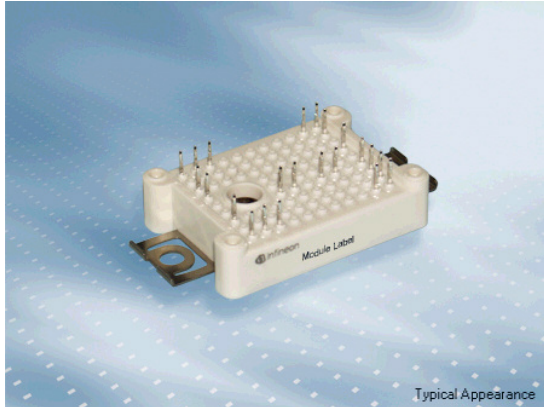
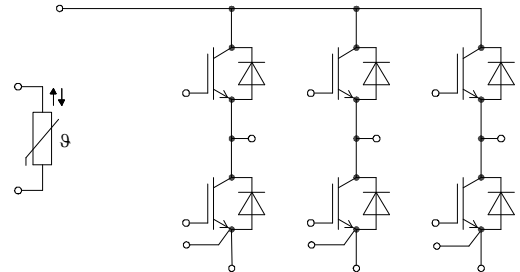


EasyPACK Modul mit Trench/Feldstopp IGBT3 und Emitter Controlled 3 Diode und PressFIT / NTC
EasyPACK module with Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode and PressFIT / NTC



Typical Appearance



$V_{CES} = 650V$
 $I_{C\ nom} = 50A / I_{CRM} = 100A$

Typische Anwendungen

- Hybrid-Elektrofahrzeuge (H)EV
- Klimaanlage
- Motorantriebe

Typical Applications

- Hybrid Electrical Vehicles (H)EV
- Air Conditioning
- Motor Drives

Elektrische Eigenschaften

- Erhöhte Sperrspannungsfestigkeit auf 650V
- Niedrige Schaltverluste
- Niedriges V_{CEsat}
- Trench IGBT 3

Electrical Features

- Increased blocking voltage capability to 650V
- Low Switching Losses
- Low V_{CEsat}
- Trench IGBT 3

Mechanische Eigenschaften

- Al_2O_3 Substrat mit kleinem thermischen Widerstand
- Hohe Leistungsdichte
- Integrierter NTC Temperatur Sensor
- Kompaktes Design
- PressFIT Verbindungstechnik
- RoHS konform
- Robuste Montage durch integrierte Befestigungsklammern

Mechanical Features

- Al_2O_3 Substrate with Low Thermal Resistance
- High Power Density
- Integrated NTC temperature sensor
- Compact design
- PressFIT Contact Technology
- RoHS compliant
- Rugged mounting due to integrated mounting clamps

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

| Content of the Code | Digit |
|----------------------------|---------|
| Module Serial Number | 1 - 5 |
| Module Material Number | 6 - 11 |
| Production Order Number | 12 - 19 |
| Datecode (Production Year) | 20 - 21 |
| Datecode (Production Week) | 22 - 23 |

| | | |
|-----------------|---------------------------------|--------------------|
| prepared by: SS | date of publication: 2012-01-12 | material no: 35374 |
| approved by: TR | revision: 3.0 | |

IGBT-Wechselrichter / IGBT-inverter

Höchstzulässige Werte / Maximum Rated Values

| | | | | |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------|----------|--------|
| Kollektor-Emitter-Sperrspannung Collector-emitter voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{CES} | 650 | V |
| Kollektor-Dauergleichstrom Continuous DC collector current | $T_C = 90^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{C\ nom}$ I_C | 50 70 | A A |
| Periodischer Kollektor-Spitzenstrom Repetitive peak collector current | $t_p = 1\ \text{ms}$ | I_{CRM} | 100 | A |
| Gesamt-Verlustleistung Total power dissipation | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | P_{tot} | 205 | W |
| Gate-Emitter-Spitzenspannung Gate-emitter peak voltage | | V_{GES} | +/-20 | V |

