

Product Summary

| $V_{(BR)CES}$ | $V_{CE(SAT)MAX}$ | $I_c(100^{\circ}C)$ |
|---------------|------------------|---------------------|
| 1200V | 1.95V@15V | 40A |

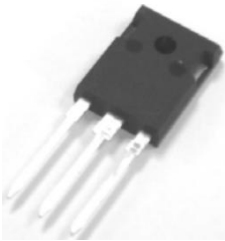
Feature

- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD

Application

- EV-Charging
- String inverter
- Welding converters
- Uninterruptible power supply

Package

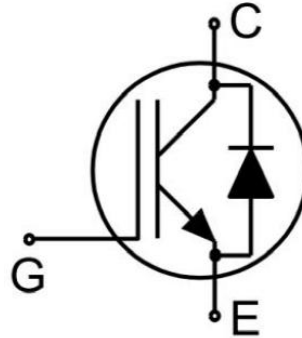


TO-247AB

Marking



Circuit diagram



Absolute maximum ratings (Tc=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|------------------------|------------|------|
| Collector-Emitter Voltage | V _{CEs} | 1200 | V |
| Continuous Gate- Emitter Voltage | V _{GES} | ±20 | V |
| Collector Current | I _c | 80 | A |
| Collector Current(T _c =100°C) | I _c (100°C) | 40 | A |
| Pulsed Collector Current, tp limited by T _{jmax} , V _{GE} =15V | I _{CM} | 120 | A |
| Diode Continuous Forward Current | I _F | 80 | A |
| Diode Continuous Forward Current(T _c =100°C) | I _F (100°C) | 40 | A |
| Diode Forward Pulsed Current,tp limited by T _{jmax} | I _{Fpuls} | 120 | A |
| Turn off Safe Operating Area V _{CE} ≤1200V, T _J ≤150°C | - | 120 | A |
| Power Dissipation(T _J =175°C) | P _D | 288 | W |
| Thermal Resistance, Junction to case for Diode | R _{θJC} | 0.65 | °C/W |
| Thermal Resistance, Junction to case for IGBT | R _{θJC} | 0.52 | °C/W |
| Maximum Temperature for Soldering,wave soldering 1.6mm (0.063in.) from case for 10s | T _L | 260 | °C |
| Junction Temperature Range | T _J | -40 ~ +175 | °C |
| Storage Temperature Range | T _{STG} | -55 ~ +150 | °C |

Electrical characteristics of the IGBT (T_J=25°C unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|--------------------------------------|----------------------|---|------|------|------|------|
| Static Characteristics | | | | | | |
| Collector-Emitter Breakdown Voltage | V _{(BR)CES} | V _{GE} = 0V, I _{CE} =250uA | 1200 | | | V |
| Collector-Emitter Leakage Current | I _{CES} | V _{GE} = 0V, V _{CE} =1200V | | | 0.25 | mA |
| | | V _{GE} = 0V, V _{CE} =1200V, T _J =150°C | | | 4 | |
| Gate to Emitter Leakage Current | I _{GES} | V _{GE} =±20V, V _{CE} = 0V | | | 100 | nA |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} | V _{GE} =15V, I _c =40A | | 1.65 | 1.95 | V |
| | | V _{GE} =15V, I _c =40A, T _J =125°C | | 1.95 | | |
| | | V _{GE} =15V, I _c =40A, T _J =150°C | | 2.05 | | |
| Gate Threshold Voltage | V _{GE(th)} | V _{CE} =V _{GE} , I _c =1mA | 5.0 | 5.8 | 6.6 | V |
| Dynamic characteristics | | | | | | |
| Input Capacitance | C _{ies} | V _{CE} =25V, V _{GE} =0V, f =1MHz | | 5.06 | | nF |
| Reverse Transfer Capacitance | C _{res} | | | 0.04 | | |
| Total Gate Charge | Q _g | V _{CC} =960V, V _{GE} =15V, I _c =40A | | 0.12 | | uC |
| Turn-on delay time | t _{d(on)} | V _{CC} =600V, V _{GE} = -5V~15V, I _c =40A, R _G =10Ω, | | 56 | | nS |
| Turn-on rise time | t _r | | | 31 | | |
| Turn-off delay time | t _{d(off)} | | | 192 | | |
| Turn-off fall time | t _f | | | 69 | | |
| Turn-on Switching Energy | E _{on} | | | 2.29 | | |
| Turn-off Switching Energy | E _{off} | | 1.12 | | | |
| Turn-on delay time | t _{d(on)} | V _{CC} =600V, V _{GE} = -5V~15V, I _c =40A, R _G =10Ω, T _J =125°C | | 58 | | nS |
| Turn-on rise time | t _r | | | 32 | | |
| Turn-off delay time | t _{d(off)} | | | 201 | | |
| Turn-off fall time | t _f | | | 77 | | |
| Turn-on Switching Energy | E _{on} | | | 2.32 | | |
| Turn-off Switching Energy | E _{off} | | 1.22 | | | |
| Turn-on delay time | t _{d(on)} | V _{CC} =600V, V _{GE} = -5V~15V, I _c =40A, R _G =10Ω, T _J =150°C | | 59 | | nS |
| Turn-on rise time | t _r | | | 33 | | |
| Turn-off delay time | t _{d(off)} | | | 206 | | |
| Turn-off fall time | t _f | | | 83 | | |
| Turn-on Switching Energy | E _{on} | | | 2.33 | | |
| Turn-off Switching Energy | E _{off} | | 1.26 | | | |

