# MJW18020

# NPN Silicon Power Transistors High Voltage Planar

The MJW18020 planar High Voltage Power Transistor is specifically Designed for motor control applications, high power supplies and UPS's for which the high reproducibility of DC and Switching parameters minimizes the dead time in bridge configurations.

### Features

- High and Excellent Gain Linearity
- Fast and Very Tight Switching Times Parameters $t_{si}$ and $t_{fi}$
- Very Stable Leakage Current due to the Planar Structure
- High Reliability
- Pb−Free Package is Available*

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector−Emitter Sustaining Voltage | $V_{CEO}$ | 450 | Vdc |
| Collector−Base Breakdown Voltage | $V_{CES}$ | 1000 | Vdc |
| Collector−Base Voltage | $V_{CBO}$ | 1000 | Vdc |
| Emitter−Base Voltage | $V_{EBO}$ | 9.0 | Vdc |
| Collector Current − Continuous<br>− Peak (Note 1) | $I_C$ | 30<br>45 | Adc |
| Base Current − Continuous<br>− Peak (Note 1) | $I_B$ | 6.0<br>10 | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate Above 25°C | $P_D$ | 250<br>2.0 | W<br>W/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 0.5 | °C/W |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 50 | °C/W |
| Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds | $T_L$ | 275 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

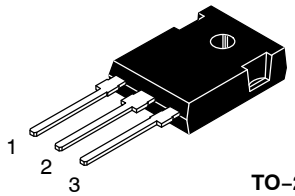
1. Pulse Test: Pulse Width = 5 μs, Duty Cycle ≤ 10%.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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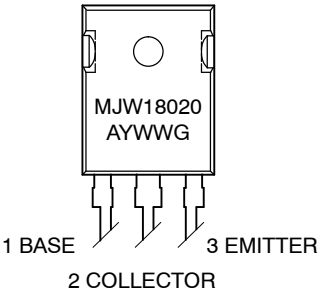
**http://onsemi.com**

**30 AMPERES**
**1000 VOLTS $BV_{CES}$**
**450 VOLTS $BV_{CEO}$, 250 WATTS**




**TO−247**
**CASE 340L**

### MARKING DIAGRAM




A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

### ORDERING INFORMATION

| Device | Package | Shipping |
|---|---|---|
| MJW18020 | TO−247 | 30 Units/Rail |
| MJW18020G | TO−247 (Pb−Free) | 30 Units/Rail |

