MMBT2907AM3T5G

PNP General Purpose Transistor

The MMBT2907AM3T5G device is a spin−off of our popular SOT−23 three−leaded device. It is designed for general purpose amplifier applications and is housed in the SOT−723 surface mount package. This device is ideal for low−power surface mount applications where board space is at a premium.

Features

- Reduces Board Space
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	−60	Vdc
Collector−Base Voltage	V_{CBO}	−60	Vdc
Emitter−Base Voltage	V_{EBO}	−5.0	Vdc
Collector Current − Continuous	I_C	−600	mAdc

THERMAL CHARACTERISTICS

| Characteristic	Symbol	Max	Unit
Total Device Dissipation FR−5 Board (Note 1) $T_A = 25°C$ Derate above 25°C	P_D	265 2.1	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	470	°C/W
Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25°C$ Derate above 25°C	P_D	640 5.1	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	195	°C/W
Junction and Storage Temperature	T_J, T_{stg}	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. FR−5 = 1.0 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 0.024 in. 99.5% alumina.

ON Semiconductor®

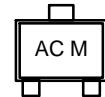COLLECTOR
3

1
BASE

2
EMITTER

MARKING DIAGRAM

3

2

1
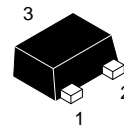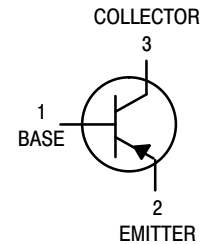
SOT−723 CASE 631AA STYLE 1

AC M

AC	= Specific Device Code
M	= Date Code

ORDERING INFORMATION

Device	Package	Shipping[†]
MMBT2907AM3T5G	SOT−723 (Pb−Free)	8000/Tape & Reel
NSVMMBT2907AM3T5G	SOT−723 (Pb−Free)	8000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (Note 3) (I_C = −10 mAdc, I_B = 0)	$V_{(BR)CEO}$	−60	–	Vdc
Collector–Base Breakdown Voltage (I_C = −10 μAdc, I_E = 0)	$V_{(BR)CBO}$	−60	–	Vdc
Emitter–Base Breakdown Voltage (I_E = −10 μAdc, I_C = 0)	$V_{(BR)EBO}$	−5.0	–	Vdc
Collector Cutoff Current (V_{CE} = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc)	I_{CEX}	–	−50	nAdc
Collector Cutoff Current (V_{CB} = −50 Vdc, I_E = 0) (V_{CB} = −50 Vdc, I_E = 0, T_A = 125°C)	I_{CBO}	– –	−0.010 −10	μAdc
Base Cutoff Current (V_{CE} = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc)	I_{BL}	–	−50	nAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = −0.1 mAdc, V_{CE} = −10 Vdc) (I_C = −1.0 mAdc, V_{CE} = −10 Vdc) (I_C = −10 mAdc, V_{CE} = −10 Vdc) (I_C = −150 mAdc, V_{CE} = −10 Vdc) (I_C = −500 mAdc, V_{CE} = −10 Vdc) (Note 3)	h_{FE}	75 100 100 100 50	– – – 300 –	–
Collector–Emitter Saturation Voltage (Note 3) (I_C = −150 mAdc, I_B = −15 mAdc) (Note 3) (I_C = −500 mAdc, I_B = −50 mAdc)	$V_{CE(sat)}$	– –	−0.4 −1.6	Vdc
Base–Emitter Saturation Voltage (Note 3) (I_C = −150 mAdc, I_B = −15 mAdc) (I_C = −500 mAdc, I_B = −50 mAdc)	$V_{BE(sat)}$	– –	−1.3 −2.6	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain–Bandwidth Product (Notes 3, 4) (I_C = −50 mAdc, V_{CE} = −20 Vdc, f = 100 MHz)	f_T	200	–	MHz
Output Capacitance (V_{CB} = −10 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	8.0	pF
Input Capacitance (V_{EB} = −2.0 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	–	30	

SWITCHING CHARACTERISTICS

			Min	Max	Unit
Turn–On Time	(V_{CC} = −30 Vdc, I_C = −150 mAdc, I_{B1} = −15 mAdc)	t_{on}	–	45	ns
Delay Time		t_d	–	10	
Rise Time		t_r	–	40	
Turn–Off Time	(V_{CC} = −6.0 Vdc, I_C = −150 mAdc, I_{B1} = I_{B2} = −15 mAdc)	t_{off}	–	100	
Storage Time		t_s	–	80	
Fall Time		t_f	–	30	