Electrical characteristics of the Diode ($T_j=25^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------|--|------|------|------|---------------|
| Diode Forward Voltage | V_F | $I_F=40\text{A}$ | | 2.2 | 2.7 | V |
| | | $I_F=40\text{A}, T_j=125^\circ\text{C}$ | | 2.0 | | |
| | | $I_F=40\text{A}, T_j=150^\circ\text{C}$ | | 1.9 | | |
| Reverse Recovery Current | I_{rr} | $I_F=40\text{A}, V_R=600\text{V}, -di/dt=500\text{A}/\mu\text{s}$ | | 11 | | A |
| Diode reverse recovery time | t_{rr} | | | 225 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 1.29 | | μC |
| Reverse recovery Energy | E_{rec} | | | 0.33 | | mJ |
| Reverse Recovery Current | I_{rr} | $I_F=40\text{A}, V_R=600\text{V}, -di/dt=500\text{A}/\mu\text{s}, T_j=125^\circ\text{C}$ | | 15 | | A |
| Diode reverse recovery time | t_{rr} | | | 315 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 3.58 | | μC |
| Reverse recovery Energy | E_{rec} | | | 1.07 | | mJ |
| Reverse Recovery Current | I_{rr} | $I_F=40\text{A}, V_R=600\text{V}, -di/dt=500\text{A}/\mu\text{s}, T_j=150^\circ\text{C}$ | | 16 | | A |
| Diode reverse recovery time | t_{rr} | | | 344 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 4.11 | | μC |
| Reverse recovery Energy | E_{rec} | | | 1.23 | | mJ |

Typical Characteristics

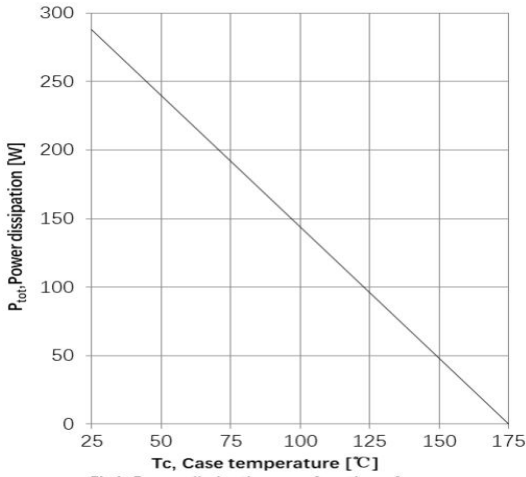


Fig1. Power dissipation as a function of case temperature ($T_j < 175^\circ\text{C}$)

