | 79.2 | -- | nC |
| $Q_{GE}$ | Gate to Emitter Charge | | -- | 19.3 | -- | nC |
| $Q_{GC}$ | Gate to Collector Charge | | -- | 44.8 | -- | nC |
| $t_{rr}$ | Diode reverse recovery time | VR = 400V, IF = 40A, diF/dt = 100A/μs | -- | 74 | -- | nS |
| $Q_{rr}$ | Diode reverse recovery charge | | -- | 144 | -- | nC |
| $I_{rrm}$ | Diode peak reverse recovery current | | -- | 3.7 | -- | A |

（3） Including the reverse recovery of the diode.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

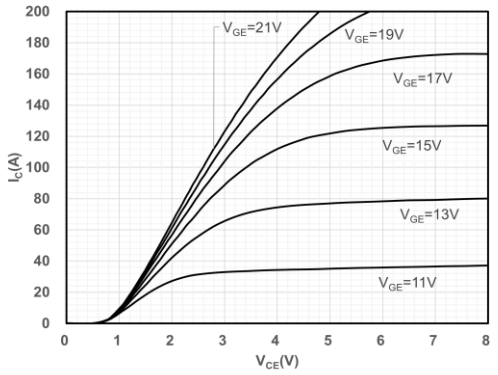



**Figure 1: Output Characteristic**

**(Tj=25°C )**

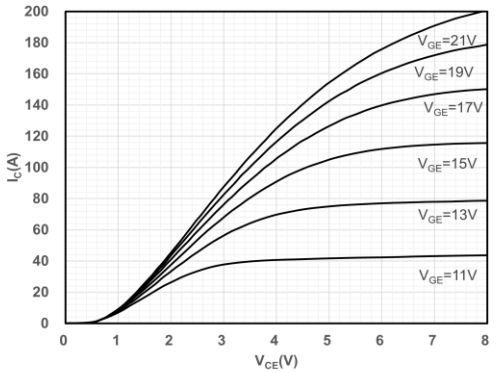



