

2N6052

Preferred Device

Darlington Complementary Silicon Power Transistors

This package is designed for general-purpose amplifier and low frequency switching applications.

Features

- High DC Current Gain — $h_{FE} = 3500$ (Typ) @ $I_C = 5.0$ Adc
- Collector-Emitter Sustaining Voltage — @ 100 mA
 $V_{CEO(sus)} = 100$ Vdc (Min)
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors
- This is a Pb-Free Device*

MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	100	Vdc
Collector-Base Voltage	V_{CB}	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current - Continuous Peak	I_C	12 20	Adc
Base Current	I_B	0.2	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	150 0.857	W W/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.17	$^\circ\text{C}/\text{W}$

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. Indicates JEDEC Registered Data.

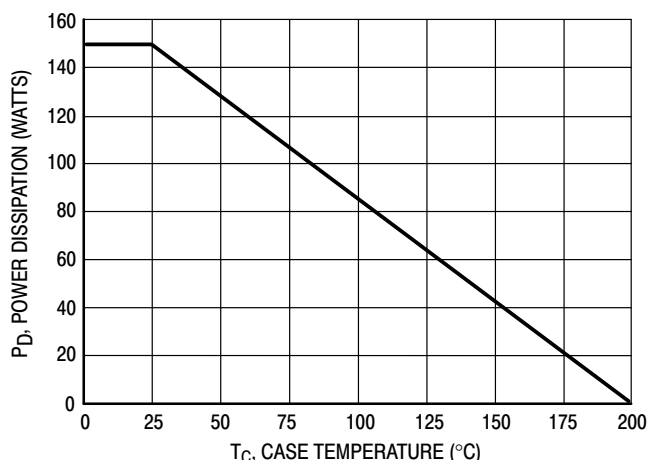


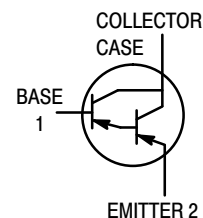
Figure 1. Power Derating



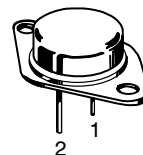
ON Semiconductor®

<http://onsemi.com>

12 AMPERE COMPLEMENTARY SILICON POWER TRANSISTOR 100 VOLTS, 150 WATTS



MARKING DIAGRAM



TO-204AA (TO-3)
CASE 1-07
STYLE 1

2N6052 = Device Code
G = Pb-Free Package
A = Location Code
YY = Year
WW = Work Week
MEX = Country of Origin

ORDERING INFORMATION

Device	Package	Shipping
2N6052G	TO-3 (Pb-Free)	100 Units/Tray

Preferred devices are recommended choices for future use and best overall value.

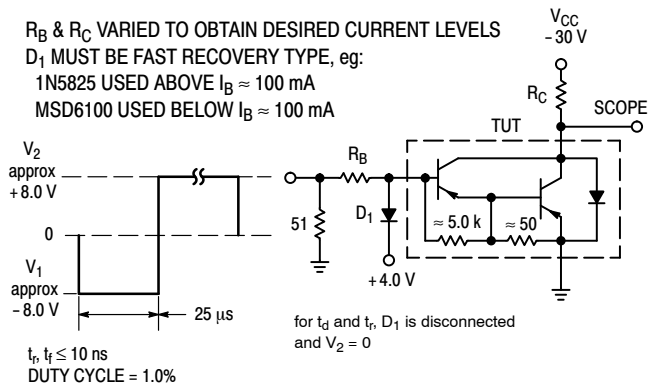
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

2N6052

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (Note 2)

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (Note 3)	$(I_C = 100 \text{ mAdc}, I_B = 0)$	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current	$(V_{CE} = 50 \text{ Vdc}, I_B = 0)$	I_{CEO}	–	1.0	mAdc
Collector Cutoff Current	$(V_{CE} = \text{Rated } V_{CEO}, V_{BE(off)} = 1.5 \text{ Vdc})$ $(V_{CE} = \text{Rated } V_{CEO}, V_{BE(off)} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C})$	I_{CEX}	–	0.5 5.0	mAdc
Emitter Cutoff Current	$(V_{BE} = 5.0 \text{ Vdc}, I_C = 0)$	I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS (Note 3)					
DC Current Gain	$(I_C = 6.0 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc})$ $(I_C = 12 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc})$	h_{FE}	750 100	18,000 –	–
Collector-Emitter Saturation Voltage	$(I_C = 6.0 \text{ Adc}, I_B = 24 \text{ mAdc})$ $(I_C = 12 \text{ Adc}, I_B = 120 \text{ mAdc})$	$V_{CE(sat)}$	–	2.0 3.0	Vdc
Base-Emitter Saturation Voltage	$(I_C = 12 \text{ Adc}, I_B = 120 \text{ mAdc})$	$V_{BE(sat)}$	–	4.0	Vdc
Base-Emitter On Voltage	$(I_C = 6.0 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc})$	$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS					
Magnitude of Common Emitter Small-Signal Short Circuit Forward Current Transfer Ratio	$(I_C = 5.0 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc}, f = 1.0 \text{ MHz})$	$ h_{fe} $	4.0	–	MHz
Output Capacitance	$(V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 0.1 \text{ MHz})$	C_{ob}	–	500	pF
Small-Signal Current Gain	$(I_C = 5.0 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc}, f = 1.0 \text{ kHz})$	h_{fe}	300	–	–

- Indicates JEDEC Registered Data.
- Pulse test: Pulse Width = 300 μs , Duty Cycle = 2.0%.