Charakteristische Werte / Characteristic Values

| | | | min. | typ. | max. | |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------|-------------------------|------|-------------------------------------------------|
| Kollektor-Emitter-Sättigungsspannung Collector-emitter saturation voltage | $I_C = 50\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 50\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 50\ \text{A}, V_{GE} = 15\ \text{V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\ sat}$ | 1,45 1,60 1,70 | 1,90 | V V V |
| Gate-Schwellenspannung Gate threshold voltage | $I_C = 0,80\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 4,9 5,8 6,5 | | V |
| Gateladung Gate charge | $V_{GE} = -15\ \text{V} \dots +15\ \text{V}$ | | Q_G | 0,50 | | μC |
| Interner Gatewiderstand Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 0,0 | | Ω |
| Eingangskapazität Input capacitance | $f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$ | | C_{ies} | 3,10 | | nF |
| Rückwirkungskapazität Reverse transfer capacitance | $f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$ | | C_{res} | 0,095 | | nF |
| Kollektor-Emitter-Reststrom Collector-emitter cut-off current | $V_{CE} = 650\ \text{V}, V_{GE} = 0\ \text{V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{CES} | | 0,05 | mA |
| Gate-Emitter-Reststrom Gate-emitter leakage current | $V_{CE} = 0\ \text{V}, V_{GE} = 20\ \text{V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{GES} | | 400 | nA |
| Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\ on}$ | 0,023 0,023 0,023 | | μs μs μs |
| Anstiegszeit, induktive Last Rise time, inductive load | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_r | 0,019 0,022 0,022 | | μs μs μs |
| Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\ off}$ | 0,17 0,19 0,20 | | μs μs μs |
| Fallzeit, induktive Last Fall time, inductive load | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_f | 0,03 0,04 0,05 | | μs μs μs |
| Einschaltverlustenergie pro Puls Turn-on energy loss per pulse | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}, L_S = 50\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, di/dt = 2200\ \text{A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $R_{Gon} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{on} | 0,40 0,57 0,64 | | mJ mJ mJ |
| Abschaltverlustenergie pro Puls Turn-off energy loss per pulse | $I_C = 50\ \text{A}, V_{CE} = 300\ \text{V}, L_S = 50\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, du/dt = 4000\ \text{V}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $R_{Goff} = 6,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{off} | 1,20 1,60 1,70 | | mJ mJ mJ |
| Kurzschlußverhalten SC data | $V_{GE} \leq 15\ \text{V}, V_{CC} = 360\ \text{V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ | $t_p \leq 8\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_p \leq 6\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | I_{SC} | 350 250 | | A A |
| Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case | pro IGBT / per IGBT | | R_{thJC} | 0,65 0,73 | | K/W K/W |
| Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink | pro IGBT / per IGBT $\lambda_{Paste} = 1\ \text{W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\ \text{W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,80 | | K/W |

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| prepared by: SS | date of publication: 2012-01-12 |
| approved by: TR | revision: 3.0 |

Diode-Wechselrichter / Diode-inverter
Höchstzulässige Werte / Maximum Rated Values

| | | | | |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|----------------------|
| Periodische Spitzensperrspannung Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{RRM} | 650 | V |
| Dauergleichstrom Continuous DC forward current | | I_F | 50 | A |
| Periodischer Spitzenstrom Repetitive peak forward current | $t_p = 1\text{ ms}$ | I_{FRM} | 100 | A |
| Grenzlastintegral I^2t - value | $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | I^2t | 370 | A^2s |
| | | | 330 | A^2s |

Charakteristische Werte / Characteristic Values

| | | | min. | typ. | max. | |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------|------|------|---------------|
| Durchlassspannung Forward voltage | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ | | 1,55 | 2,00 | V |
| | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 125^{\circ}\text{C}$ | V_F | 1,50 | | V |
| | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 150^{\circ}\text{C}$ | | 1,45 | | V |
| Rückstromspitze Peak reverse recovery current | $I_F = 50\text{ A}, -di_F/dt = 2200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ | | 50,0 | | A |
| | | $T_{vj} = 125^{\circ}\text{C}$ | I_{RM} | 60,0 | | A |
| | | $T_{vj} = 150^{\circ}\text{C}$ | | 65,0 | | A |
| Sperrverzögerungsladung Recovered charge | $I_F = 50\text{ A}, -di_F/dt = 2200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ | | 2,00 | | μC |
| | | $T_{vj} = 125^{\circ}\text{C}$ | Q_r | 3,90 | | μC |
| | | $T_{vj} = 150^{\circ}\text{C}$ | | 4,40 | | μC |
| Abschaltenergie pro Puls Reverse recovery energy | $I_F = 50\text{ A}, -di_F/dt = 2200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ | | 0,50 | | mJ |
| | | $T_{vj} = 125^{\circ}\text{C}$ | E_{rec} | 1,00 | | mJ |
| | | $T_{vj} = 150^{\circ}\text{C}$ | | 1,15 | | mJ |
| Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case | pro Diode / per diode | R_{thJC} | | 1,00 | 1,10 | K/W |
| Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink | pro Diode / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | R_{thCH} | | 0,85 | | K/W |