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**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector−Emitter Sustaining Voltage ($I_C$ = 100 mAdc, $I_B$ = 0) | | $V_{CEO(sus)}$ | 450 | – | – | Vdc |
| Collector Cutoff Current ($V_{CE}$ = Rated $V_{CEO}$, $I_B$ = 0) | | $I_{CEO}$ | – | – | 100 | μAdc |
| Collector Cutoff Current ($V_{CE}$ = Rated $V_{CES}$, $V_{EB}$ = 0) | | $I_{CES}$ | – | – | 100 | μAdc |
| ($T_C$ = 125°C) | | | | | 500 | |
| Emitter Cutoff Current ($V_{CE}$ = 9 Vdc, $I_C$ = 0) | | $I_{EBO}$ | – | – | 100 | μAdc |
| **ON CHARACTERISTICS** | | | | | | |
| DC Current Gain ($I_C$ = 3 Adc, $V_{CE}$ = 5 Vdc) | | $h_{FE}$ | 14 | | 34 | |
| | ($T_C$ = 125°C) | | – | 30 | – | |
| ($I_C$ = 10 Adc $V_{CE}$ = 2 Vdc) | | | 8 | 16 | | |
| | ($T_C$ = 125°C) | | 5 | 14 | – | |
| ($I_C$ = 20 Adc $V_{CE}$ = 2 Vdc) | | | 5.5 | 9 | – | |
| | ($T_C$ = 125°C) | | 4 | 7 | – | |
| ($I_C$ = 10 mAdc $V_{CE}$ = 5 Vdc) | | | 14 | 25 | – | |
| Base−Emitter Saturation Voltage ($I_C$ = 10 Adc, $I_B$ = 2 Adc) | | $V_{BE(sat)}$ | – | 0.97 | 1.25 | Vdc |
| ($I_C$ = 20 Adc, $I_B$ = 4 Adc) | | | | 1.15 | 1.5 | |
| Collector−Emitter Saturation Voltage | | $V_{CE(sat)}$ | | | | Vdc |
| ($I_C$ = 10 Adc, $I_B$ = 2 Adc) | | | – | 0.2 | 0.6 | |
| | ($T_C$ = 125°C) | | – | 0.3 | – | |
| ($I_C$ = 20 Adc, $I_B$ = 4 Adc) | | | – | 0.5 | 1.5 | |
| | ($T_C$ = 125°C) | | – | 0.9 | 2.0 | |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Current Gain Bandwidth Product ($I_C$ = 1 Adc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1 MHz) | | $f_T$ | – | 13 | – | MHz |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, $f_{test}$ = 1 MHz) | | $C_{ob}$ | – | 300 | 500 | pF |
| Input Capacitance ($V_{EB}$ = 8.0) | | $C_{ib}$ | – | 7000 | 9000 | pF |
| **SWITCHING CHARACTERISTICS: Resistive Load** (D.C. = 10%, Pulse Width = 70 μs) | | | | | | |
| Turn−On Time | ($I_C$ = 10 Adc, $I_{B1}$ = $I_{B2}$ = 2 Adc, Vcc = 125 V) | $t_{On}$ | – | 540 | 750 | ns |
| Storage Time | | $t_s$ | – | 4.75 | 6 | μs |
| Fall Time | | $t_f$ | – | 380 | 500 | ns |
| Turn−Off Time | | $t_{Off}$ | – | 5.2 | 6.5 | μs |
| Turn−On Time | ($I_C$= 20 Adc, $I_{B1}$ = $I_{B2}$ = 4 Adc, Vcc = 125 V) | $t_{On}$ | – | 965 | 1200 | ns |
| Storage Time | | $t_s$ | – | 2.9 | 3.5 | μs |
| Fall Time | | $t_f$ | – | 350 | 500 | ns |
| Turn−Off Time | | $t_{Off}$ | – | 3.25 | 4 | μs |
| **SWITCHING CHARACTERISTICS: Inductive Load** ($V_{clamp}$= 300 V , Vcc = 15 V, L = 200 μH) | | | | | | |
| Fall Time | ($I_C$ = 10 Adc, $I_{B1}$ = $I_{B2}$ = 2 Adc) | $t_{fi}$ | – | 142 | 250 | ns |
| Storage Time | | $t_{si}$ | – | 4.75 | 6 | μs |
| Crossover Time | | $t_c$ | – | 320 | 500 | ns |
| Fall Time | ($I_C$ = 20 Adc, $I_{B1}$ = $I_{B2}$ = 4 Adc) | $t_{fi}$ | – | 350 | 500 | ns |
| Storage Time | | $t_{si}$ | – | 3.0 | 3.5 | μs |
| Crossover Time | | $t_c$ | – | 500 | 750 | ns |