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
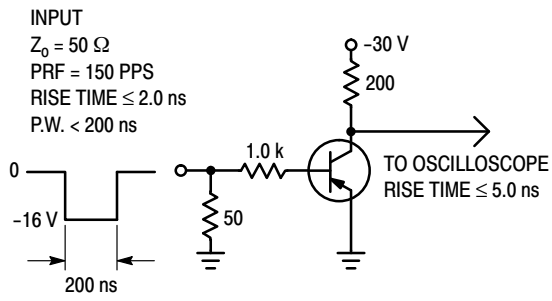4. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

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INPUT
Z_0 = 50 Ω
PRF = 150 PPS
RISE TIME ≤ 2.0 ns
P.W. < 200 ns

0

−16 V

200 ns

1.0 k

50

−30 V

200

TO OSCILLOSCOPE
RISE TIME ≤ 5.0 ns

Figure 1. Delay and Rise Time Test Circuit

INPUT
Z_0 = 50 Ω
PRF = 150 PPS
RISE TIME ≤ 2.0 ns
P.W. < 200 ns

0

−30 V

200 ns

1.0 k

50

+15 V

1.0 k

−6.0 V

37

1N916

TO OSCILLOSCOPE
RISE TIME ≤ 5.0 ns
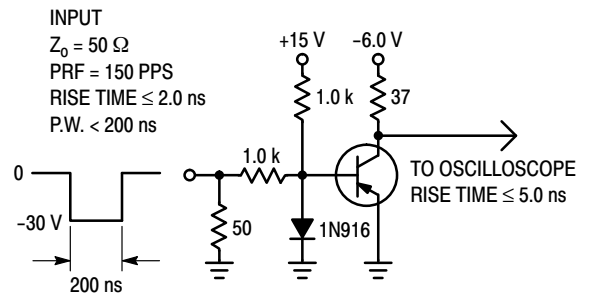
Figure 2. Storage and Fall Time Test Circuit