NTC-Widerstand / NTC-thermistor

Charakteristische Werte / Characteristic Values

| | | | min. | typ. | max. | |
|------------------------------------------|---------------------------------------------------------------|--------------|------|------|------|------------|
| Nennwiderstand Rated resistance | $T_C = 25^{\circ}\text{C}$ | R_{25} | | 5,00 | | k Ω |
| Abweichung von R100 Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$ | $\Delta R/R$ | -5 | | 5 | % |
| Verlustleistung Power dissipation | $T_C = 25^{\circ}\text{C}$ | P_{25} | | | 20,0 | mW |
| B-Wert B-value | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/50}$ | | 3375 | | K |
| B-Wert B-value | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/80}$ | | 3411 | | K |
| B-Wert B-value | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ | | 3433 | | K |

Angaben gemäß gültiger Application Note.
Specification according to the valid application note.

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| prepared by: SS | date of publication: 2012-01-12 |
| approved by: TR | revision: 3.0 |

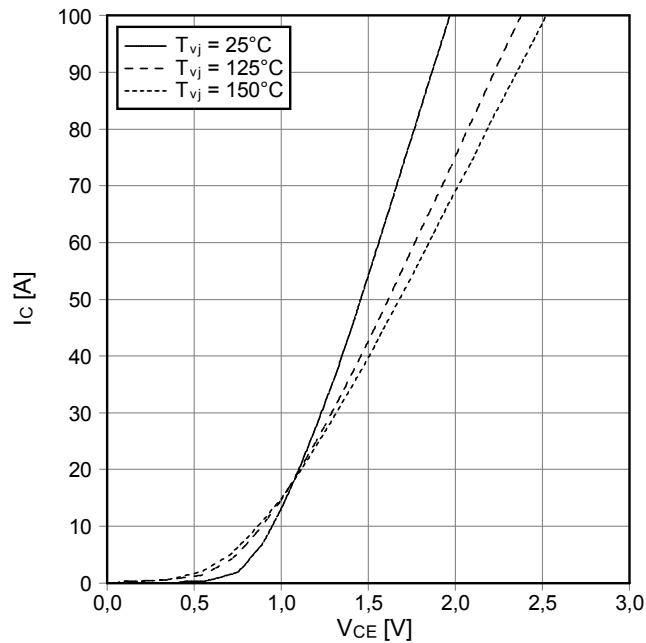


Modul / Module

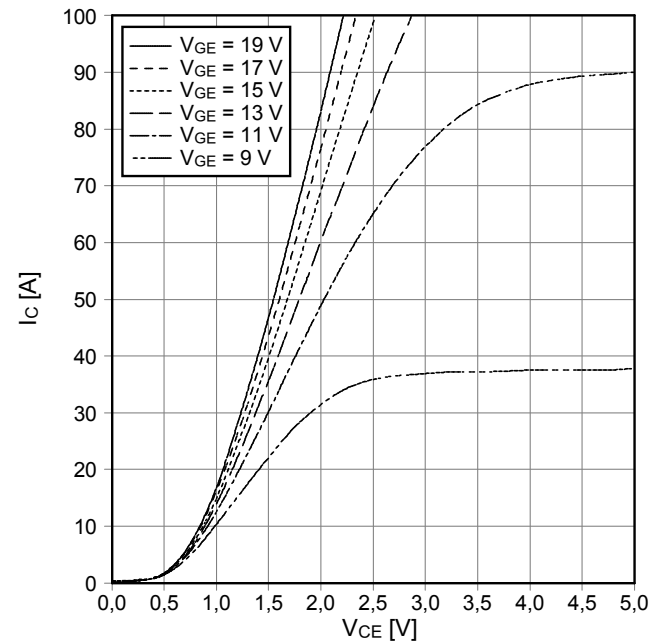
| | | | | | |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|--------------------------------------|------|--------|
| Isolations-Prüfspannung Isolation test voltage | RMS, f = 50 Hz, t = 1 min. | V _{ISOL} | 2,5 | | kV |
| Innere Isolation Internal isolation | | | impr. Al ₂ O ₃ | | |
| Kriechstrecke Creepage distance | Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal | | 11,5 6,3 | | mm |
| Luftstrecke Clearance | Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal | | 10,0 5,0 | | mm |
| Vergleichszahl der Kriechwegbildung Comperative tracking index | | CTI | > 200 | | |
| | | | min. | typ. | max. |
| Modulstreuintuktivität Stray inductance module | | L _{SCE} | | 25 | nH |
| Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip | T _C = 25°C, pro Schalter / per switch | R _{CC'+EE'} | | 3,50 | mΩ |
| Höchstzulässige Sperrschichttemperatur Maximum junction temperature | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper | T _{vj max} | | | 175 °C |
| Temperatur im Schaltbetrieb Temperature under switching conditions | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper | T _{vj op} | -40 | | 150 °C |
| Lagertemperatur Storage temperature | | T _{stg} | -40 | | 125 °C |
| Anpresskraft für mech. Bef. pro Feder mounting force per clamp | | F | 20 | - | 50 N |
| Gewicht Weight | | G | | 24 | g |

