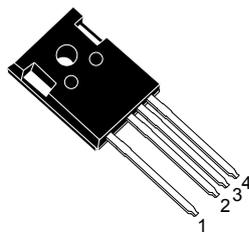
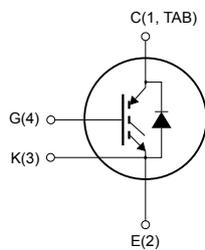


Trench gate field-stop 650 V, 80 A high speed HB series IGBT



TO247-4



NG4K3E2C1_TAB



Product status link

[STGW80H65DFB-4](#)

Product summary

| | |
|-------------------|----------------|
| Order code | STGW80H65DFB-4 |
| Marking | G80H65DFB |
| Package | TO-247-4 |
| Packing | Tube |

Features

- $V_{CE(sat)} = 1.6 \text{ V (typ.) @ } I_C = 80 \text{ A}$
- Maximum junction temperature: $T_J = 175 \text{ }^\circ\text{C}$
- High speed switching series
- Minimized tail current
- Tight parameter distribution
- Safe paralleling
- Low thermal resistance
- Very fast soft recovery antiparallel diode
- Excellent switching performance thanks to the extra driving kelvin pin

Applications

- Photovoltaic inverters
- High frequency converters

Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the new HB series of IGBTs, which represents an optimum compromise between conduction and switching loss to maximize the efficiency of any frequency converter. A faster switching event can be achieved by the Kelvin pin, which separates power path from driving signal. Furthermore, the slightly positive $V_{CE(sat)}$ temperature coefficient and very tight parameter distribution result in safer paralleling operation.

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-------------------------|--|--------------------|------|
| V_{CES} | Collector-emitter voltage ($V_{GE} = 0$ V) | 650 | V |
| I_C | Continuous collector current at $T_C = 25$ °C | 120 ⁽¹⁾ | A |
| | Continuous collector current at $T_C = 100$ °C | 80 | |
| I_{CP} ⁽²⁾ | Pulsed collector current ($t_p \leq 1$ μ s, $T_J < 175$ °C) | 300 | A |
| V_{GE} | Gate-emitter voltage | ± 20 | V |
| | Transient gate-emitter voltage | ± 30 | V |
| I_F | Continuous forward current at $T_C = 25$ °C | 120 ⁽¹⁾ | A |
| | Continuous forward current at $T_C = 100$ °C | 80 | |
| I_{FP} ⁽²⁾ | Pulsed forward current ($t_p \leq 1$ μ s, $T_J < 175$ °C) | 300 | A |
| P_{TOT} | Total power dissipation at $T_C = 25$ °C | 470 | W |
| T_{STG} | Storage temperature range | - 55 to 150 | °C |
| T_J | Operating junction temperature range | - 55 to 175 | |

1. Current level is limited by bond wires
2. Defined by design, not subject to production test.

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|--|-------|------|
| R_{thJC} | Thermal resistance junction-case IGBT | 0.32 | °C/W |
| R_{thJC} | Thermal resistance junction-case diode | 0.66 | |
| R_{thJA} | Thermal resistance junction-ambient | 50 | |

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified

Table 3. Static characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|--|------|------|-----------|---------------|
| $V_{(BR)CES}$ | Collector-emitter breakdown voltage | $V_{GE} = 0\text{ V}, I_C = 2\text{ mA}$ | 650 | | | V |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $V_{GE} = 15\text{ V}, I_C = 80\text{ A}$ | | 1.6 | 2.0 | V |
| | | $V_{GE} = 15\text{ V}, I_C = 80\text{ A}, T_J = 125\text{ °C}$ | | 1.8 | | |
| | | $V_{GE} = 15\text{ V}, I_C = 80\text{ A}, T_J = 175\text{ °C}$ | | 1.9 | | |
| V_F | Forward on-voltage | $I_F = 80\text{ A}$ | | 2.15 | 2.8 | V |
| | | $I_F = 80\text{ A}, T_J = 125\text{ °C}$ | | 1.8 | | |
| | | $I_F = 80\text{ A}, T_J = 175\text{ °C}$ | | 1.7 | | |
| $V_{GE(th)}$ | Gate threshold voltage | $V_{CE} = V_{GE}, I_C = 1\text{ mA}$ | 5 | 6 | 7 | V |
| I_{CES} | Collector cut-off current | $V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}$ | | | 100 | μA |
| I_{GES} | Gate-emitter leakage current | $V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$ | | | ± 250 | nA |