**Figure 2: Output Characteristic**

**(Tj=150°C )**

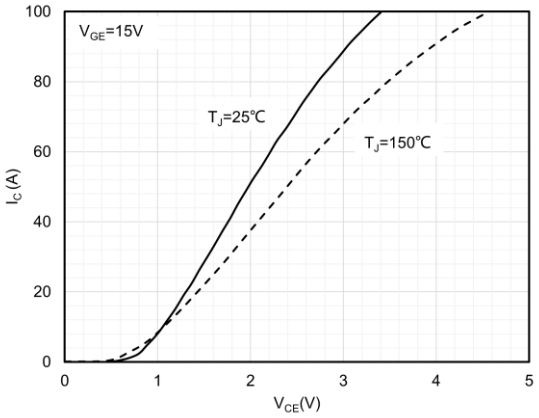



**Figure 3: Collector-Emitter Saturation Voltage**

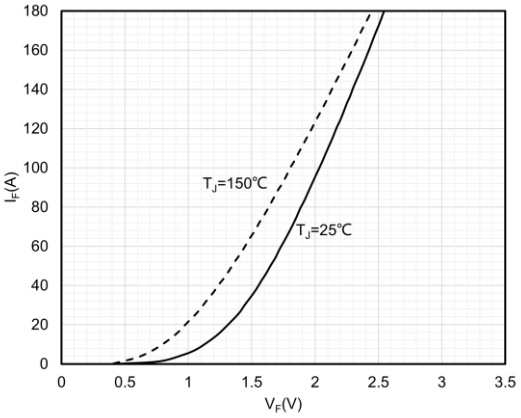



**Figure 4: Diode Characteristic**

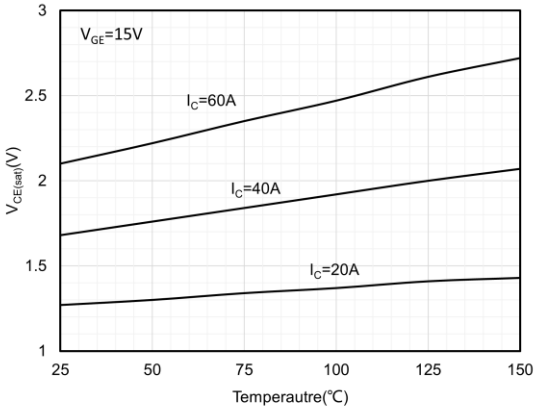



**Figure 5: Collector-Emitter Saturation Voltage vs. Junction Temperature**

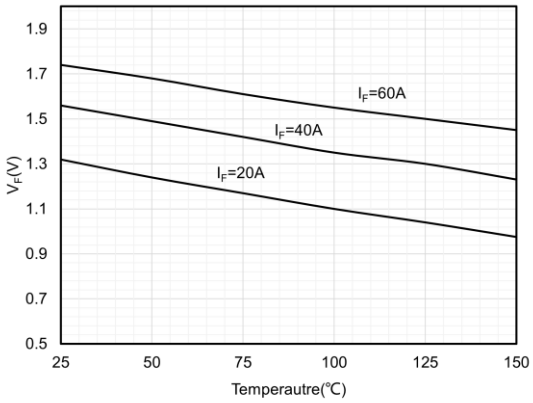



**Figure 6: Diode Forward voltage vs. Junction Temperature**

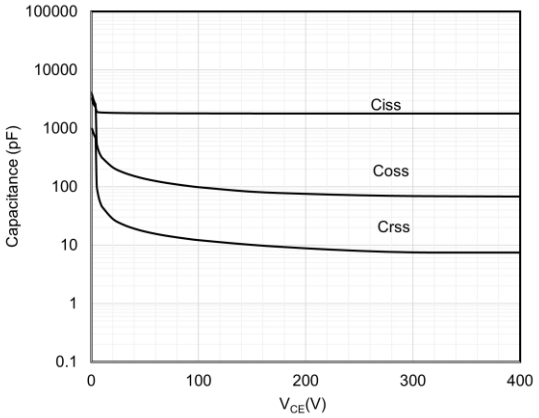



**Figure 7: Capacitance Characteristic**

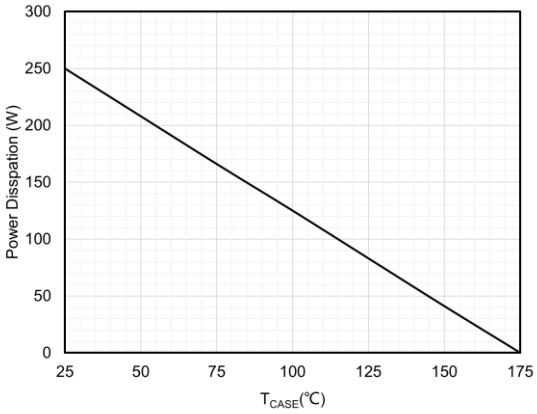



