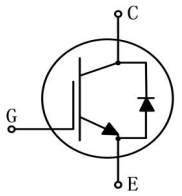
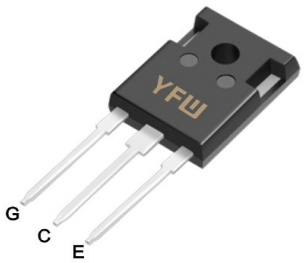
## 1200V N-Channel Enhancement Mode Power IGBT

### MAIN CHARACTERISTICS

| | |
|---|---|
| $I_{C\ @TC=100℃}$ | 20A |
| $V_{CE}$ | 1200V |
| VCE(sat)-typ | 1.7V |




TO-247

### Applications

- Inductive Cooking
- Soft Switching Applications

### FEATURES

- Low gate charge
- Trench FS Technology
- Positive temperature coefficient
- High ruggedness, temperature stable

### Maximum Ratings

| Characteristics | | Symbol | Value | Unit |
|---|---|---|---|---|
| | | | TO-247 | |
| Collector-emitter voltage | | $V_{CES}$ | 1200 | V |
| Gate-emitter voltage | | $V_{GES}$ | ±20 | V |
| Continuous collector current (TC=25℃) | | $I_C$ | 40 | A |
| Continuous collector current (TC=100℃) | | | 20 | A |
| Pulsed collector current, tp limited by Tvjmax | | $I_{CM}$ | 60 | A |
| Diode continuous forward current | ($T_C$=25℃) | $I_F$ | 20 | A |
| | ($T_C$=100℃) | | 13 | A |
| Diode Maximum Forward Current | | $I_{FM}$ | 30 | A |
| Power Dissipation | $T_C$=25℃ | $P_D$ | 357 | W |
| Operation Junction Temperature | | $T_j$ | -55 to +175 | °C |
| Storage temperature range | | $T_{stg}$ | -55 to +175 | °C |
| Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s | | $T_L$ | 260 | °C |

### Thermal characteristics

| Characteristics | Symbol | Values | | Unit |
|---|---|---|---|---|
| | | Typ | Max. | |
| Thermal resistance, junction to case for IGBT | $R_{th(j-c)}$ | - | 0.42 | °C/ W |
| Thermal resistance, junction to case for Diode | $R_{th(j-c)}$ | - | 0.66 | °C/ W |
| Thermal resistance, junction to ambient | $R_{th(j-a)}$ | - | 40 | °C/ W |

## Electrical Characteristics（$T_j$ = 25°C unless otherwise specified)

| Characteristics | | Test Condition | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Collector-emitter breakdown voltage | | $V_{GE}$=0V, $I_C$=250μA | | $B_{VCES}$ | 1200 | - | - | V |
| Collector-emitter leakage current | | $V_{CE}$=1200V, $V_{GE}$=0V | | $I_{CES}$ | - | - | 5 | μA |
| Gate leakage current | forward | $V_{DS}$=0V,$V_{GE}$=20V | | $I_{GESF}$ | | | 100 | nA |
| | forward | $V_{DS}$=0V,$V_{GEE}$=-20V | | $I_{GESR}$ | - | - | -100 | nA |
| Gate-emitter threshold voltage | | $V_{GE}$=$V_{CE}$, $I_C$=0.7mA | | $V_{GE(th)}$ | 5.1 | - | 6.4 | V |
| Collector-emitter saturation voltage | | $V_{GE}$=15 V, $I_C$=20A, $T_j$=25℃ | | $V_{CE(sat)}$ | - | 1.6 | 1.8 | V |
| | | $V_{GE}$=15 V, $I_C$=20A, $T_j$=125℃ | | | - | 1.7 | - | |
| | | $V_{GE}$=15V, $I_C$=20A, $T_j$=175℃ | | | - | 1.8 | - | |
| Diode forward voltage | | $V_{GE}$ = 0V<br>$I_F$ = 10A | $T_j$=25℃ | $V_F$ | - | 1.2 | 1.4 | V |
| | | | $T_j$=125℃ | | - | 1.2 | - | |
| Transconductance | | $V_{CE}$ = 20 V, $V_{GE}$ = 20V | | $g_{fs}$ | - | 11.5 | - | S |
| Input capacitance | | $V_{CE}$=25V<br>$V_{GE}$=0V<br>f =1.0MHz | | $C_{ies}$ | - | 1307 | - | pF |
| Output capacitance | | | | $C_{oes}$ | - | 76 | - | |
| Reverse transfer capacitance | | | | $C_{res}$ | - | 14 | - | |
| Total gate charge | | $V_{CC}$=960V $V_{GE}$=15V $I_C$=20A | | $Q_g$ | - | 133 | - | nC |
| Internal Emitter Inductance measured 5mm (0.197in.)from case | | | | $L_E$ | - | 13 | - | nH |
| Turn-on delay time | | Tj=25℃<br>$V_{CC}$ =600V<br>$I_C$=20A<br>$R_G$=47Ω<br>$V_{GE}$ = 15V<br>L=180nH<br>C=39pF | | td(on) | - | 57 | - | ns |
| Rise time | | | | tr | - | 25 | - | ns |
| Turn-off delay time | | | | td(off) | - | 579 | - | ns |
| Fall time | | | | tf | - | 68 | - | ns |
| Turn-on energy | | | | Eon | - | - | - | mJ |
| Turn-off energy | | | | Eoff | - | 1.7 | - | mJ |
| Total switching energy | | | | Ets | - | 1.7 | - | mJ |
| Turn-on delay time | | Tj =175℃<br>$V_{CC}$=600V<br>$I_C$=20A<br>$R_G$=47Ω<br>$V_{GE}$=15V<br>L=180nH<br>C=39pF | | td(on) | - | 55 | - | ns |
| Rise time | | | | tr | - | 37 | - | ns |
| Turn-off delay time | | | | td(off) | - | 701 | - | ns |
| Fall time | | | | tf | - | 132 | - | ns |
| Turn-on energy | | | | Eon | - | - | - | mJ |
| Turn-off energy | | | | Eoff | - | 2.8 | - | mJ |
| Total switching energy | | | | Ets | - | 2.8 | - | mJ |