Table 4. Dynamic characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---|------|------|------|---------------|
| C_{ies} | Input capacitance | $V_{CE} = 25\text{ V}, f = 1\text{ MHz}, V_{GE} = 0\text{ V}$ | - | 10.5 | - | μF |
| C_{oes} | Output capacitance | | - | 0.38 | - | |
| C_{res} | Reverse transfer capacitance | | - | 0.21 | - | |
| Q_g | Total gate charge | $V_{CC} = 520\text{ V}, I_C = 80\text{ A}, V_{GE} = 0\text{ to }15\text{ V}$ (see Figure 29. Gate charge test circuit) | - | 414 | - | nC |
| Q_{ge} | Gate-emitter charge | | - | 78 | - | |
| Q_{gc} | Gate-collector charge | | - | 170 | - | |

Table 5. IGBT switching characteristics (inductive load)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|--|--|------|------|------------------|
| $t_{d(on)}$ | Turn-on delay time | $V_{CE} = 400\text{ V}$, $I_C = 80\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$ (see Figure 28. Test circuit for inductive load switching) | | 75 | - | ns |
| t_r | Current rise time | | | 35 | - | |
| $(di/dt)_{on}$ | Turn-on current slope | | | 1750 | - | A/ μs |
| $t_{d(off)}$ | Turn-off-delay time | | | 336 | - | ns |
| t_f | Current fall time | | | 23 | - | |
| $E_{on}^{(1)}$ | Turn-on switching energy | | | 1 | - | mJ |
| $E_{off}^{(2)}$ | Turn-off switching energy | | | 1.7 | - | |
| E_{ts} | Total switching energy | | | 2.7 | - | |
| $t_{d(on)}$ | Turn-on delay time | | $V_{CE} = 400\text{ V}$, $I_C = 80\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_J = 175\text{ }^\circ\text{C}$ (see Figure 28. Test circuit for inductive load switching) | | 66 | - |
| t_r | Current rise time | | | 38 | - | |
| $(di/dt)_{on}$ | Turn-on current slope | | | 1670 | - | A/ μs |
| $t_{d(off)}$ | Turn-off-delay time | | | 403 | - | ns |
| t_f | Current fall time | | | 45 | - | |
| $E_{on}^{(1)}$ | Turn-on switching energy | | | 1.5 | - | mJ |
| $E_{off}^{(2)}$ | Turn-off switching energy | | | 2.47 | - | |
| E_{ts} | Total switching energy | | | 3.97 | - | |

1. Including the reverse recovery of the diode.
2. Including the tail of the collector current.

Table 6. Diode switching characteristics (inductive load)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit | |
|--------------|--|--|------|------|------|------|------------------|
| t_{rr} | Reverse recovery time | $I_F = 80\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = 15\text{ V}$ di/ $dt = 1000\text{ A}/\mu\text{s}$ (see Figure 28. Test circuit for inductive load switching) | - | 112 | - | ns | |
| Q_{rr} | Reverse recovery charge | | | - | 955 | - | nC |
| I_{rrm} | Reverse recovery current | | | - | 27.2 | - | A |
| di_{rr}/dt | Peak rate of fall of reverse recovery current during t_b | | | - | 1515 | - | A/ μs |
| E_{rr} | Reverse recovery energy | | | - | 170 | - | μJ |
| t_{rr} | Reverse recovery time | $I_F = 80\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$ di/dt = 1000 A/ μs (see Figure 28. Test circuit for inductive load switching) | - | 164 | - | ns | |
| Q_{rr} | Reverse recovery charge | | | - | 3838 | - | nC |
| I_{rrm} | Reverse recovery current | | | - | 52 | - | A |
| di_{rr}/dt | Peak rate of fall of reverse recovery current during t_b | | | - | 785 | - | A/ μs |
| E_{rr} | Reverse recovery energy | | | - | 635 | - | μJ |