## TYPICAL CHARACTERISTICS

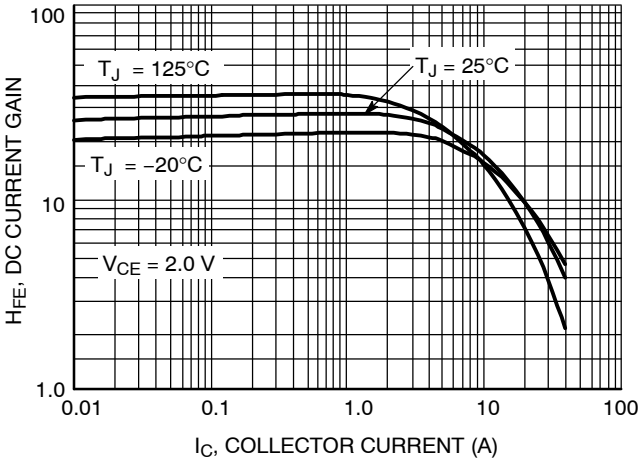



**Figure 1. DC Current Gain, $V_{CE}$ = 2.0 V**

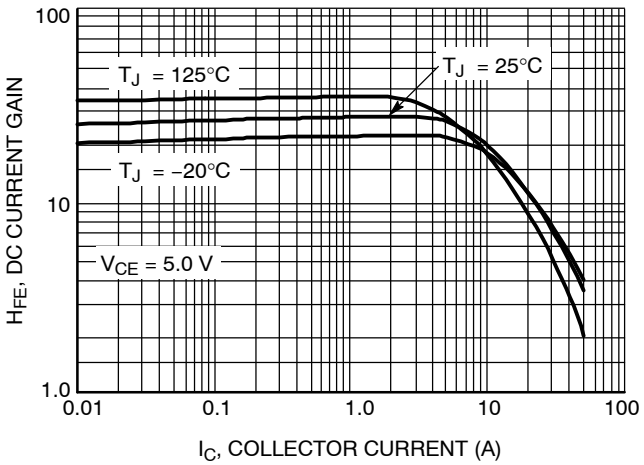



**Figure 2. DC Current Gain, $V_{CE}$ = 5.0 V**

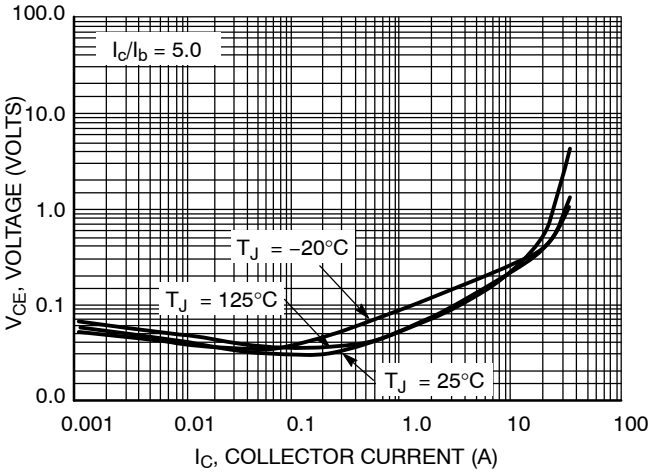



**Figure 3. Typical Collector−Emitter Saturation Voltage, $I_C/I_B$ = 5.0**

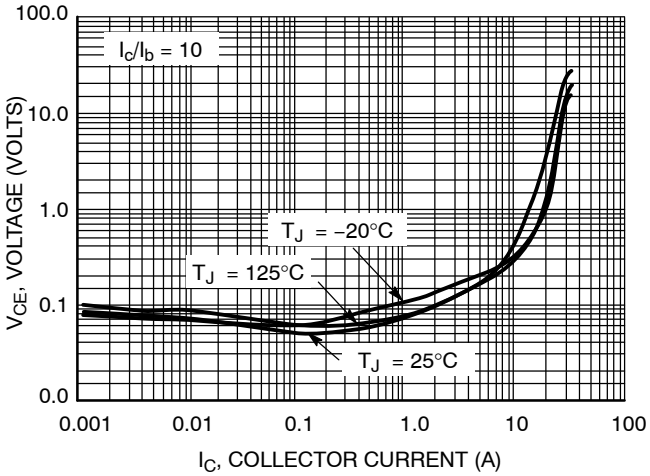



**Figure 4. Typical Collector−Emitter Saturation Voltage, $I_C/I_B$ = 10**

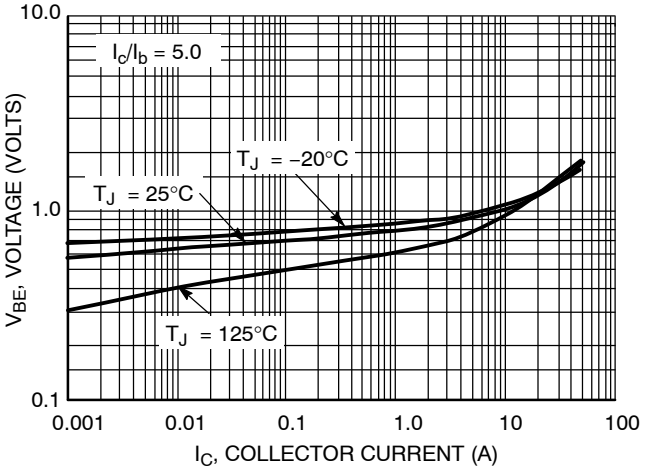



**Figure 5. Typical Base−Emitter Saturation Voltage, $I_C/I_B$ = 5.0**

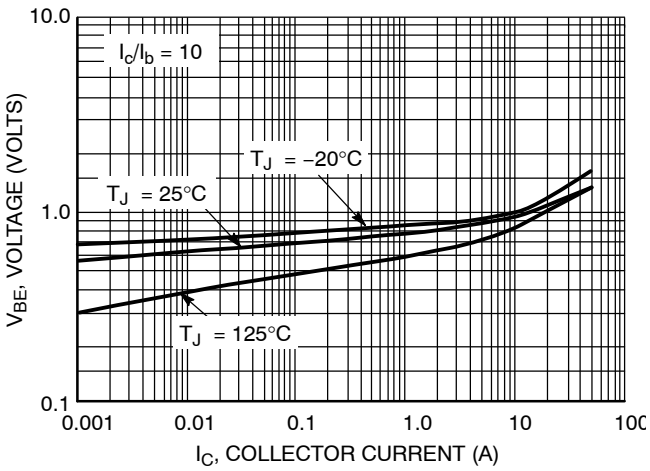