## Typical Characteristics

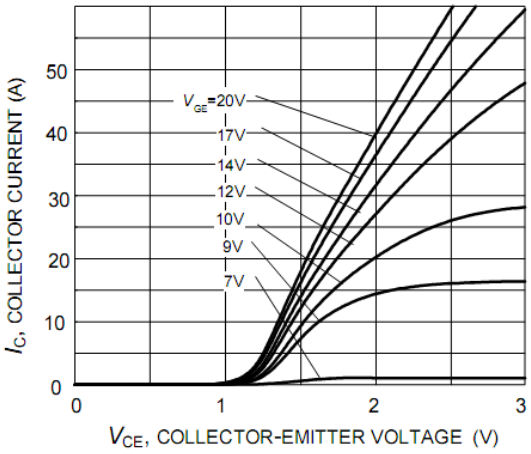



**Figure 1. Typical output characteristic ($T_j$ = 25℃)**

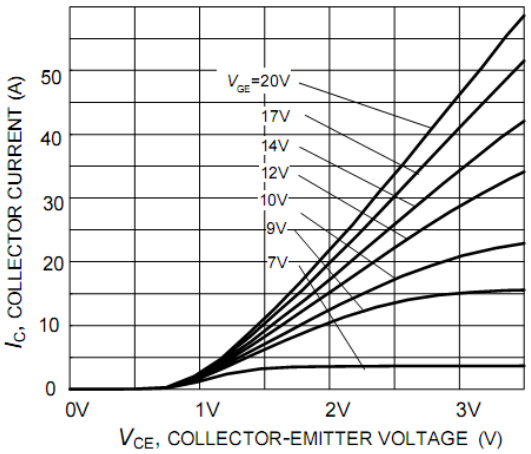



**Figure 2. Typical output characteristic ($T_j$ = 175℃)**

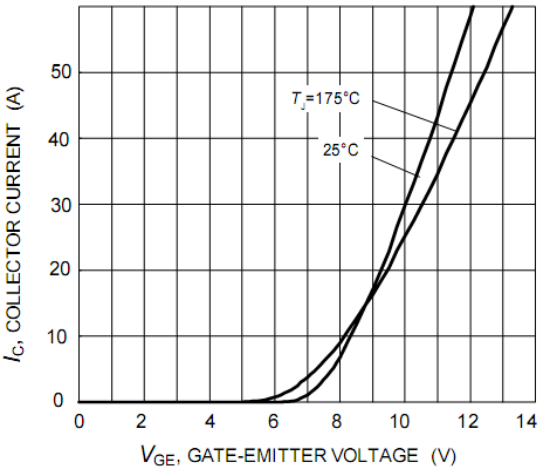



**Figure 3. Typical transfer characteristic**

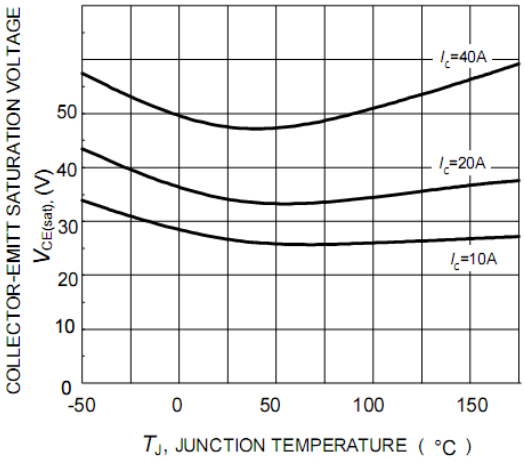



**Figure 4. Saturation Voltage vs. junction temperature**

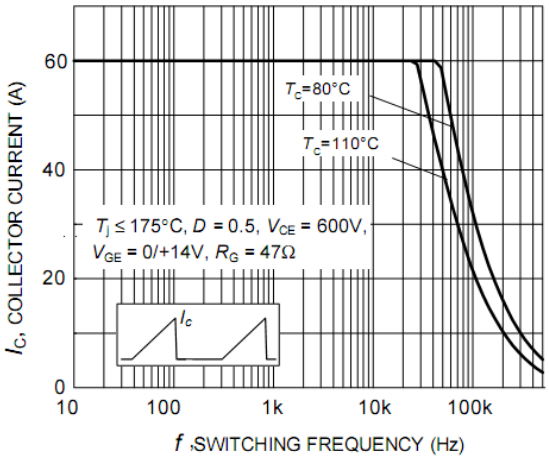