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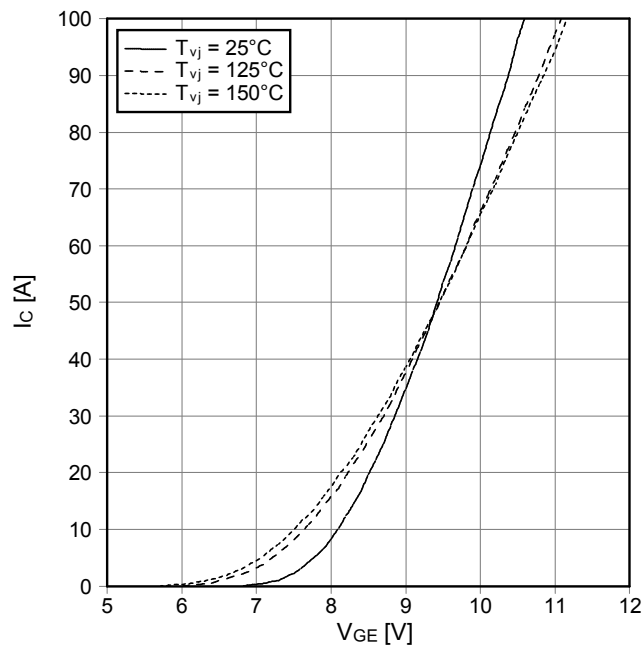
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_c = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



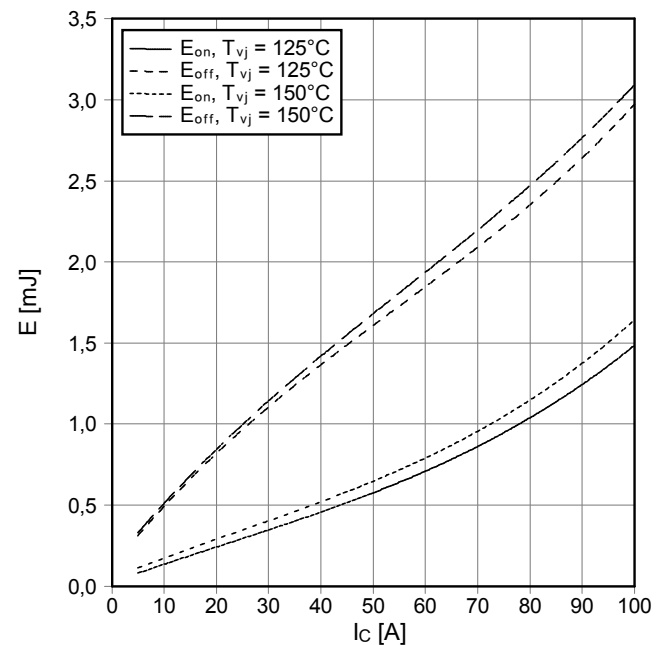
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_c = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



Übertragungscharakteristik IGBT-Wechselr. (typisch)
transfer characteristic IGBT-inverter (typical)
 $I_c = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