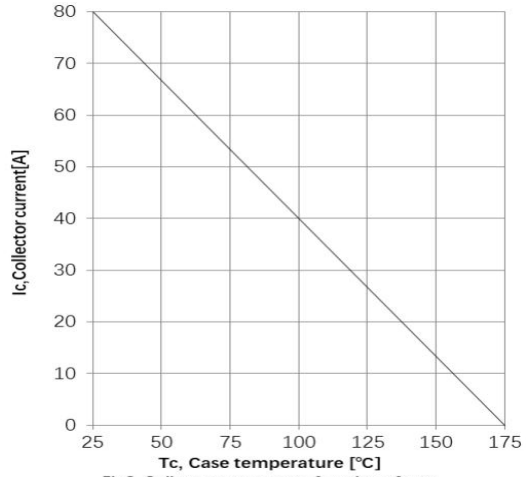


Fig2. Collector current as a function of case temperature ($V_{ge} > 15\text{V}$, $T_j < 175^\circ\text{C}$)

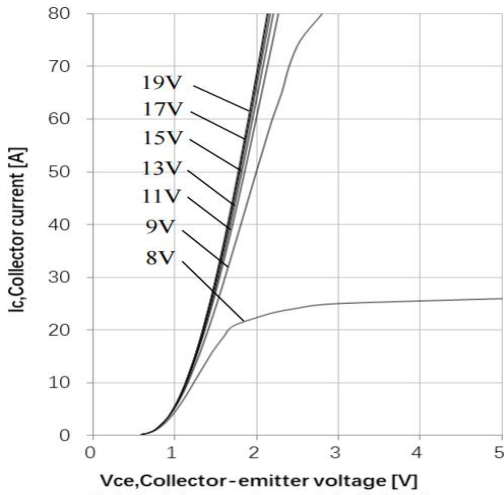


Fig3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

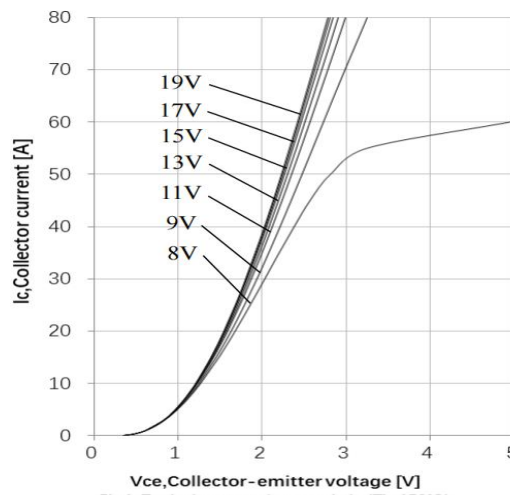


Fig4. Typical output characteristic ($T_j = 150^\circ\text{C}$)

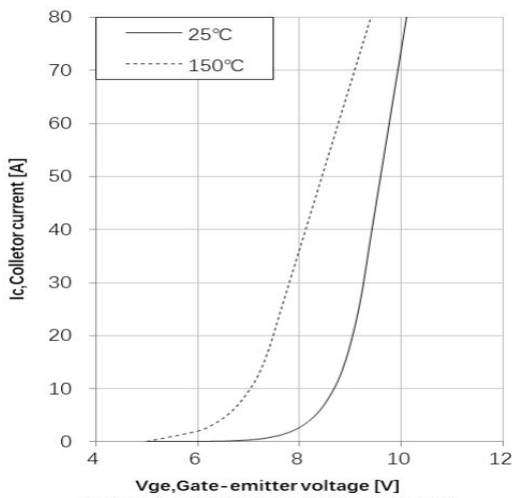


Fig5. Typical transfer characteristic ($V_{ce} = 20\text{V}$)