**Figure 5. IGBT Safe operating area**

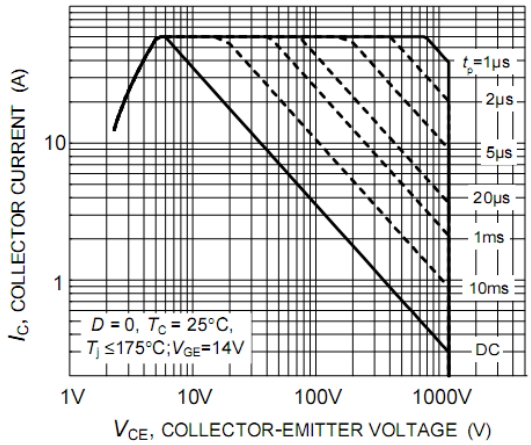



**Figure 6. Collector current as a function of switching frequency for hard switching (turn-off)**

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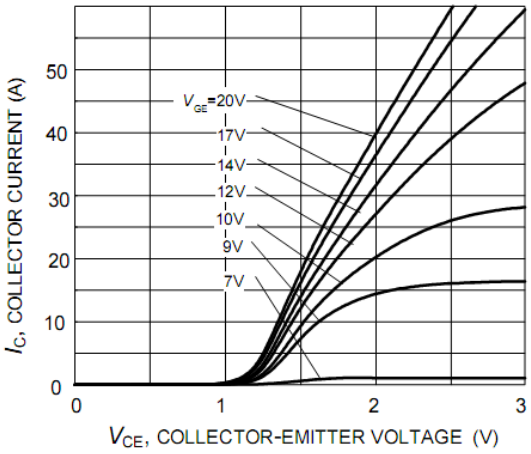


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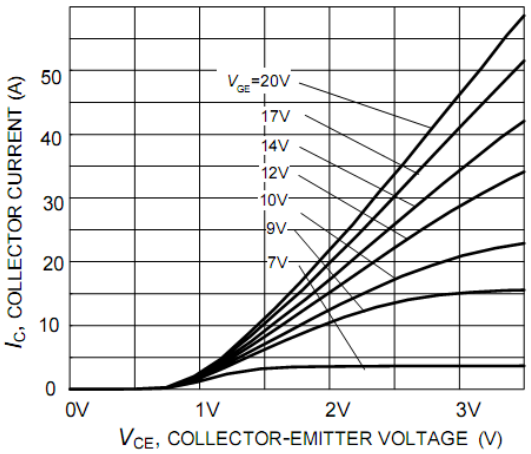


