

# 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-Emitter Breakdown Voltage	$V_{CES}$	1000	Vdc
Collector-Base Voltage	$V_{CBO}$	1000	Vdc
Emitter-Base Voltage	$V_{EBO}$	9.0	Vdc
Collector Current – Continuous – Peak (Note 1)	$I_C$	30 45	Adc
Base Current – Continuous – Peak (Note 1)	$I_B$	6.0 10	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	250 2.0	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

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

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.

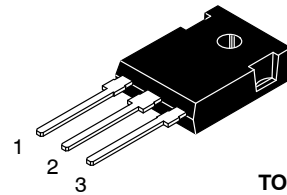
1. Pulse Test: Pulse Width = 5  $\mu\text{s}$ , Duty Cycle  $\leq 10\%$ .



**ON Semiconductor®**

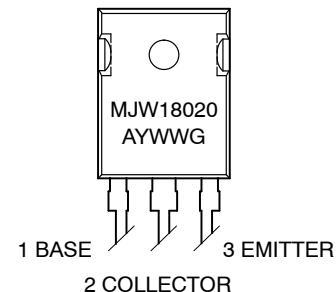
<http://onsemi.com>

**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

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

# MJW18020

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	450	–	–	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CEO</sub> , I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	100	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CES</sub> , V <sub>EB</sub> = 0) (T <sub>C</sub> = 125°C)	I <sub>CES</sub>	–	–	100 500	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>CE</sub> = 9 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	–	100	μA <sub>dc</sub>

## ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = 3 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )  (I <sub>C</sub> = 10 A <sub>dc</sub> , V <sub>CE</sub> = 2 V <sub>dc</sub> )  (I <sub>C</sub> = 20 A <sub>dc</sub> , V <sub>CE</sub> = 2 V <sub>dc</sub> )  (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )	(T <sub>C</sub> = 125°C)	h <sub>FE</sub>	14	30	34	
	(T <sub>C</sub> = 125°C)		–	16	–	
	(T <sub>C</sub> = 125°C)		8	14	–	
	(T <sub>C</sub> = 125°C)		5	9	–	
	(T <sub>C</sub> = 125°C)		5.5	7	–	
Base-Emitter Saturation Voltage (I <sub>C</sub> = 10 A <sub>dc</sub> , I <sub>B</sub> = 2 A <sub>dc</sub> ) (I <sub>C</sub> = 20 A <sub>dc</sub> , I <sub>B</sub> = 4 A <sub>dc</sub> )		V <sub>BE(sat)</sub>	–	0.97 1.15	1.25 1.5	V <sub>dc</sub>
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 A <sub>dc</sub> , I <sub>B</sub> = 2 A <sub>dc</sub> )  (I <sub>C</sub> = 20 A <sub>dc</sub> , I <sub>B</sub> = 4 A <sub>dc</sub> )	(T <sub>C</sub> = 125°C)	V <sub>CE(sat)</sub>	–	0.2	0.6	V <sub>dc</sub>
	(T <sub>C</sub> = 125°C)		–	0.3	–	
	(T <sub>C</sub> = 125°C)		–	0.5	1.5	
	(T <sub>C</sub> = 125°C)		–	0.9	2.0	

## DYNAMIC CHARACTERISTICS

Current Gain Bandwidth Product (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	–	13	–	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	C <sub>ob</sub>	–	300	500	pF
Input Capacitance (V <sub>EB</sub> = 8.0)	C <sub>ib</sub>	–	7000	9000	pF

## SWITCHING CHARACTERISTICS: Resistive Load (D.C. = 10%, Pulse Width = 70 μs)

Turn-On Time	(I <sub>C</sub> = 10 A <sub>dc</sub> , I <sub>B1</sub> = I <sub>B2</sub> = 2 A <sub>dc</sub> , V <sub>CC</sub> = 125 V)	t <sub>On</sub>	–	540	750	ns
Storage Time		t <sub>s</sub>	–	4.75	6	μs
Fall Time		t <sub>f</sub>	–	380	500	ns
Turn-Off Time		t <sub>Off</sub>	–	5.2	6.5	μs
Turn-On Time	(I <sub>C</sub> = 20 A <sub>dc</sub> , I <sub>B1</sub> = I <sub>B2</sub> = 4 A <sub>dc</sub> , V <sub>CC</sub> = 125 V)	t <sub>On</sub>	–	965	1200	ns
Storage Time		t <sub>s</sub>	–	2.9	3.5	μs
Fall Time		t <sub>f</sub>	–	350	500	ns
Turn-Off Time		t <sub>Off</sub>	–	3.25	4	μs