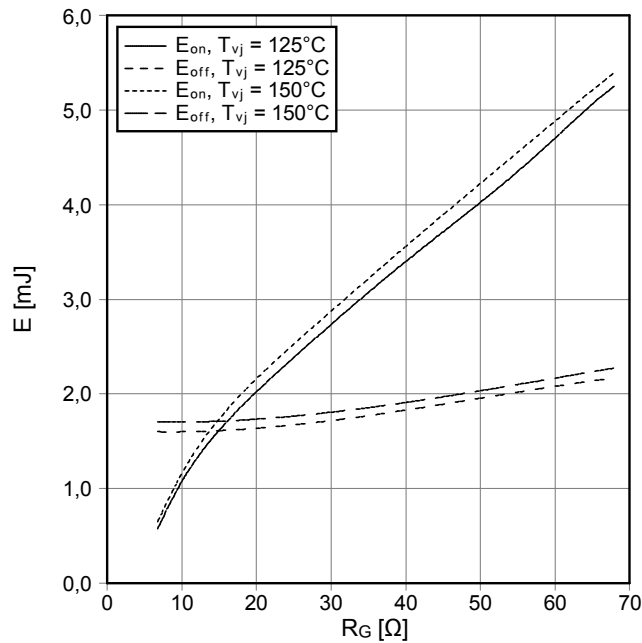
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(I_c)$, $E_{off} = f(I_c)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.8\ \Omega$, $R_{Goff} = 6.8\ \Omega$, $V_{CE} = 300\text{ V}$



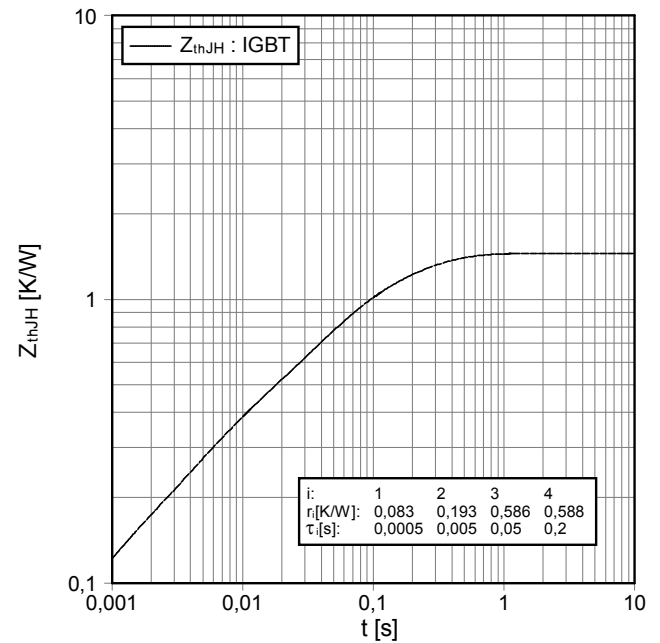
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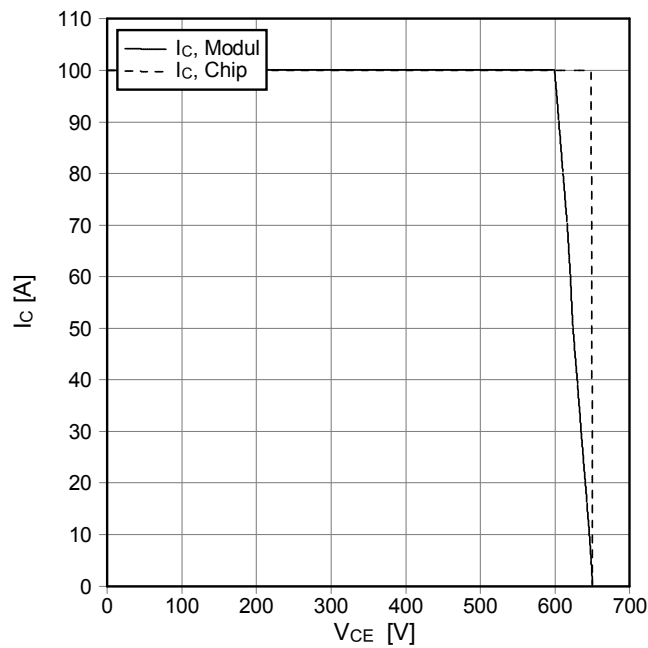
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$, $V_{CE} = 300\text{ V}$