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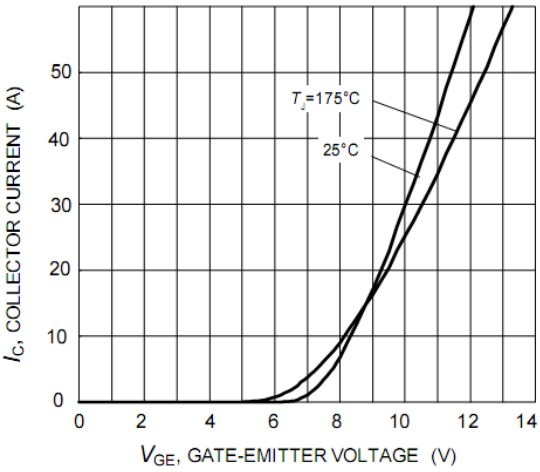


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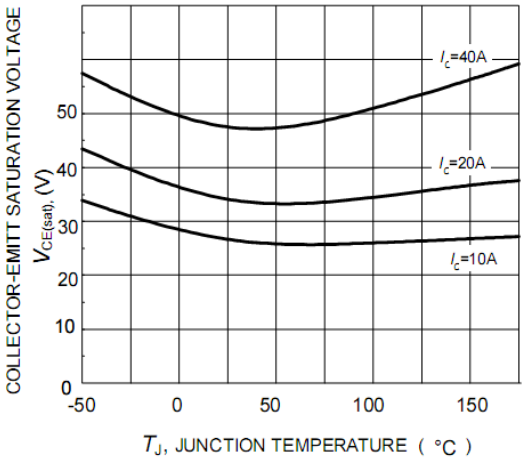


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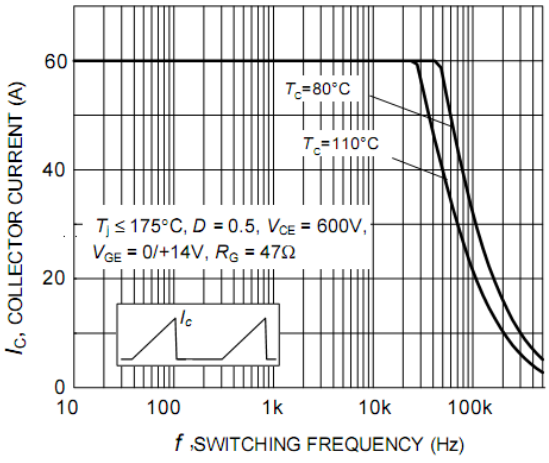


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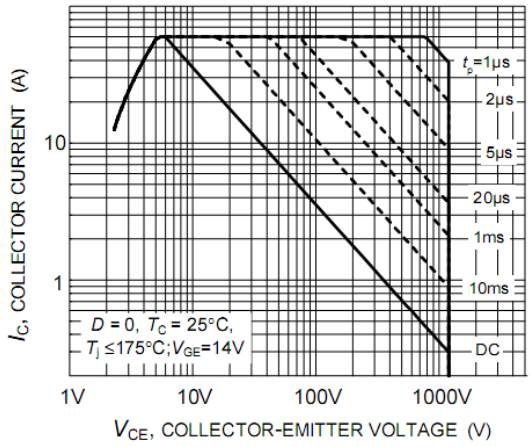


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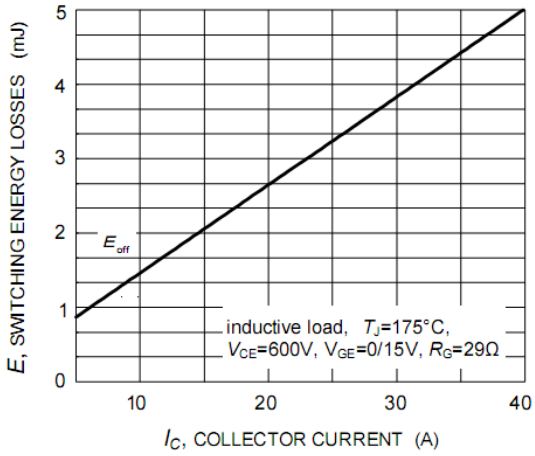