## SWITCHING CHARACTERISTICS: Inductive Load (V<sub>clamp</sub> = 300 V, V<sub>CC</sub> = 15 V, L = 200 μH)

Fall Time	(I <sub>C</sub> = 10 A <sub>dc</sub> , I <sub>B1</sub> = I <sub>B2</sub> = 2 A <sub>dc</sub> )	t <sub>fi</sub>	–	142	250	ns
Storage Time		t <sub>si</sub>	–	4.75	6	μs
Crossover Time		t <sub>c</sub>	–	320	500	ns
Fall Time	(I <sub>C</sub> = 20 A <sub>dc</sub> , I <sub>B1</sub> = I <sub>B2</sub> = 4 A <sub>dc</sub> )	t <sub>fi</sub>	–	350	500	ns
Storage Time		t <sub>si</sub>	–	3.0	3.5	μs
Crossover Time		t <sub>c</sub>	–	500	750	ns

TYPICAL CHARACTERISTICS

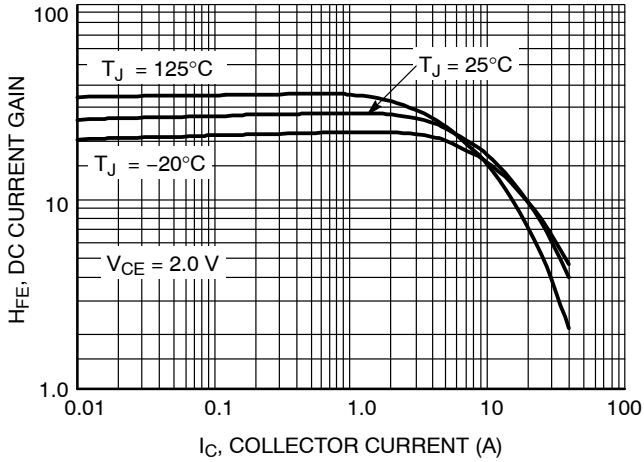


Figure 1. DC Current Gain,  $V_{CE} = 2.0\text{ V}$

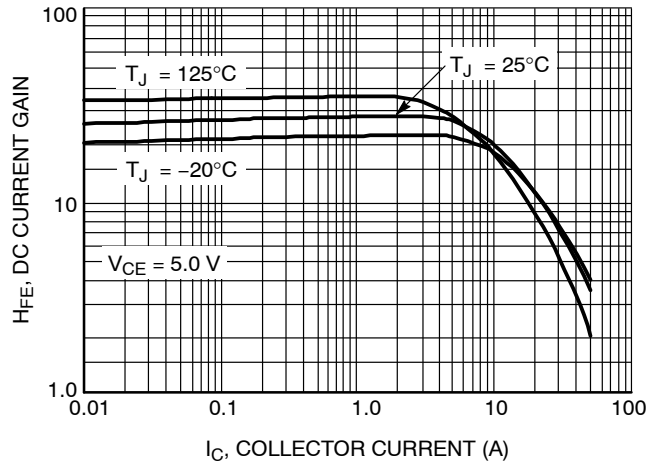


Figure 2. DC Current Gain,  $V_{CE} = 5.0\text{ V}$

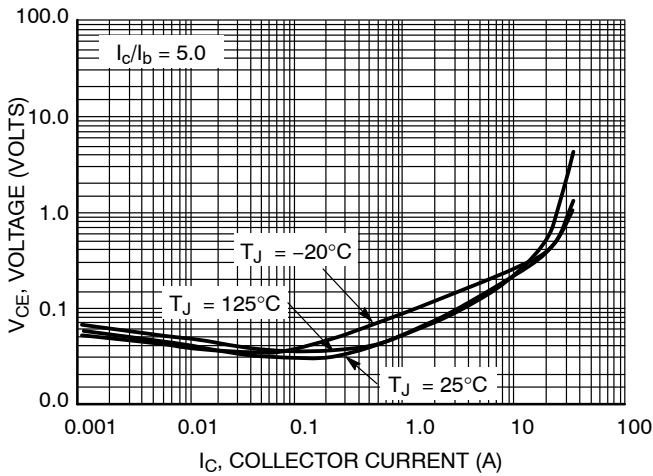


Figure 3. Typical Collector-Emitter Saturation Voltage,  $I_C/I_B = 5.0$

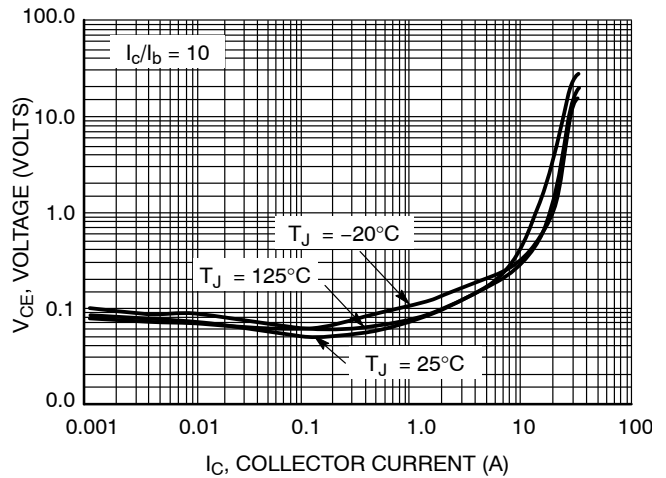


Figure 4. Typical Collector-Emitter Saturation Voltage,  $I_C/I_B = 10$

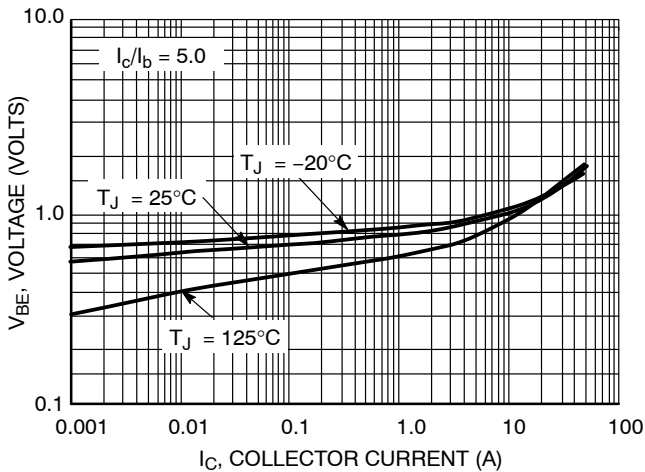


Figure 5. Typical Base-Emitter Saturation Voltage,  $I_C/I_B = 5.0$

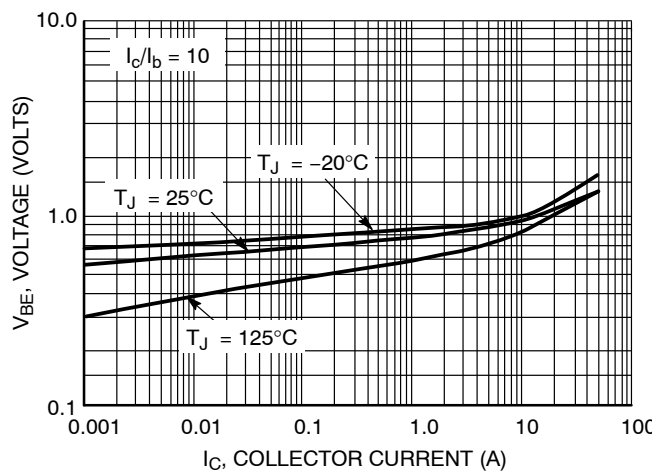


Figure 6. Typical Base-Emitter Saturation Voltage,  $I_C/I_B = 10$