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TYPICAL CHARACTERISTICS
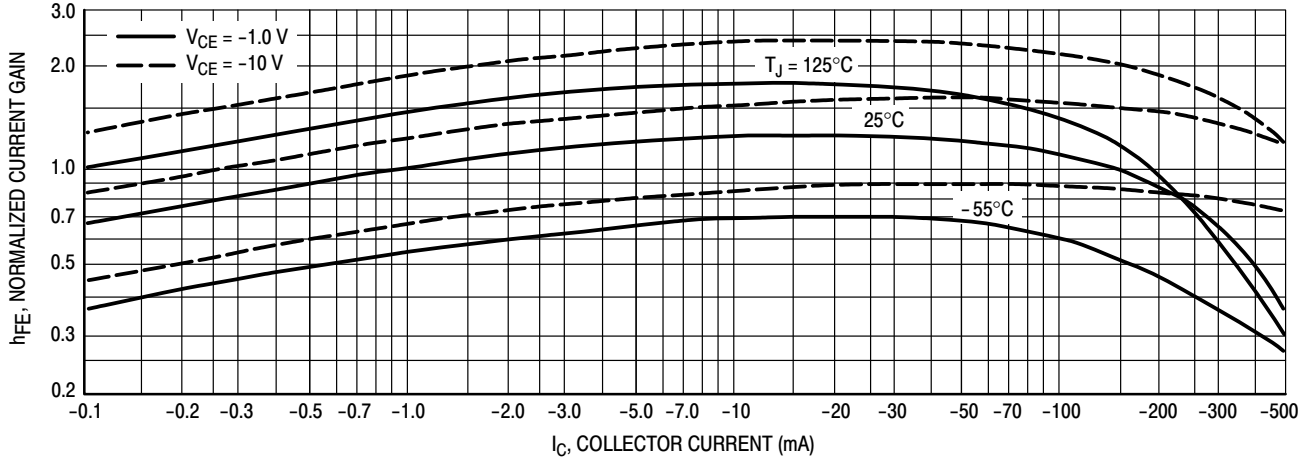
Figure 3. DC Current Gain
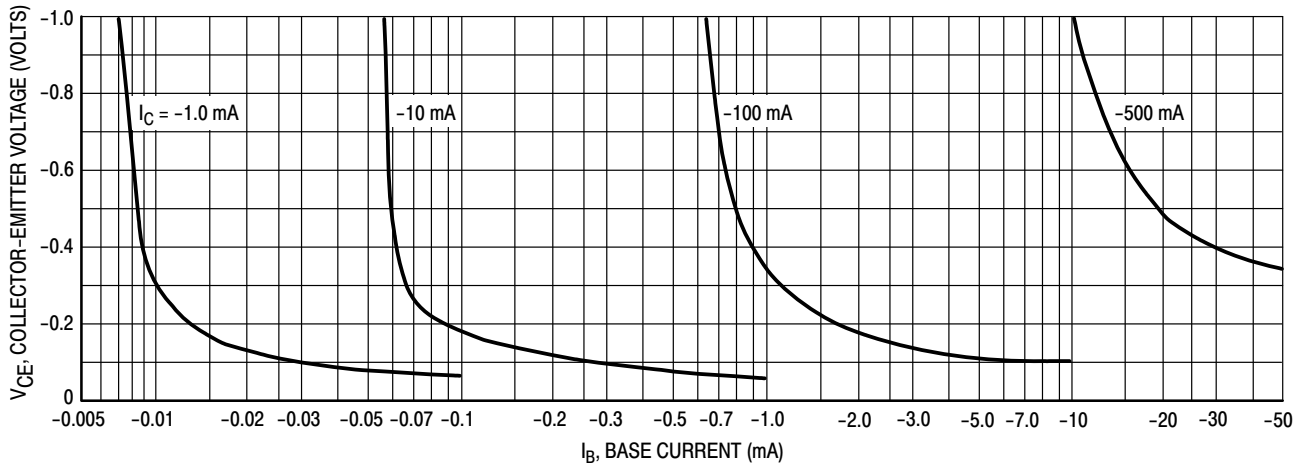
Figure 4. Collector Saturation Region
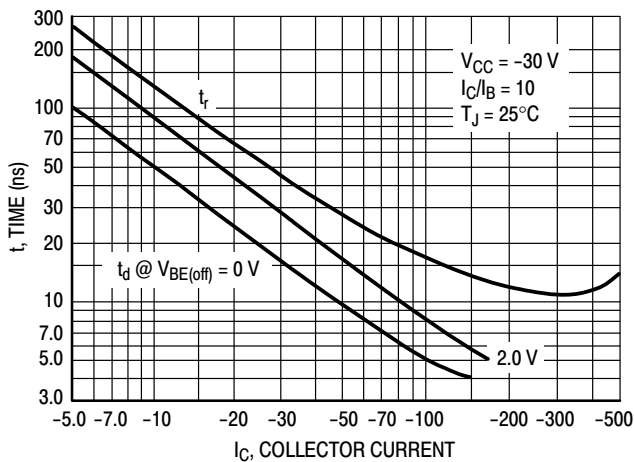
Figure 5. Turn−On Time
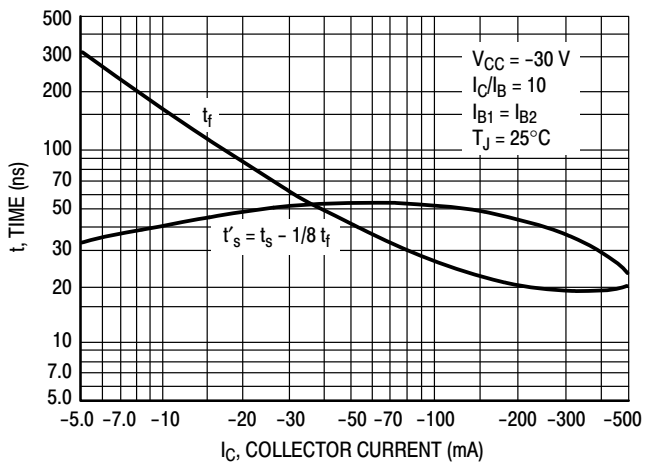
Figure 6. Turn−Off Time

MMBT2907AM3T5G

NOISE FIGURE

$V_{CE} = 10$ Vdc, $T_A = 25°C$
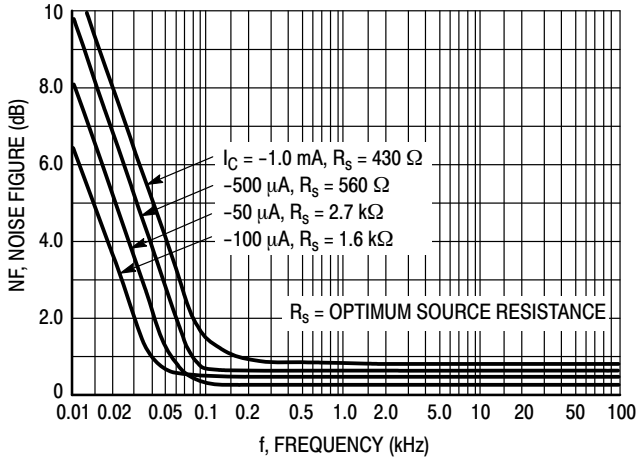
Figure 7. Frequency Effects