**Figure 11. Typical turn-off energy as a function of collector current**

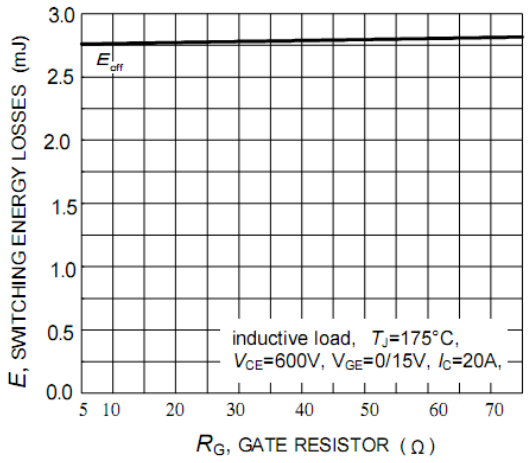



**Figure 12. Typical turn-off energy as a function of gate resistor**

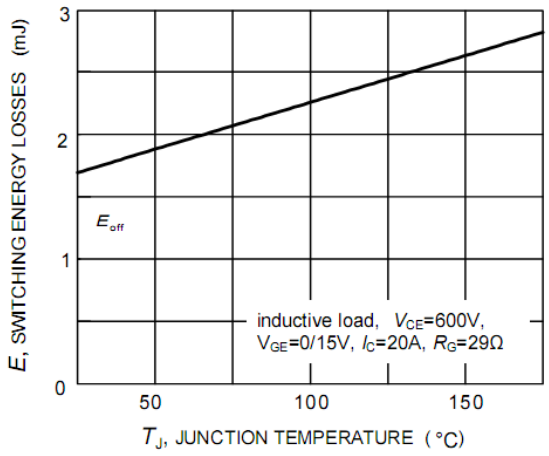



**Figure 13. Typical turn-off energy as a function of junction temperature**

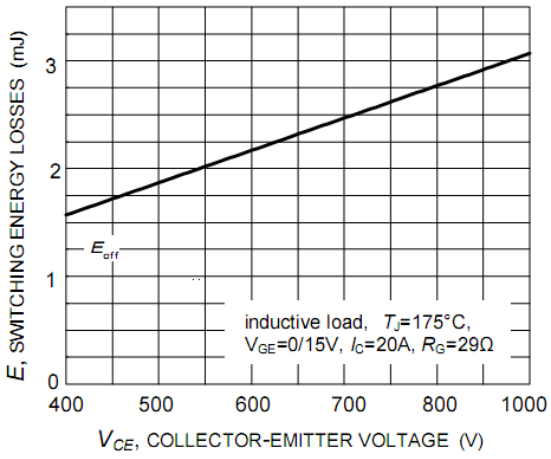



**Figure 14. Typical turn-off energy as a function of collector emitter voltage**

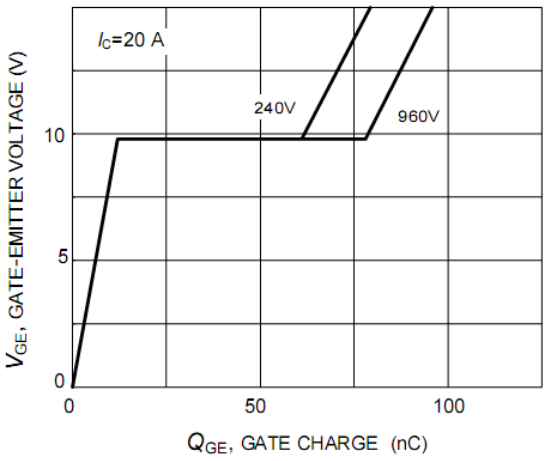



**Figure 15. Typical gate charge**

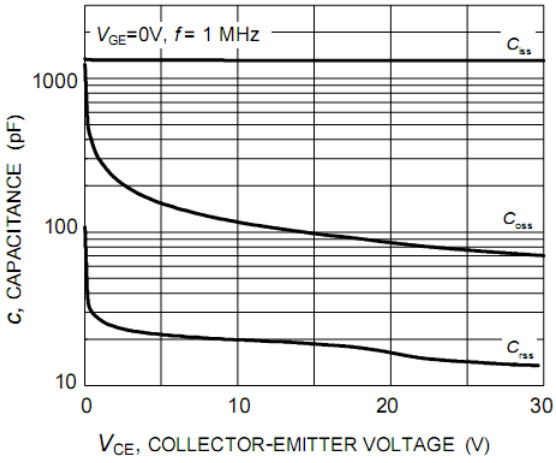