**Figure 8: Power Dissipation as a Function of Case**

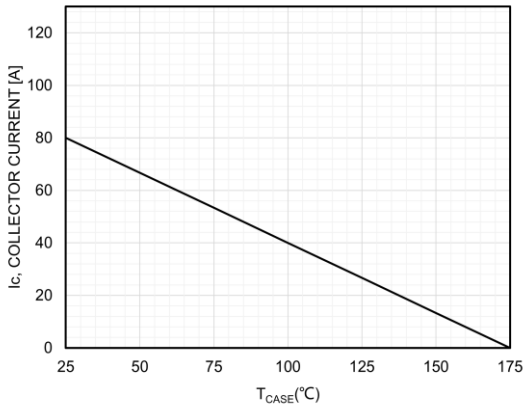



**Figure 9: Collector Current as a Function of Case**

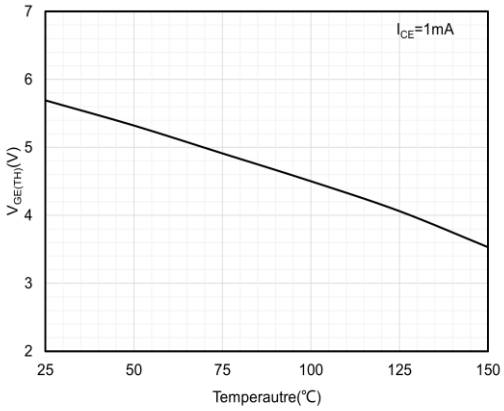



**Figure 10: VGE(TH) vs. $T_J$**

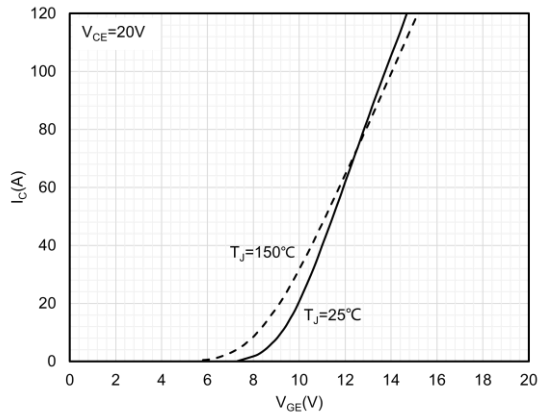



**Figure 11: Transfer Characteristic**

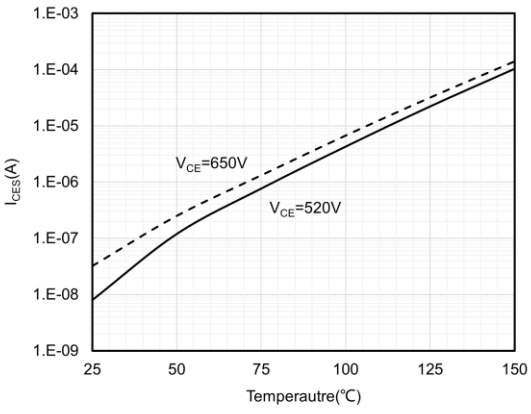



**Figure 12: Reverse Leakage Current vs. $T_J$**

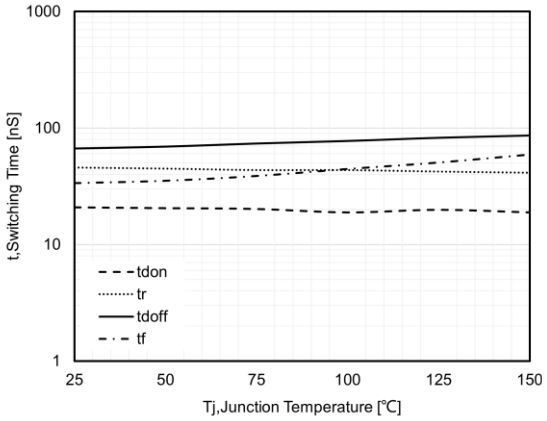



**Figure 13 Typical switching times as a function of junction temperature**

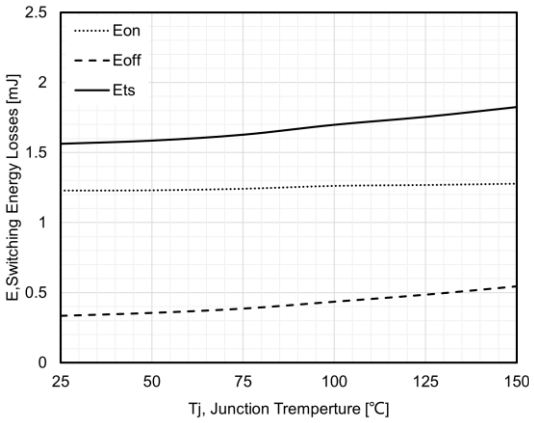
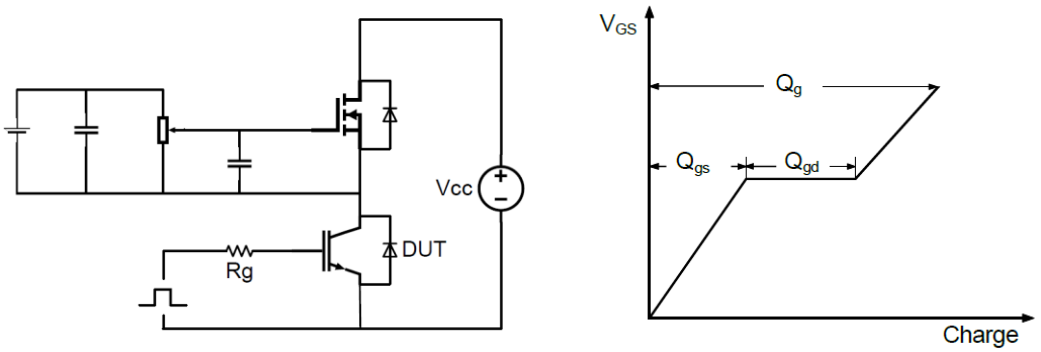