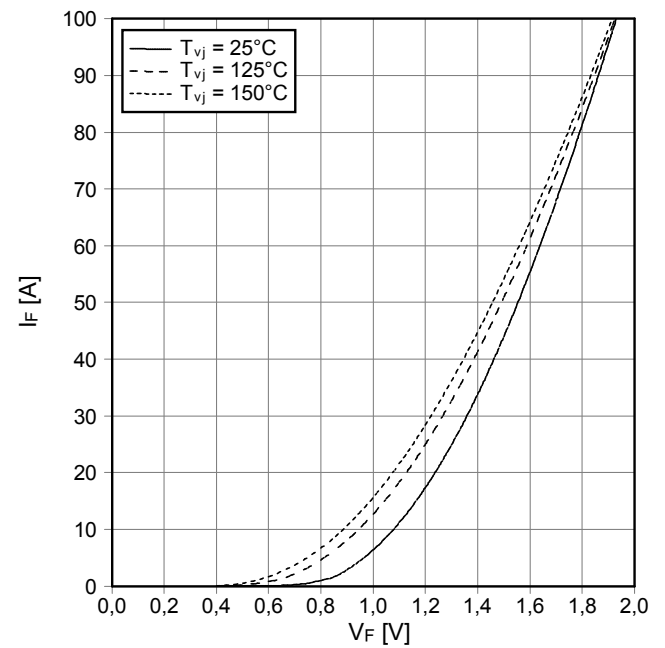
Transienter Wärmewiderstand IGBT-Wechselr.
transient thermal impedance IGBT-inverter
 $Z_{thJH} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.8\ \Omega$, $T_{vj} = 150^\circ\text{C}$



Durchlasskennlinie der Diode-Wechselr. (typisch)
forward characteristic of diode-inverter (typical)
 $I_F = f(V_F)$

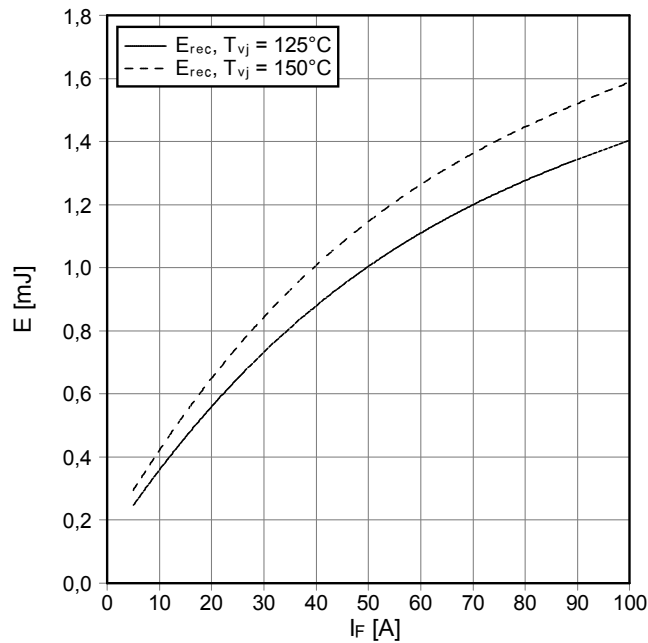


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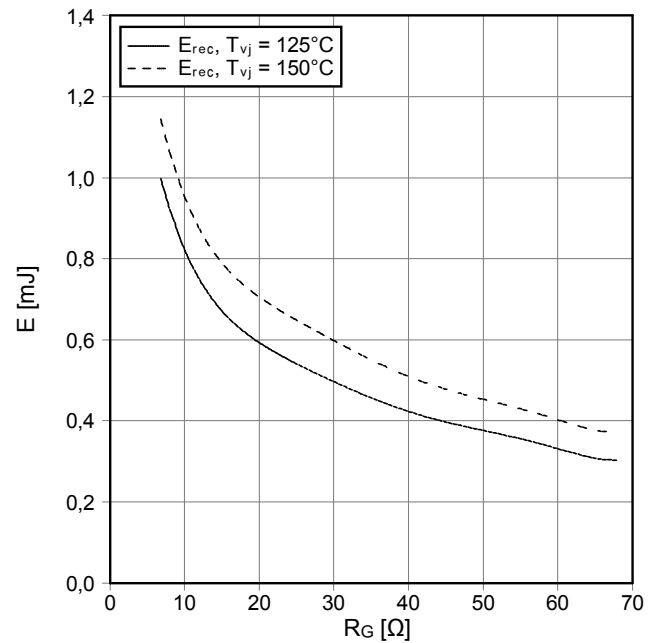
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 6.8 \Omega, V_{CE} = 300 V$