TYPICAL CHARACTERISTICS

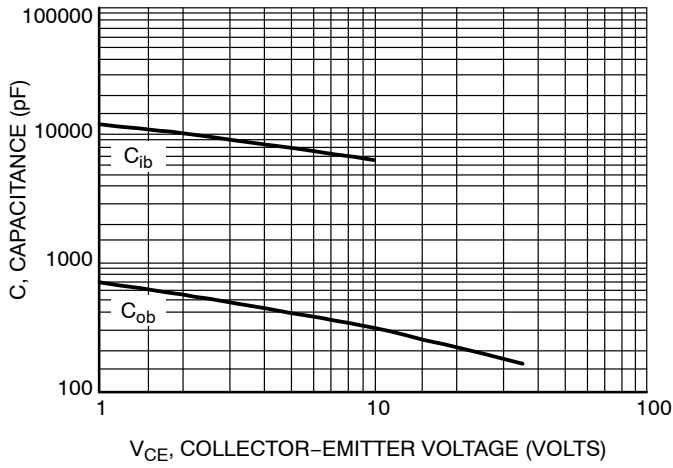


Figure 7. Typical Capacitance

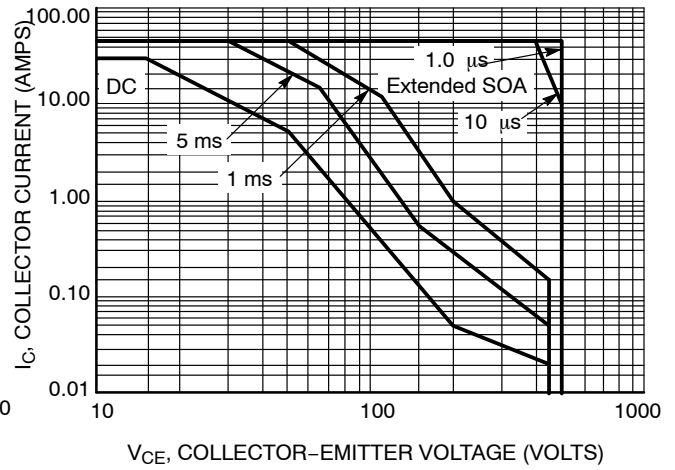


Figure 8. Forward Bias Safe Operating Area

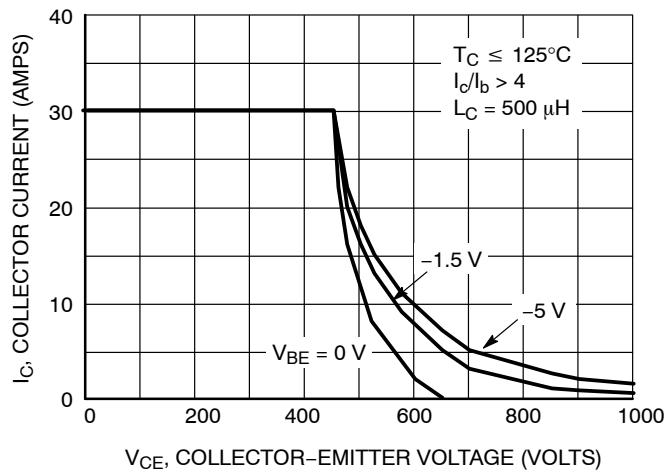
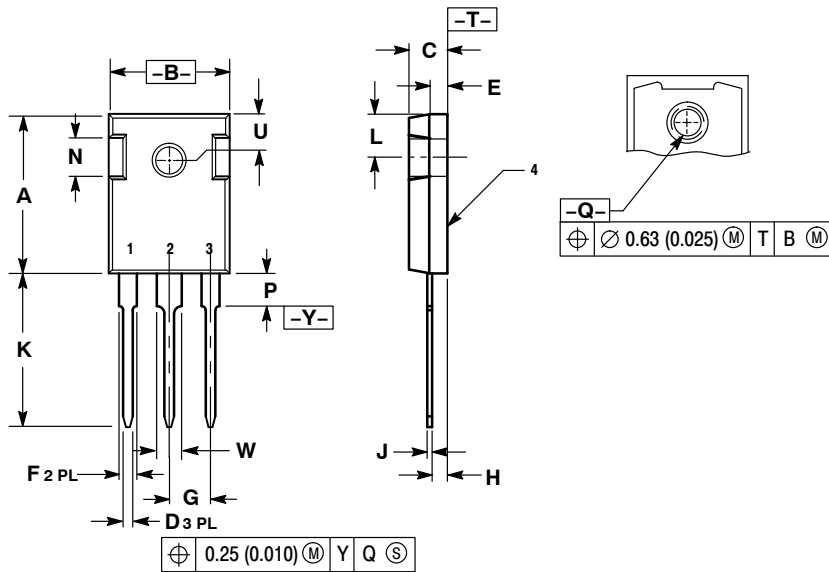


Figure 9. Reverse Bias Safe Operating Area

# MJW18020

## PACKAGE DIMENSIONS

TO-247  
CASE 340L-02  
ISSUE E



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.32	21.08	0.800	0.830
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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