2.1 Electrical characteristics (curves)

Figure 1. Power dissipation vs. case temperature

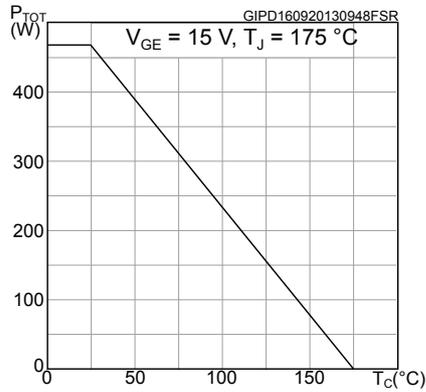


Figure 2. Collector current vs. case temperature

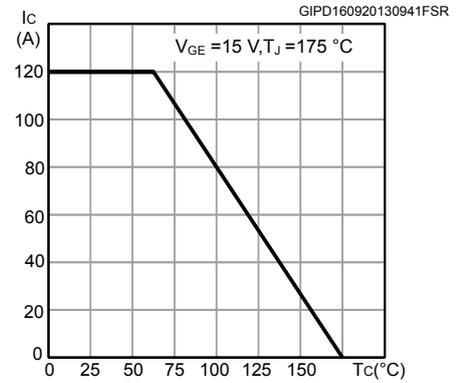


Figure 3. Output characteristics (T_J = 25 °C)

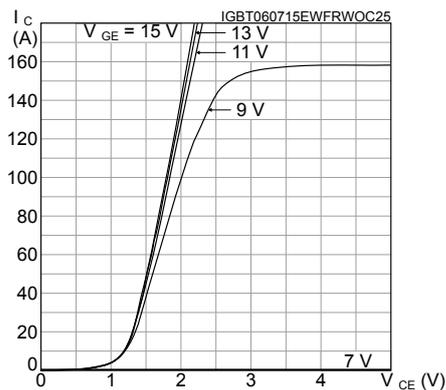


Figure 4. Output characteristics (T_J = 175 °C)