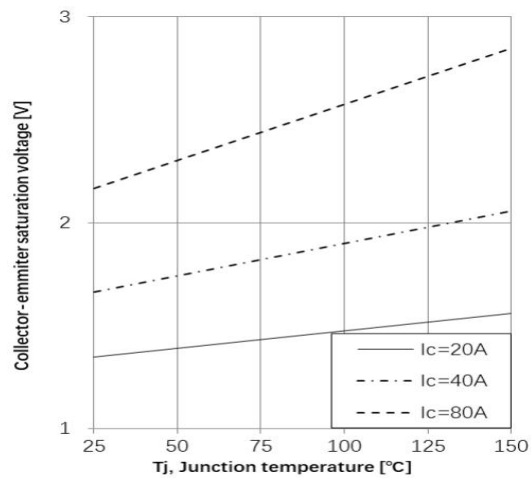
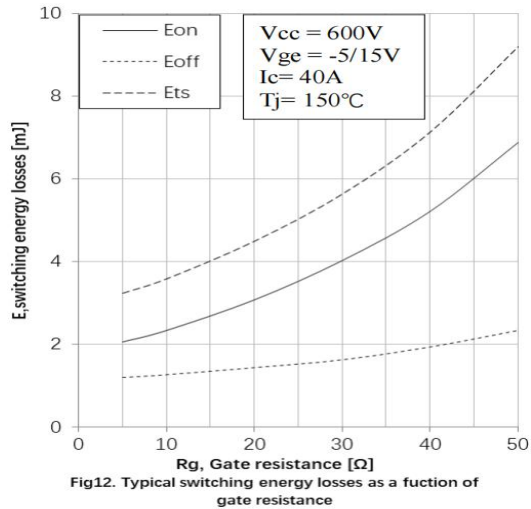
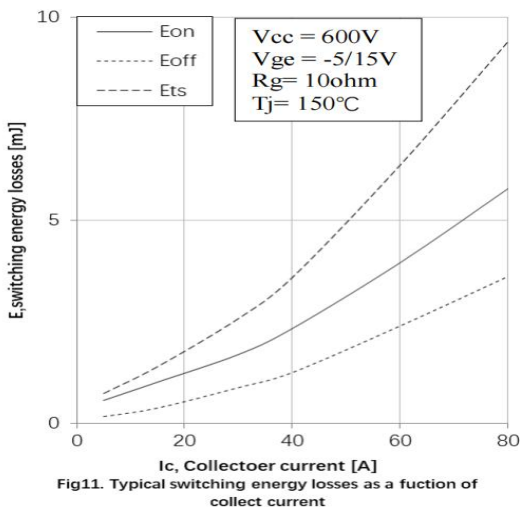
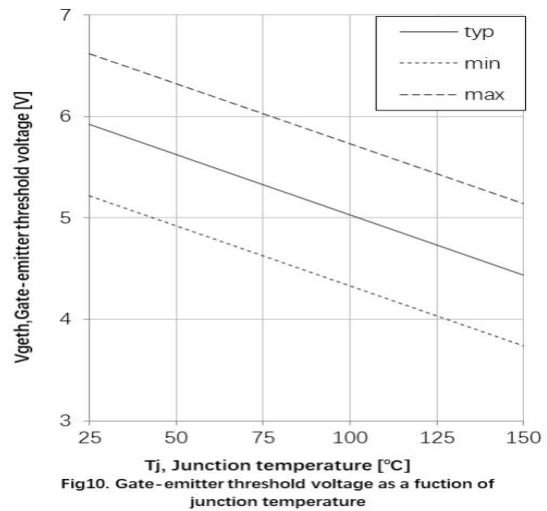
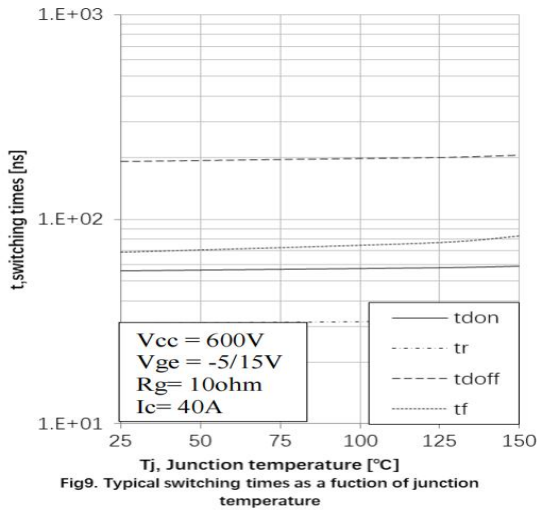
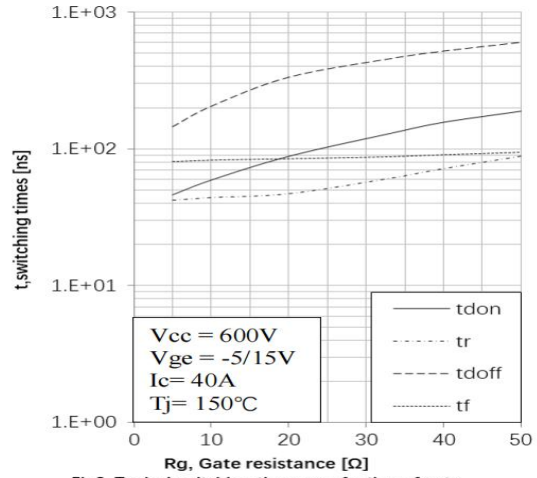
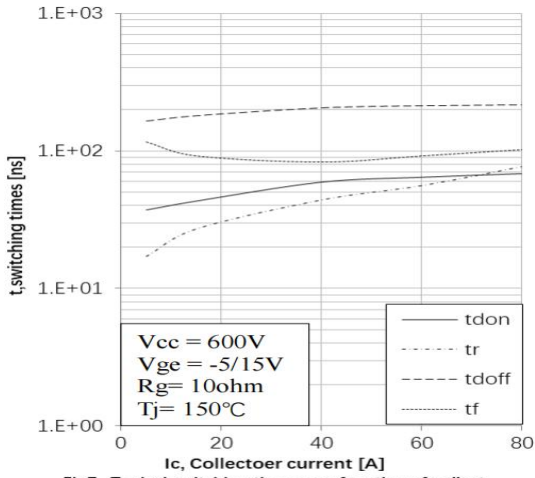