**Figure 6. Typical Base−Emitter Saturation Voltage, $I_C/I_B$ = 10**

## TYPICAL CHARACTERISTICS

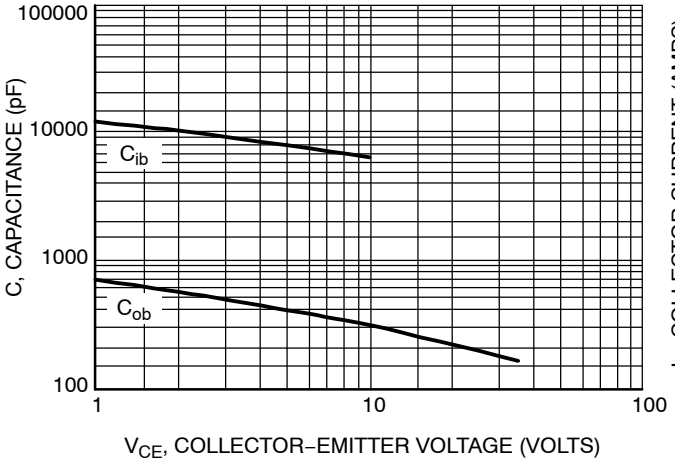



**Figure 7. Typical Capacitance**

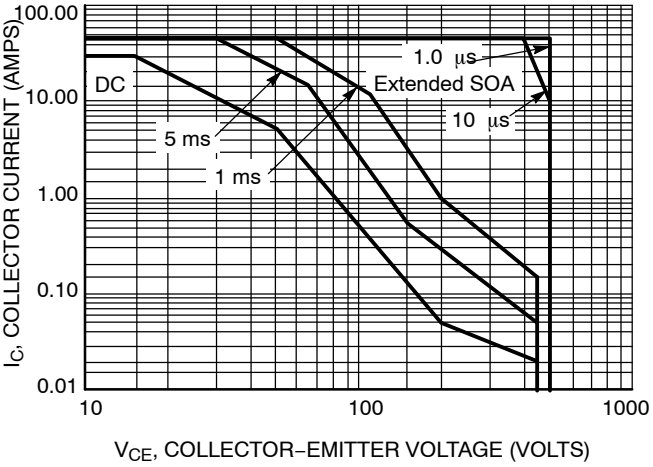



**Figure 8. Forward Bias Safe Operating Area**

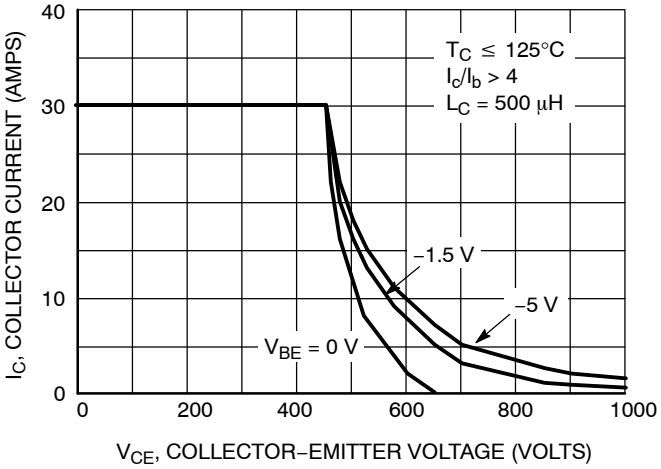
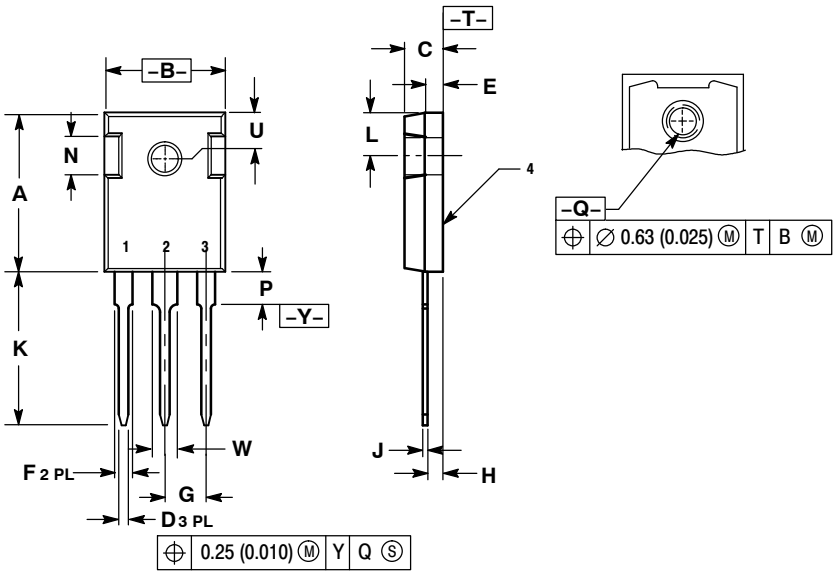



**Figure 9. Reverse Bias Safe Operating Area**

## PACKAGE DIMENSIONS

**TO−247**
CASE 340L−02
ISSUE E




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 20.32 | 21.08 | 0.800 | 8.30 |
| B | 15.75 | 16.26 | 0.620 | 0.640 |
| C | 4.70 | 5.30 | 0.185 | 0.209 |
| D | 1.00 | 1.40 | 0.040 | 0.055 |
| E | 1.90 | 2.60 | 0.075 | 0.102 |
| F | 1.65 | 2.13 | 0.065 | 0.084 |
| G | 5.45 BSC | | 0.215 BSC | |
| H | 1.50 | 2.49 | 0.059 | 0.098 |
| J | 0.40 | 0.80 | 0.016 | 0.031 |
| K | 19.81 | 20.83 | 0.780 | 0.820 |
| L | 5.40 | 6.20 | 0.212 | 0.244 |
| N | 4.32 | 5.49 | 0.170 | 0.216 |
| P | --- | 4.50 | --- | 0.177 |
| Q | 3.55 | 3.65 | 0.140 | 0.144 |
| U | 6.15 BSC | | 0.242 BSC | |
| W | 2.87 | 3.12 | 0.113 | 0.123 |

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