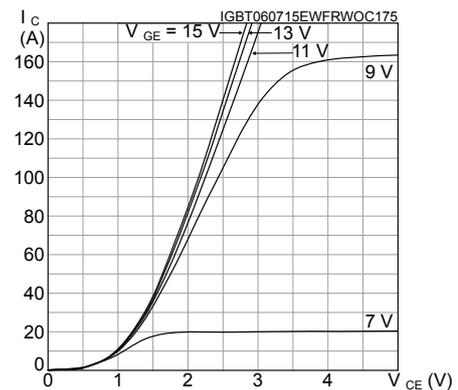


Figure 5. V_{CE(sat)} vs. junction temperature

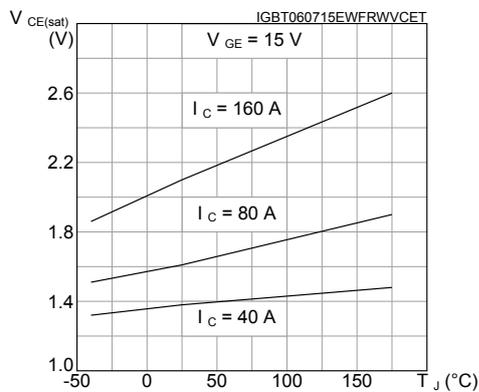


Figure 6. V_{CE(sat)} vs. collector current

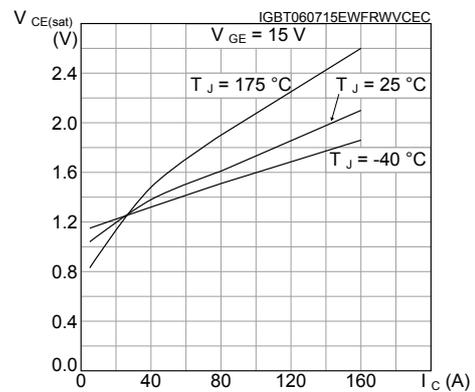


Figure 7. Collector current vs. switching frequency

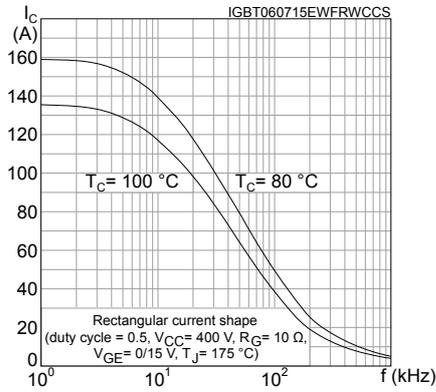


Figure 8. Forward bias safe operating area

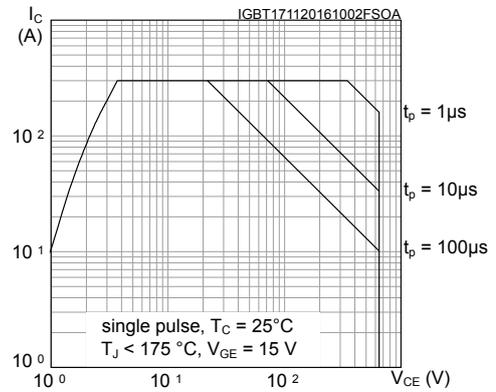


Figure 9. Transfer characteristics

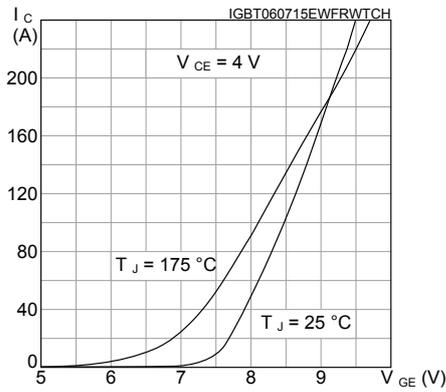


Figure 10. Diode V_F vs. forward current

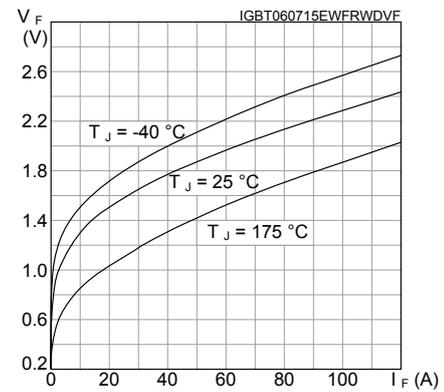


Figure 11. Normalized V_GE(th) vs. junction temperature

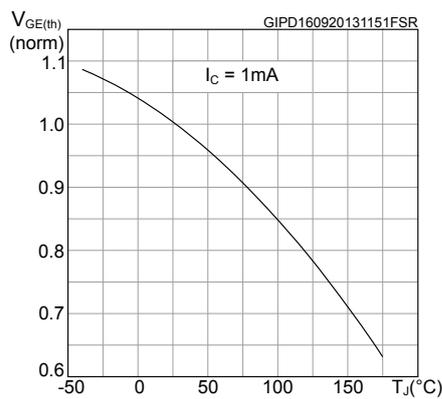