Fig6. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge} = 15\text{V}$)

Typical Characteristics



Typical Characteristics

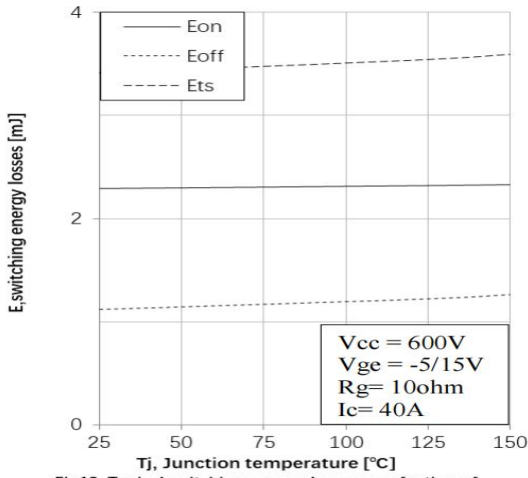


Fig13. Typical switching energy losses as a function of junction temperature

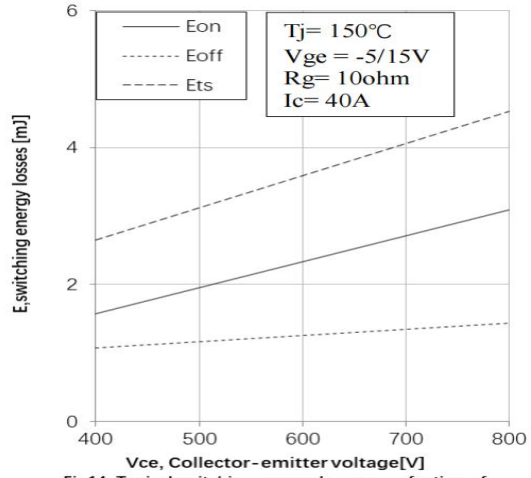


Fig14. Typical switching energy losses as a function of collector-emitter voltage