**Figure 16. Typical capacitance as a function of collector-emitter voltage**

## Typical Characteristics

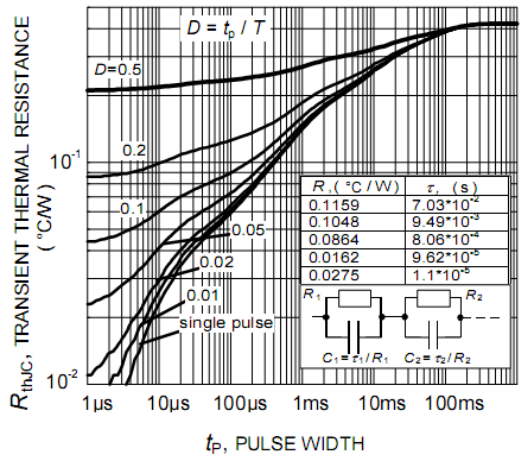



**Figure 17. IGBT transient thermal resistance**

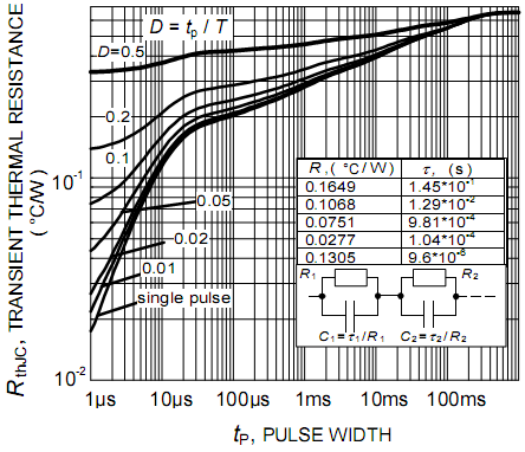



**Figure 18. Typical Diode transient thermal impedance as a function of pulse width**

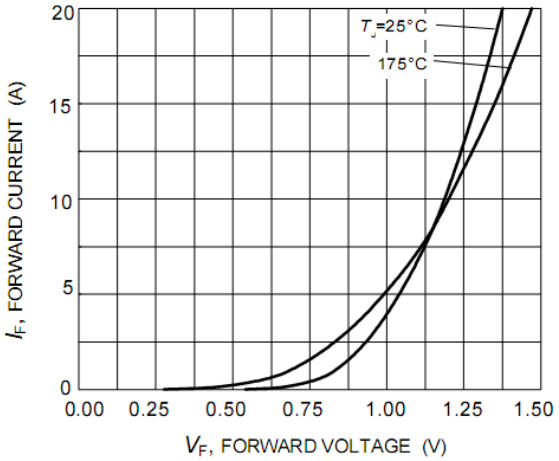



**Figure 19. Typical diode forward current as a function of forward voltage**

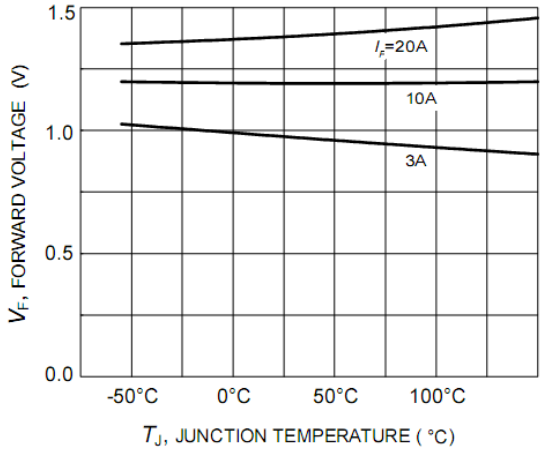
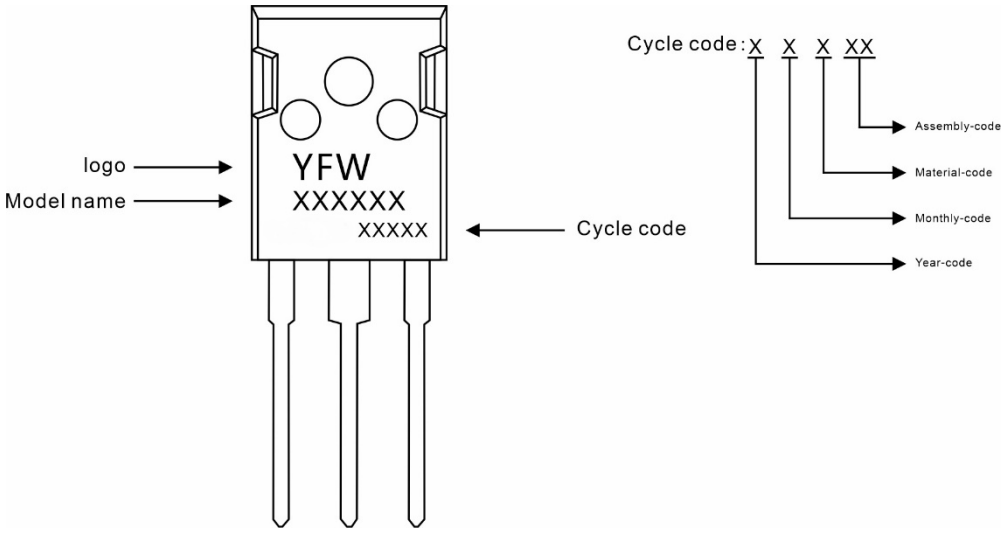