Figure 12. Normalized V_BR(CES) vs. junction temperature

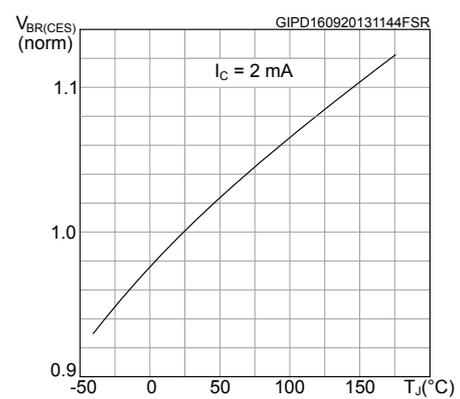


Figure 13. Capacitance variations

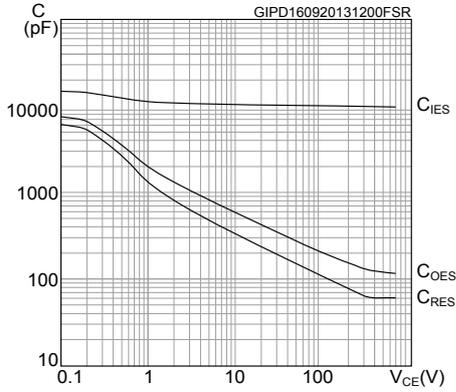


Figure 14. Gate charge vs. gate-emitter voltage

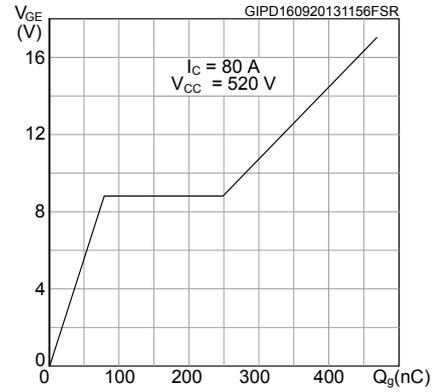


Figure 15. Switching energy vs. collector current

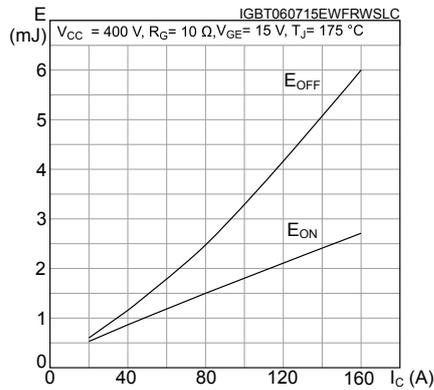


Figure 16. Switching energy vs. gate resistance

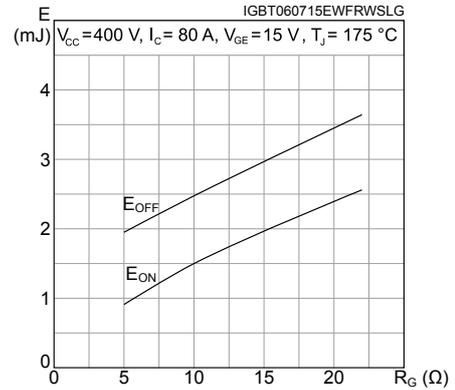


Figure 17. Switching energy vs. temperature

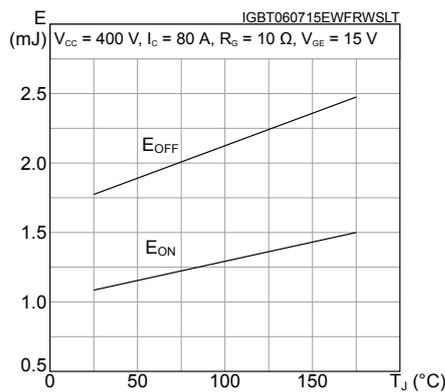


Figure 18. Switching energy vs. collector emitter voltage

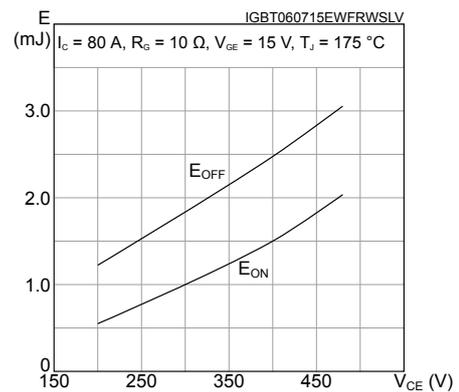


Figure 19. Switching times vs. collector current