(Graph: NF, NOISE FIGURE (dB) vs f, FREQUENCY (kHz))

$I_C = -1.0$ mA, $R_S = 430$ Ω
-500 μA, $R_S = 560$ Ω
-50 μA, $R_S = 2.7$ kΩ
-100 μA, $R_S = 1.6$ kΩ

R_S = OPTIMUM SOURCE RESISTANCE
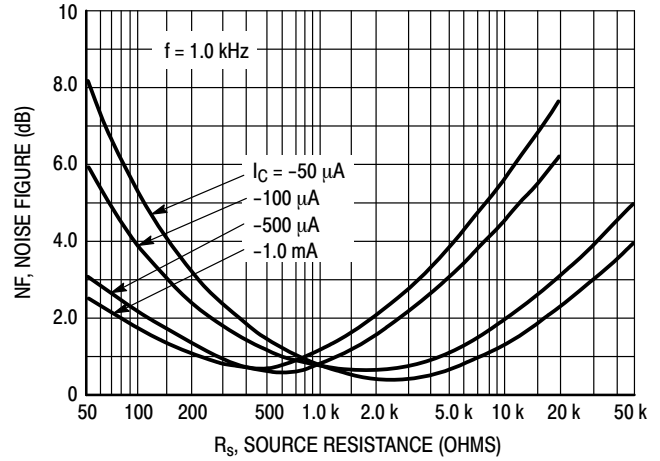
Figure 8. Source Resistance Effects

(Graph: NF, NOISE FIGURE (dB) vs R_S, SOURCE RESISTANCE (OHMS))

$f = 1.0$ kHz

$I_C = -50$ μA
-100 μA
-500 μA
-1.0 mA

Figure 9. Capacitances

(Graph: C, CAPACITANCE (pF) vs REVERSE VOLTAGE (VOLTS))

C_{eb}

C_{cb}
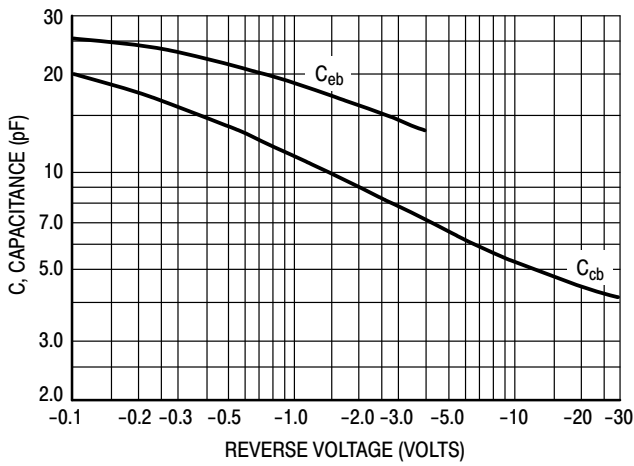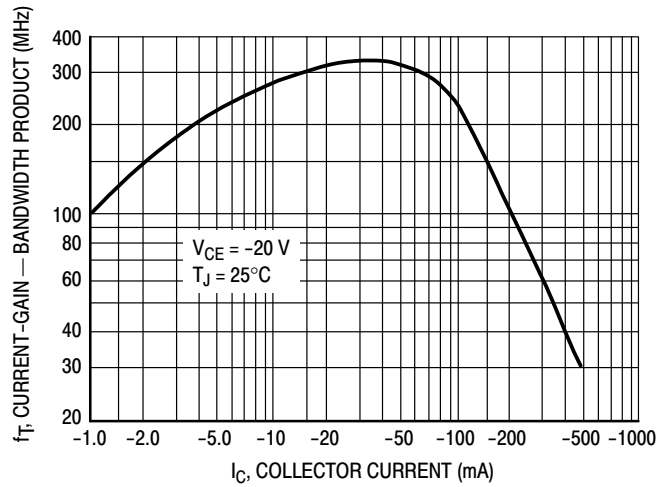
Figure 10. Current−Gain − Bandwidth Product

(Graph: f_T, CURRENT−GAIN − BANDWIDTH PRODUCT (MHz) vs I_C, COLLECTOR CURRENT (mA))

$V_{CE} = -20$ V
$T_J = 25°C$

Figure 11. "On" Voltage

(Graph: V, VOLTAGE (VOLTS) vs I_C, COLLECTOR CURRENT (mA))