**Figure 20. Typical diode forward voltage as a function of junction temperature**

## Marking Diagram

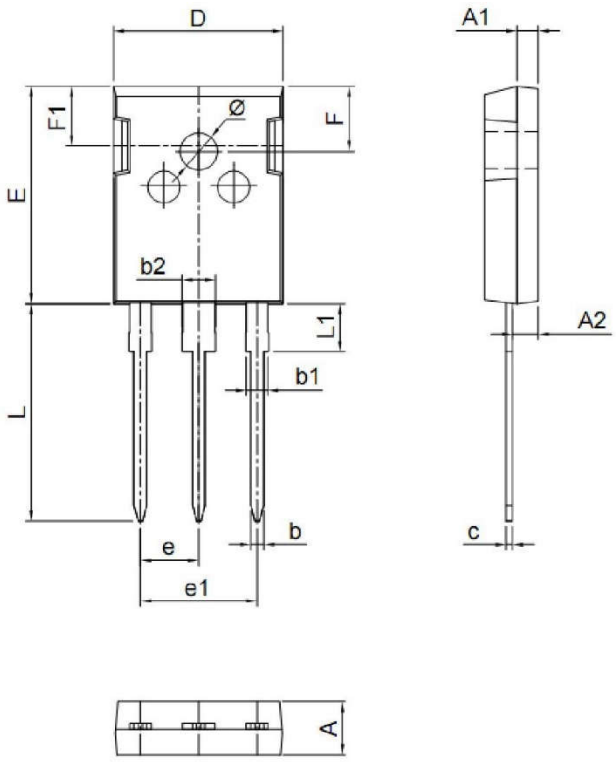



## Ordering information

| Model name | Package | Unit Weight | Base Quantity | Packing Quantity |
|---|---|---|---|---|
| YFWG20T120AP | TO-247 | 0.209oz(5.93g) | 30pcs/tube | 600PCS/Box 2400PCS/Carton |

## Package Dimensions

**TO-247**




| Symbol | Dimensions in mm | | Dimensions in Inch | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.90 | 5.10 | 0.193 | 0.201 |
| A1 | 1.90 | 2.10 | 0.075 | 0.083 |
| A2 | 2.29 | 2.54 | 0.090 | 0.100 |
| b | 1.00 | 1.40 | 0.039 | 0.055 |
| b1 | 2.00 | 2.20 | 0.079 | 0.087 |
| b2 | 3.00 | 3.20 | 0.118 | 0.126 |
| c | 0.50 | 0.70 | 0.020 | 0.028 |
| D | 15.75 | 16.05 | 0.620 | 0.632 |
| E | 20.20 | 20.80 | 0.795 | 0.819 |
| e | 5.45 (BSC) | | 0.215 (BSC) | |
| e1 | 10.90 (BSC) | | 0.429 (BSC) | |
| F | 6.05 | 6.25 | 0.238 | 0.246 |
| F1 | 5.80 | 6.00 | 0.228 | 0.236 |
| L | 20.10 | 20.40 | 0.791 | 0.803 |
| L1 | 4.05 | 4.35 | 0.159 | 0.171 |
| Φ | 3.50 | 3.70 | 0.138 | 0.146 |

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