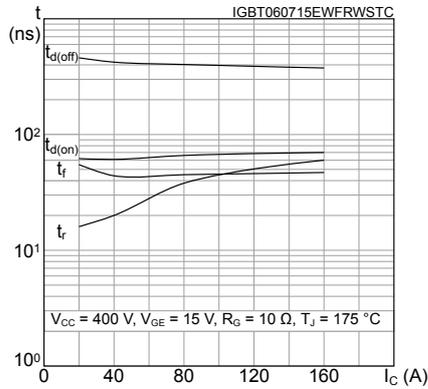


Figure 20. Switching times vs. gate resistance

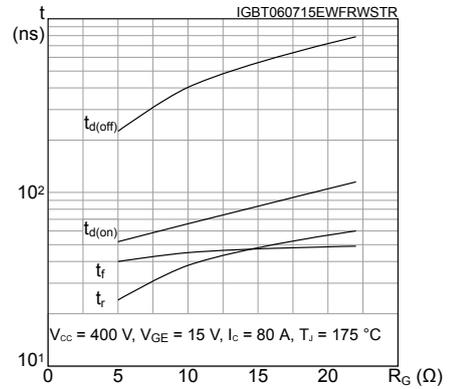


Figure 21. Reverse recovery current vs. diode current slope

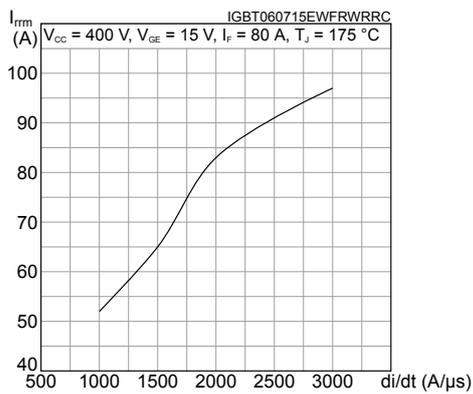


Figure 22. Reverse recovery time vs. diode current slope

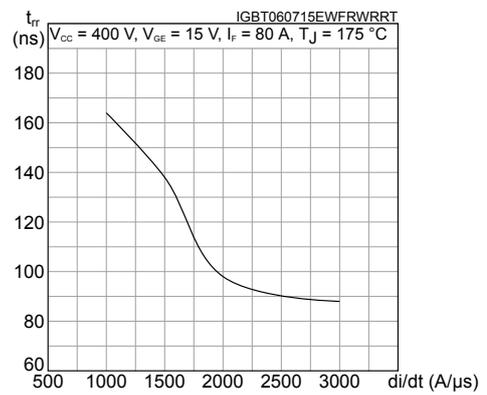


Figure 23. Reverse recovery charge vs. diode current slope

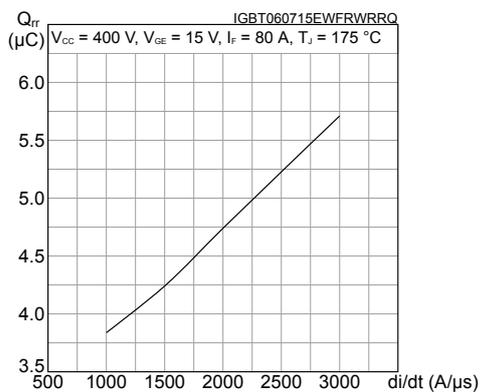


Figure 24. Reverse recovery energy vs. diode current slope

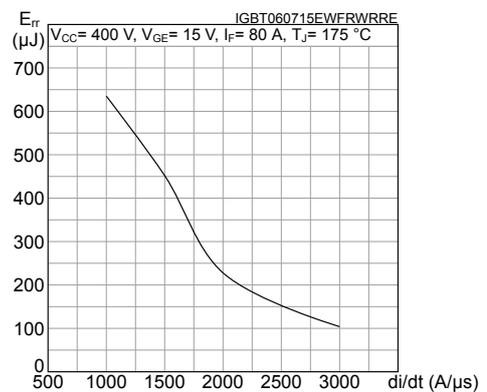


Figure 25. Thermal impedance for IGBT

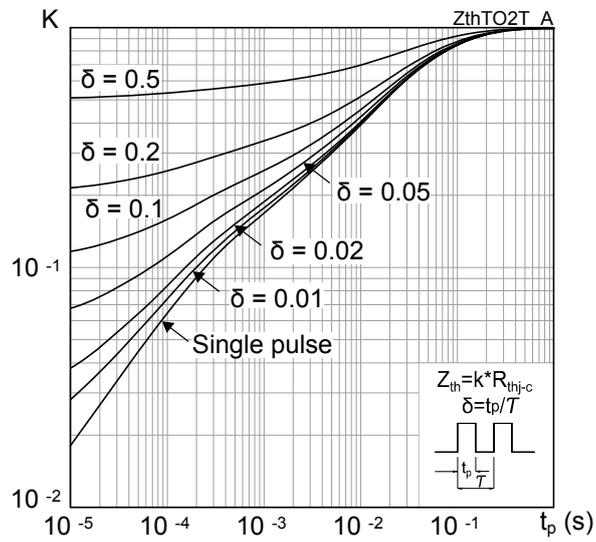
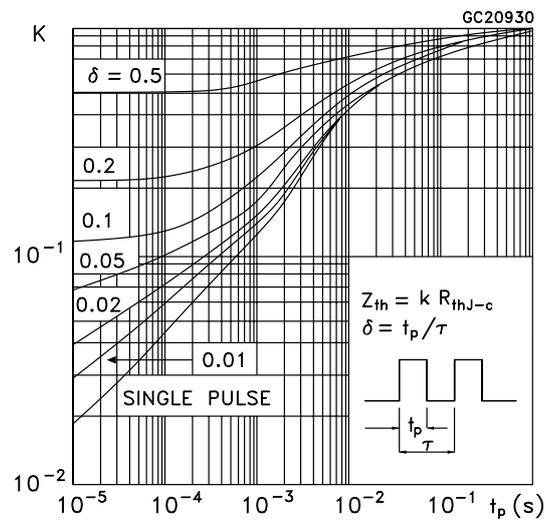