$T_J = 25°C$

$V_{BE(sat)}$ @ $I_C/I_B = 10$

$V_{BE(on)}$ @ $V_{CE} = -10$ V

$V_{CE(sat)}$ @ $I_C/I_B = 10$
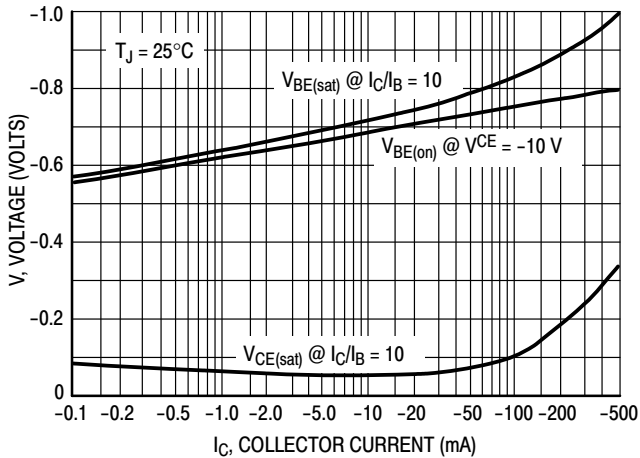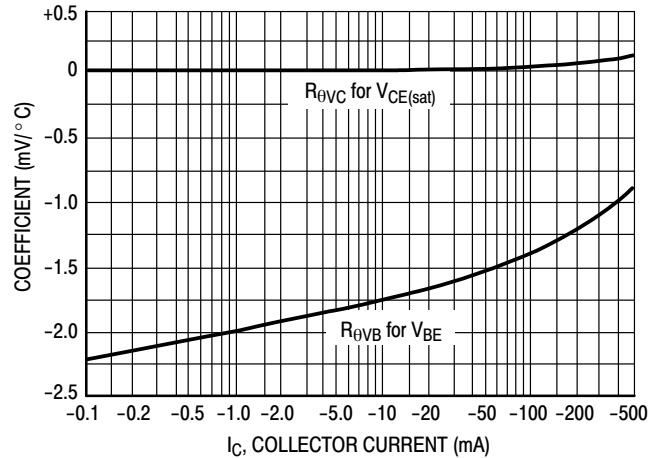
Figure 12. Temperature Coefficients

(Graph: COEFFICIENT (mV/°C) vs I_C, COLLECTOR CURRENT (mA))

$R_{\theta VC}$ for $V_{CE(sat)}$

$R_{\theta VB}$ for V_{BE}

SOT−723
CASE 631AA
ISSUE D

DATE 10 AUG 2009

SCALE 4:1

TOP VIEW

⊕ | 0.08 | X | Y

SIDE VIEW

BOTTOM VIEW
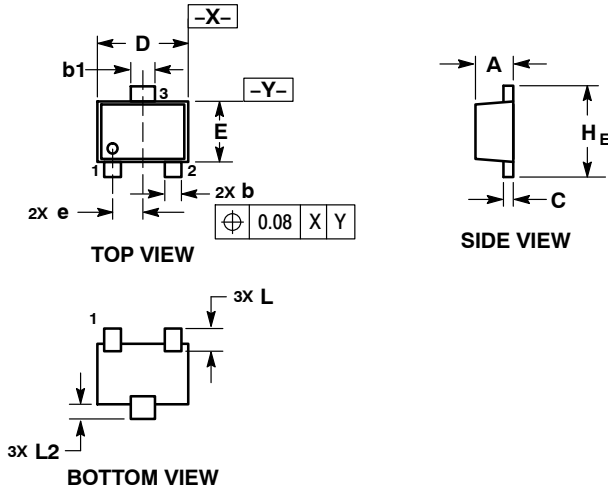
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
b	0.15	0.21	0.27
b1	0.25	0.31	0.37
C	0.07	0.12	0.17
D	1.15	1.20	1.25
E	0.75	0.80	0.85
e	0.40 BSC		
H E	1.15	1.20	1.25
L	0.29 REF		
L2	0.15	0.20	0.25

GENERIC MARKING DIAGRAM*

XX M

1
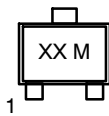
XX = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "∎", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED SOLDERING FOOTPRINT*

PACKAGE OUTLINE

2X 0.40
2X 0.27
1.50
3X 0.52
0.36

DIMENSIONS: MILLIMETERS

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

STYLE 1:
PIN 1. BASE
    2. EMITTER
    3. COLLECTOR

STYLE 2:
PIN 1. ANODE
    2. N/C
    3. CATHODE

STYLE 3:
PIN 1. ANODE
    2. ANODE
    3. CATHODE

STYLE 4:
PIN 1. CATHODE
    2. CATHODE
    3. ANODE

STYLE 5:
PIN 1. GATE
    2. SOURCE
    3. DRAIN

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