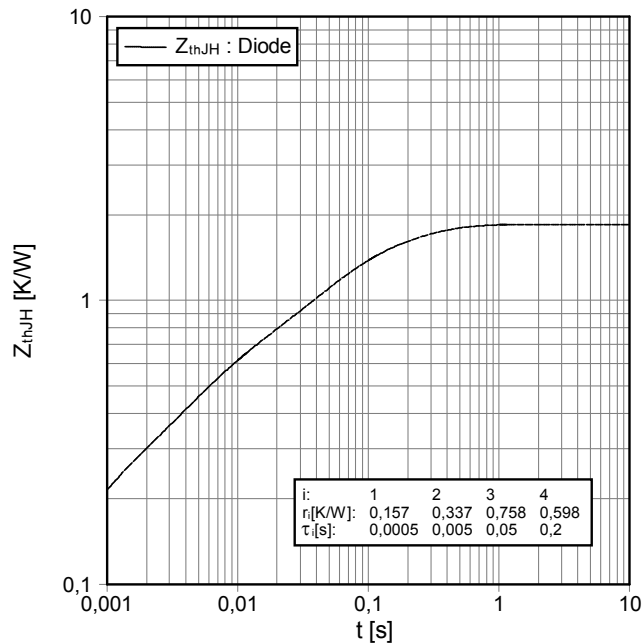
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 50 A, V_{CE} = 300 V$



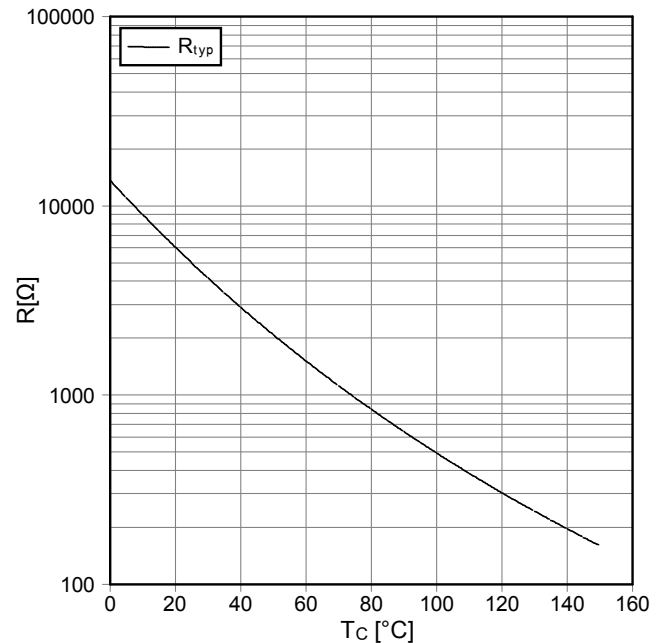
Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter

$Z_{thJH} = f(t)$



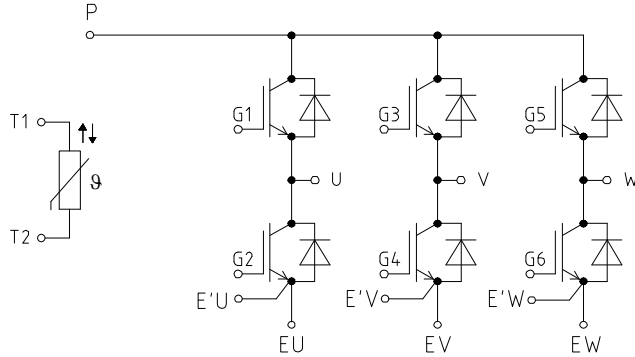
NTC-Temperaturkennlinie (typisch)
NTC-temperature characteristic (typical)