Figure 26. Thermal impedance for diode



3 Test circuits

Figure 27. Test circuit for inductive load switching

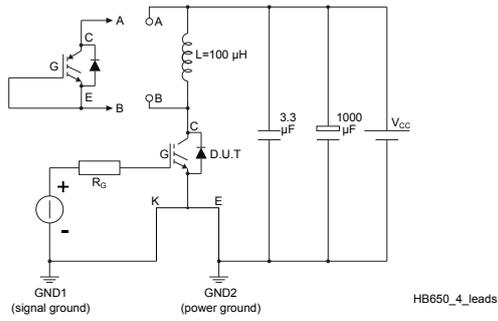


Figure 28. Gate charge test circuit

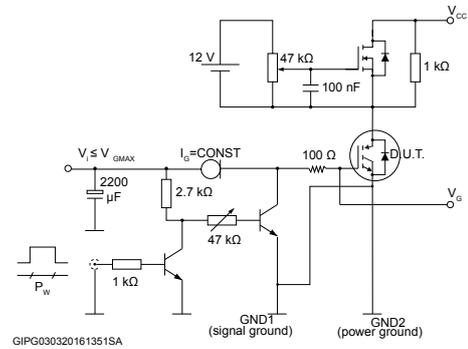


Figure 29. Switching waveform

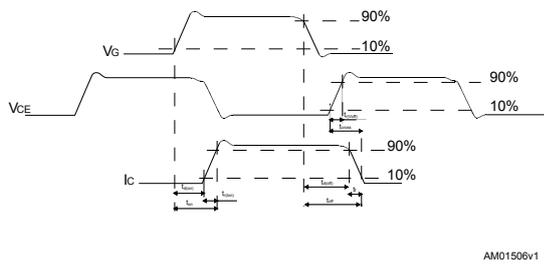
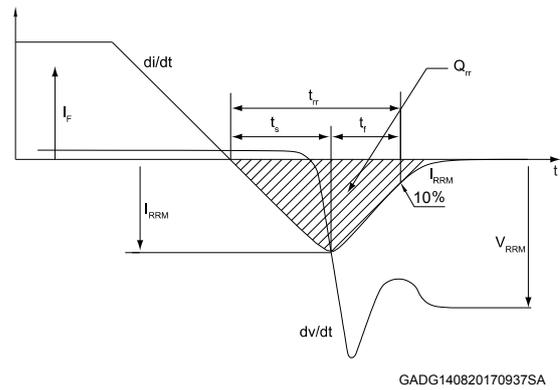