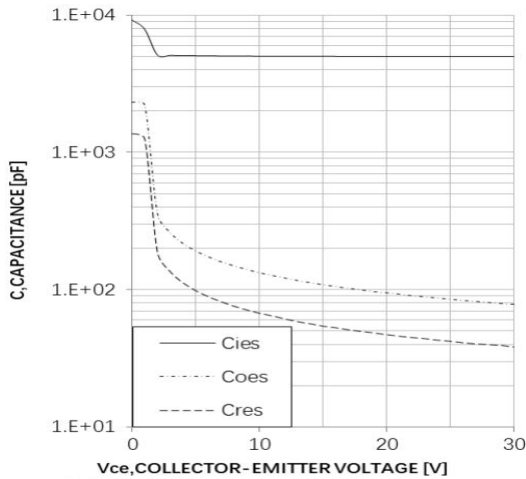


Fig15. Typical capacitance as a function of collector-emitter voltage

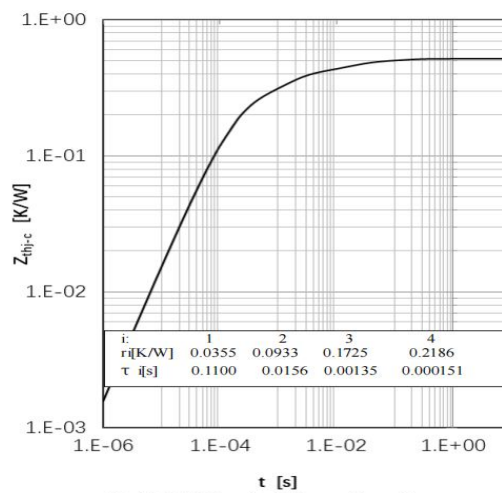


Fig16. IGBT Transient Thermal Impedance

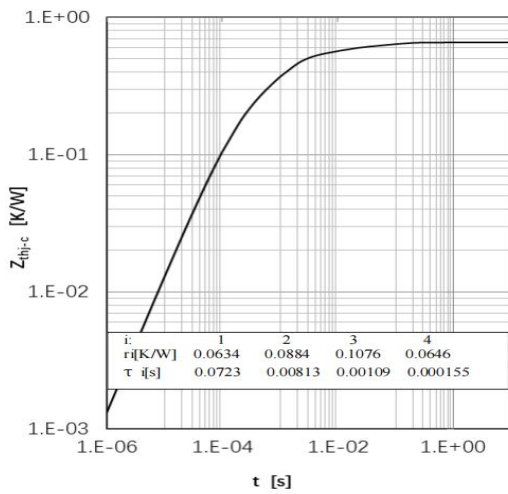


Fig17. Diode Transient Thermal Impedance

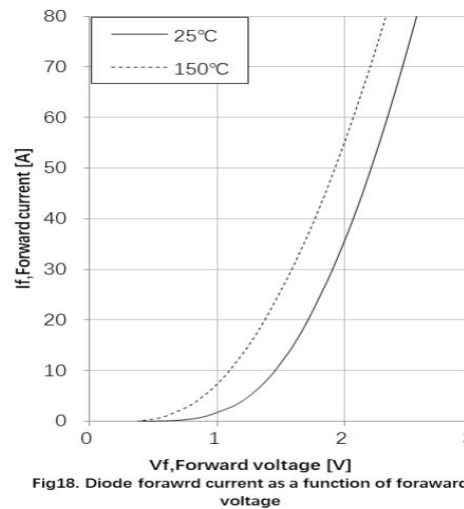


Fig18. Diode forward current as a function of forward voltage

Typical Characteristics

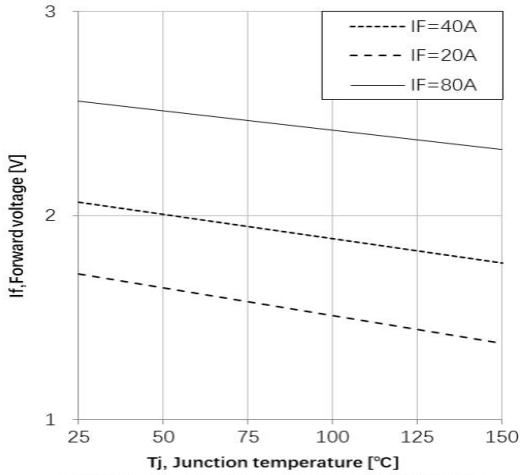
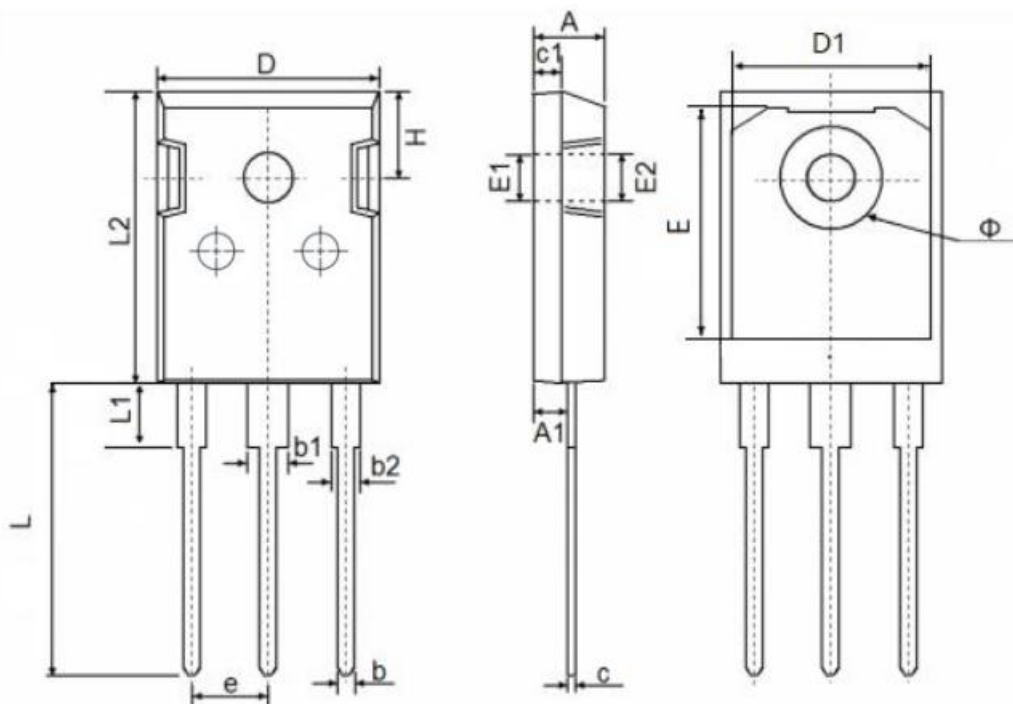


Fig19. Diode forward voltage as a function of junction temperature

TO-247AB Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.800 | 5.250 | 0.189 | 0.207 |
| A1 | 2.100 | 2.600 | 0.083 | 0.102 |
| b | 1.000 | 1.400 | 0.039 | 0.055 |
| b1 | 2.800 | 3.400 | 0.110 | 0.134 |
| b2 | 1.800 | 2.420 | 0.071 | 0.095 |
| c | 0.500 | 0.700 | 0.020 | 0.028 |
| c1 | 1.500 | 2.500 | 0.059 | 0.098 |
| D | 15.500 | 16.200 | 0.610 | 0.638 |
| D1 | 13.000 | 14.200 | 0.512 | 0.559 |
| E | 16.250 | 17.650 | 0.640 | 0.695 |
| E1 | 3.650 | 5.500 | 0.144 | 0.220 |
| E2 | 3.650 | 5.500 | 0.144 | 0.220 |
| L | 19.400 | 20.400 | 0.764 | 0.803 |
| L1 | 3.900 | 4.500 | 0.154 | 0.177 |
| L2 | 20.800 | 21.300 | 0.819 | 0.836 |
| φ | 7.190 REF. | | 0.283 REF. | |
| e | 5.440 BSC | | 0.214 BSC | |
| H | 5.300 | 6.300 | 0.209 | 0.248 |