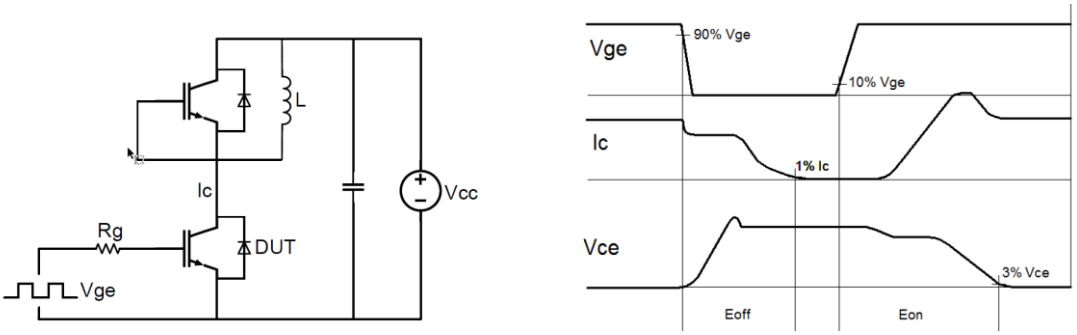

**Figure 14 Typical switching energy losses as a function of junction temperature**

## TEST CIRCUIT AND WAVEFOMRS

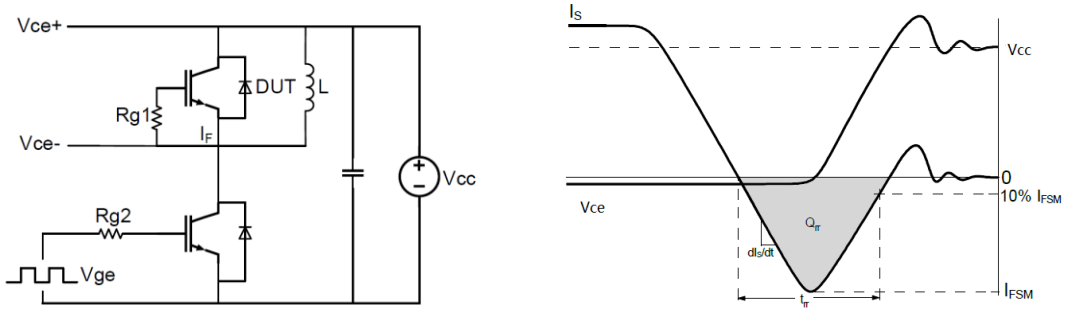
### Gate Charge



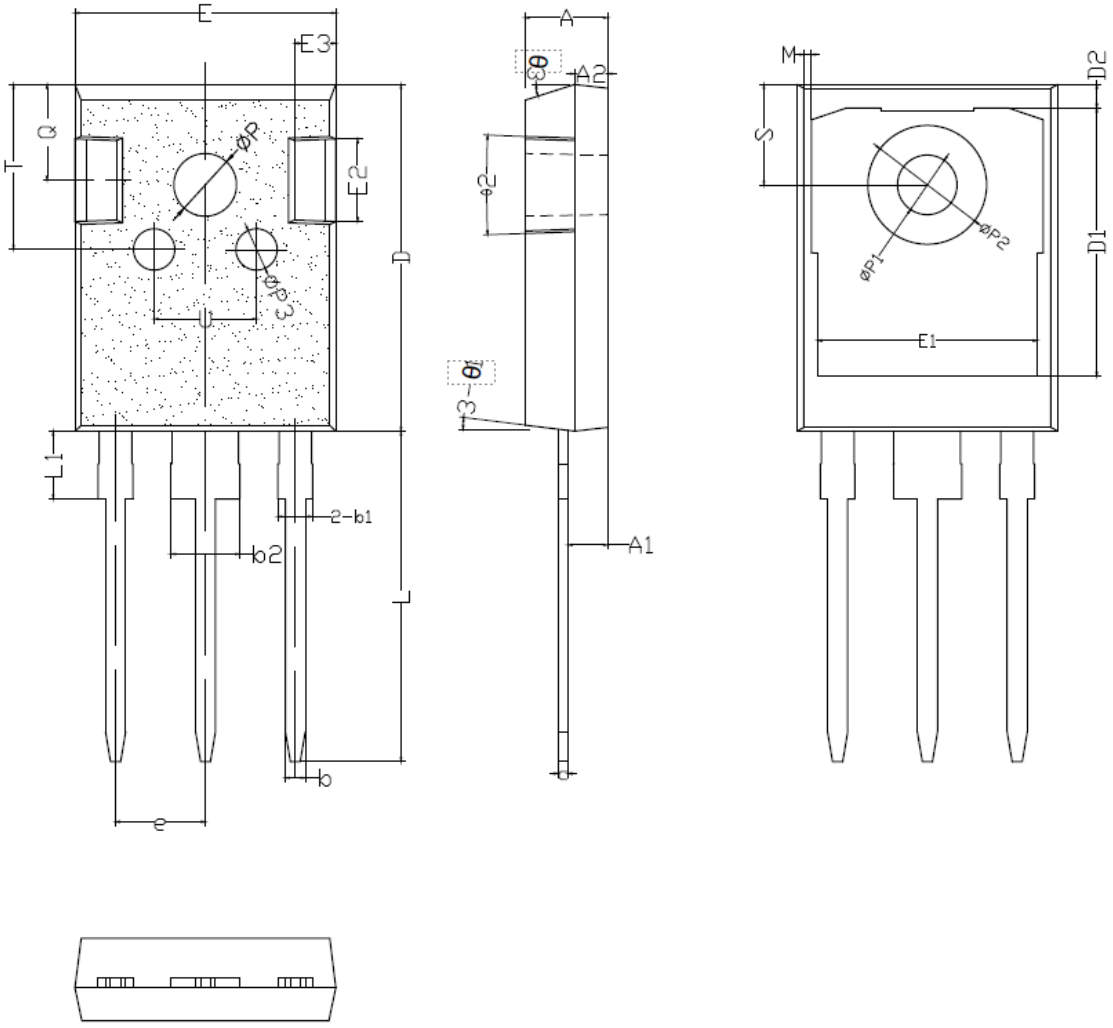

### Inductive Switching Test Circuit




### Diode Reverse Recovery



## TO-247 PACKAGE OUTLINE DIMENSIONS




| SYMBOL | mm | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| *A | 4.90 | 5.00 | 5.10 |
| *A1 | 2.31 | 2.41 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| *b | 1.15 | 1.20 | 1.25 |
| *b1 | 1.95 | 2.10 | 2.25 |
| *b2 | 2.95 | 3.10 | 3.25 |
| *c | 0.55 | 0.60 | 0.65 |