$R = f(T)$

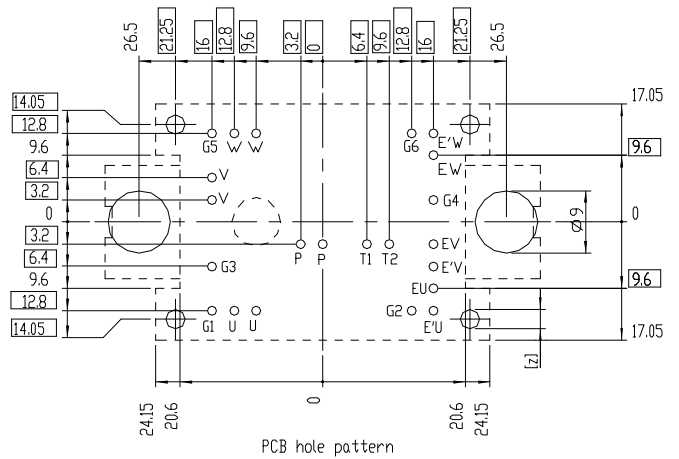
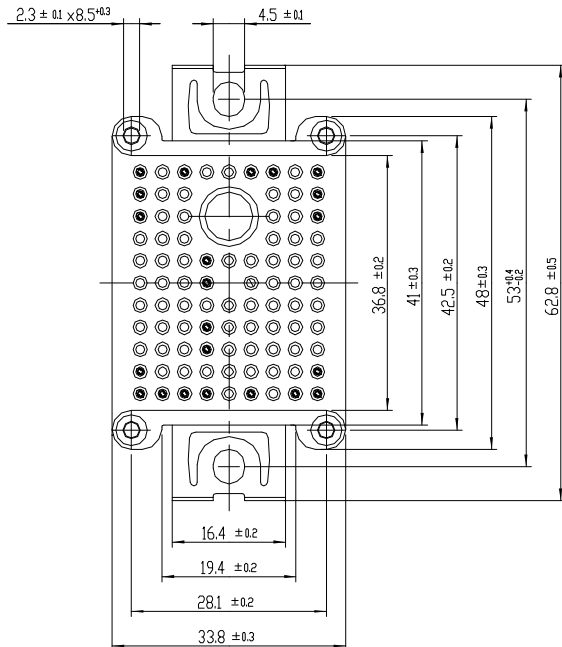
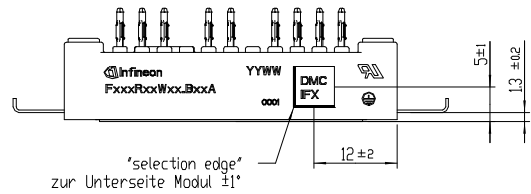
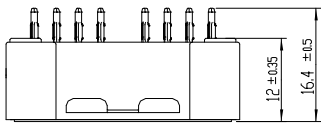


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| prepared by: SS | date of publication: 2012-01-12 |
| approved by: TR | revision: 3.0 |

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ± 0.1 26x
- Hole specification for contacts see application note Easy PressFIT
- Diameters of drill \varnothing 1.15 mm and copper thickness in hole 25 - 50 μ m
- [z] recommended diameter of PCB positioning guiding holes \varnothing 2.8 mm

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Sollten Sie von uns Produktinformationen benötigen, die über den Inhalt dieses Produktdatenblatts hinausgehen und insbesondere eine spezifische Verwendung und den Einsatz dieses Produktes betreffen, setzen Sie sich bitte mit dem für Sie zuständigen Vertriebsbüro in Verbindung (siehe www.infineon.com, Vertrieb&Kontakt). Für Interessenten halten wir Application Notes bereit.

Aufgrund der technischen Anforderungen könnte unser Produkt gesundheitsgefährdende Substanzen enthalten. Bei Rückfragen zu den in diesem Produkt jeweils enthaltenen Substanzen setzen Sie sich bitte ebenfalls mit dem für Sie zuständigen Vertriebsbüro in Verbindung.

Sollten Sie beabsichtigen, das Produkt in Anwendungen der Luftfahrt, in gesundheits- oder lebensgefährdenden oder lebenserhaltenden Anwendungsbereichen einzusetzen, bitten wir um Mitteilung. Wir weisen darauf hin, dass wir für diese Fälle

- die gemeinsame Durchführung eines Risiko- und Qualitätsassessments;
- den Abschluss von speziellen Qualitätssicherungsvereinbarungen;
- die gemeinsame Einführung von Maßnahmen zu einer laufenden Produktbeobachtung dringend empfehlen und gegebenenfalls die Belieferung von der Umsetzung solcher Maßnahmen abhängig machen.

Soweit erforderlich, bitten wir Sie, entsprechende Hinweise an Ihre Kunden zu geben.

Inhaltliche Änderungen dieses Produktdatenblatts bleiben vorbehalten.

Terms & Conditions of usage

The data contained in this product data sheet is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.infineon.com, sales&contact). For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or life endangering or life support applications, please notify. Please note, that for any such applications we urgently recommend

- to perform joint Risk and Quality Assessments;
- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

If and to the extent necessary, please forward equivalent notices to your customers.

Changes of this product data sheet are reserved.

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| prepared by: SS | date of publication: 2012-01-12 |
| approved by: TR | revision: 3.0 |



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

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