Figure 30. Diode reverse recovery waveform

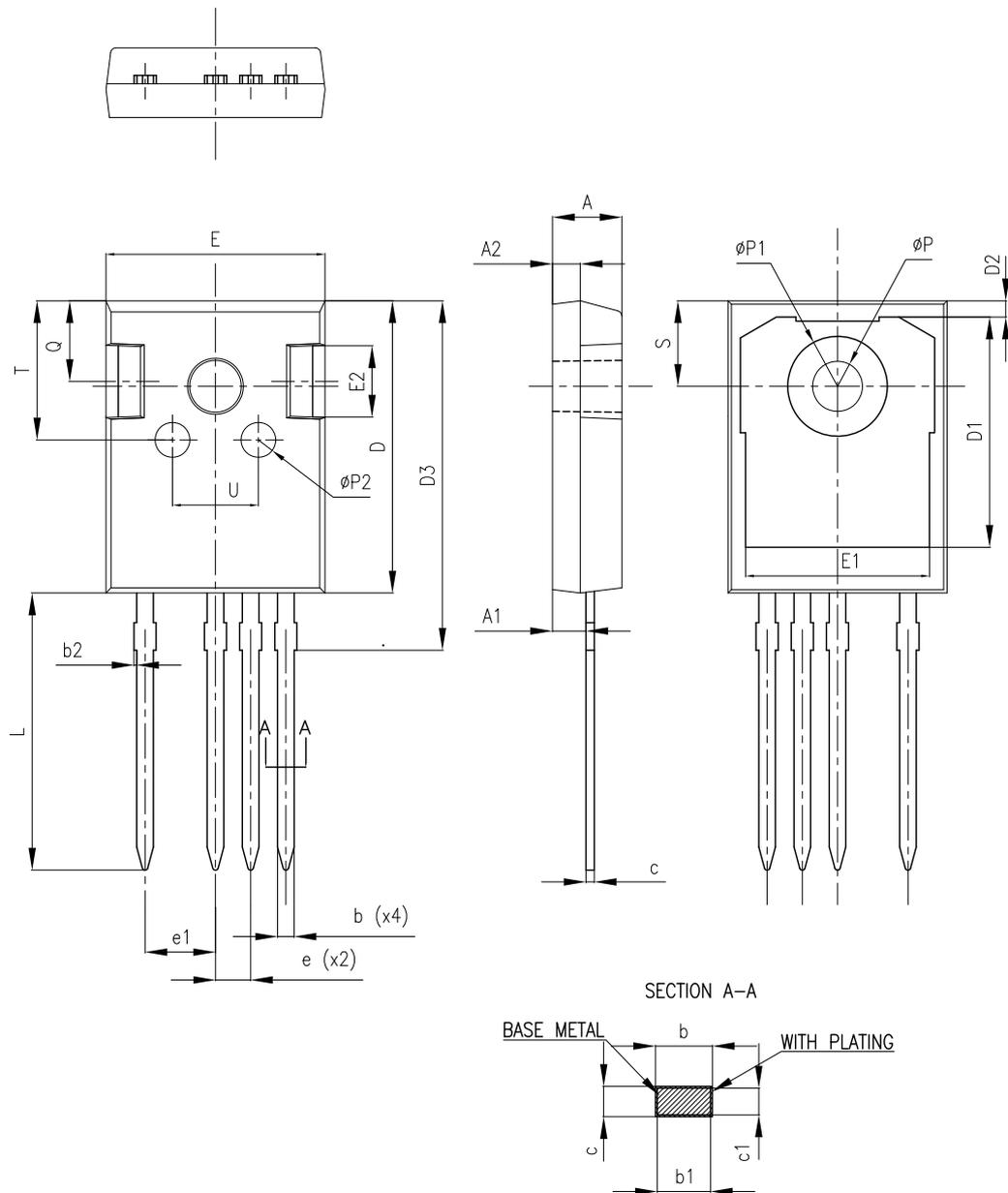


4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 TO247-4 package information

Figure 31. TO247-4 package outline



8405626_2

Table 7. TO247-4 mechanical data

| Dim. | mm | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.90 | 5.00 | 5.10 |
| A1 | 2.31 | 2.41 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| b | 1.16 | | 1.29 |
| b1 | 1.15 | 1.20 | 1.25 |
| b2 | 0 | | 0.20 |
| c | 0.59 | | 0.66 |
| c1 | 0.58 | 0.60 | 0.62 |
| D | 20.90 | 21.00 | 21.10 |
| D1 | 16.25 | 16.55 | 16.85 |
| D2 | 1.05 | 1.20 | 1.35 |
| D3 | 24.97 | 25.12 | 25.27 |
| E | 15.70 | 15.80 | 15.90 |
| E1 | 13.10 | 13.30 | 13.50 |
| E2 | 4.90 | 5.00 | 5.10 |
| E3 | 2.40 | 2.50 | 2.60 |
| e | 2.44 | 2.54 | 2.64 |
| e1 | 4.98 | 5.08 | 5.18 |
| L | 19.80 | 19.92 | 20.10 |
| P | 3.50 | 3.60 | 3.70 |
| P1 | | | 7.40 |
| P2 | 2.40 | 2.50 | 2.60 |
| Q | 5.60 | | 6.00 |
| S | | 6.15 | |
| T | 9.80 | | 10.20 |
| U | 6.00 | | 6.40 |

Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 05-Aug-2015 | 1 | First release. |
| 17-Nov-2016 | 2 | Updated features in cover page. Updated <i>Table 2: "Absolute maximum ratings"</i> and <i>Figure 9: "Forward bias safe operating area"</i> . Minor text changes. |
| 03-Mar-2017 | 3 | Updated the title in cover page, <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 4: "Static characteristics"</i> and <i>Table 6: "IGBT switching characteristics (inductive load)"</i> . Minor text changes. |
| 03-Jul-2019 | 4 | Updated Table 1. Absolute maximum ratings . Minor text changes. |

Contents

| | | |
|------------|--|-----------|
| 1 | Electrical ratings | 2 |
| 2 | Electrical characteristics | 3 |
| 2.1 | Electrical characteristics (curves) | 5 |
| 3 | Test circuits | 10 |
| 4 | Package information | 11 |
| 4.1 | TO247-4 package information | 11 |
| | Revision history | 13 |

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2019 STMicroelectronics – All rights reserved



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.