| *D | 20.90 | 21.00 | 21.10 |
| D1 | 16.35 | 16.55 | 16.75 |
| D2 | 1.05 | 1.20 | 1.35 |
| *E | 15.70 | 15.80 | 15.90 |

| | | | |
|---|---|---|---|
| E1 | 13.10 | 13.25 | 13.40 |
| E2 | 4.85 | 4.95 | 5.10 |
| E3 | 2.40 | 2.50 | 2.60 |
| *e | 5.40 | 5.44 | 5.48 |
| *L | 19.80 | 19.98 | 20.15 |
| *L1 | - | - | 4.30 |
| *ΦP | 3.40 | 3.50 | 3.60 |
| *ΦP1 | 6.90 | 7.10 | 7.30 |
| ΦP2 | 2.40 | 2.50 | 2.60 |
| ΦP3 | 2.40 | 2.50 | 2.60 |
| Q | 5.60 | 5.80 | 6.00 |
| *S | 6.05 | 6.15 | 6.25 |
| T | 9.80 | 10.00 | 10.20 |
| U | 6.00 | 6.20 | 6.40 |
| θ1 | 5° | 7° | 9° |
| θ2 | 1° | 3° | 5° |
| θ3 | 13° | 15° | 17° |
| *为管控尺寸 | | | |