For NPN test circuit reverse diode and voltage polarities.

Figure 2. Switching Times Test Circuit

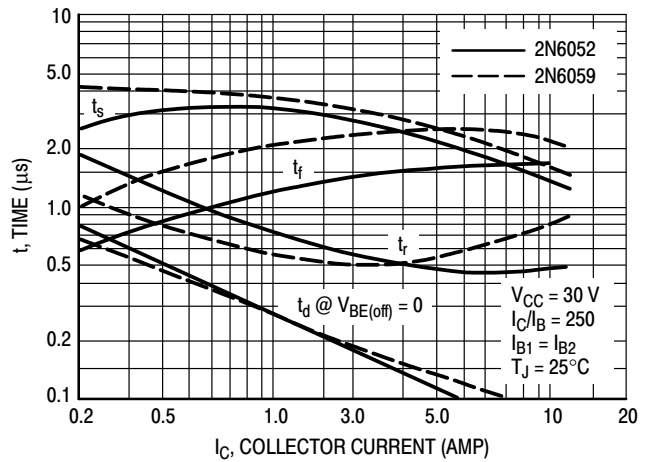


Figure 3. Switching Times

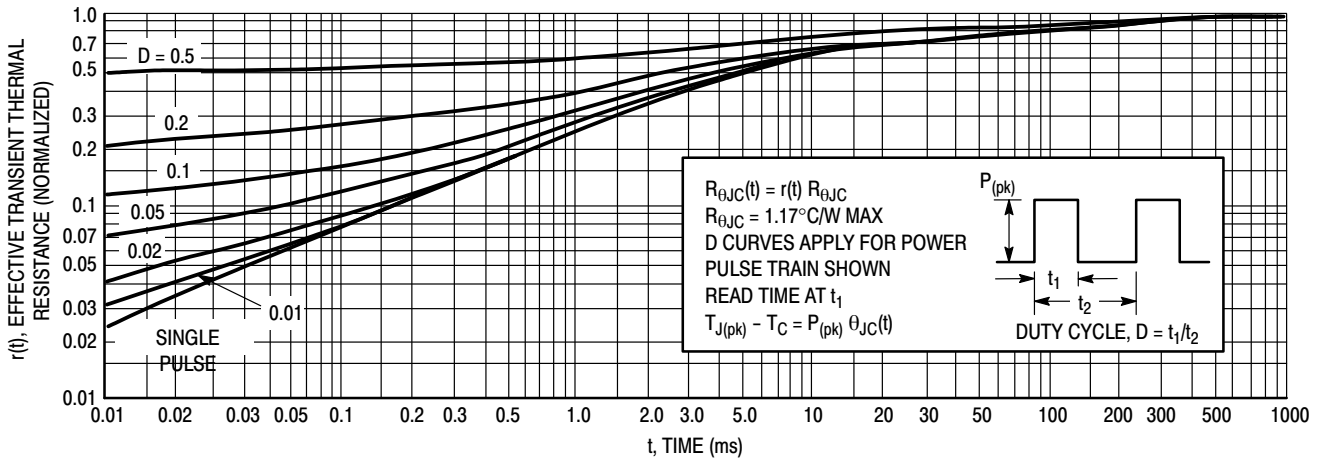


Figure 4. Thermal Response

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 5, and 6 is based on $T_{J(pk)} = 200^{\circ}\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200^{\circ}\text{C}$; $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

ACTIVE-REGION SAFE OPERATING AREA

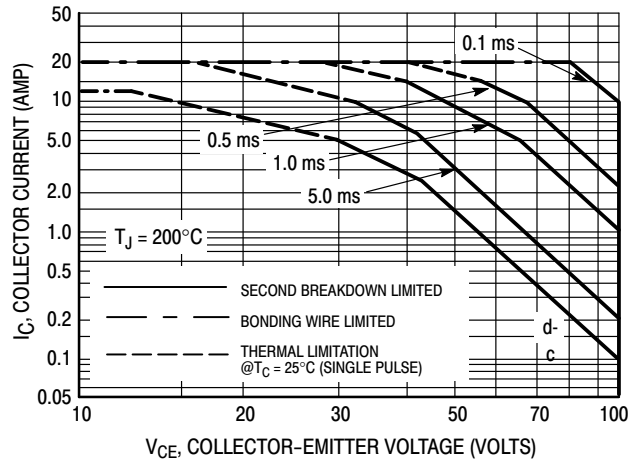


Figure 5.

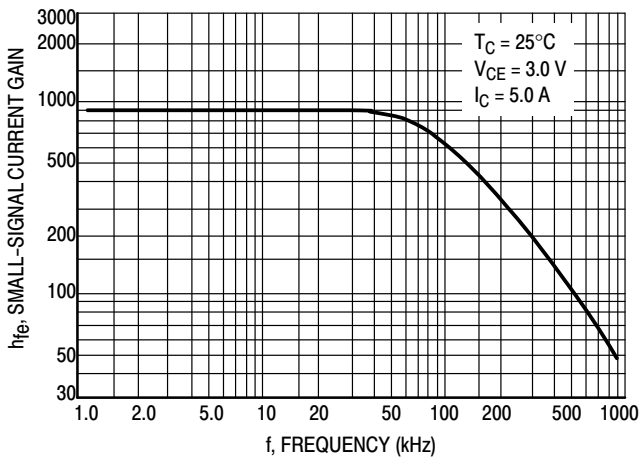


Figure 6. Small-Signal Current Gain

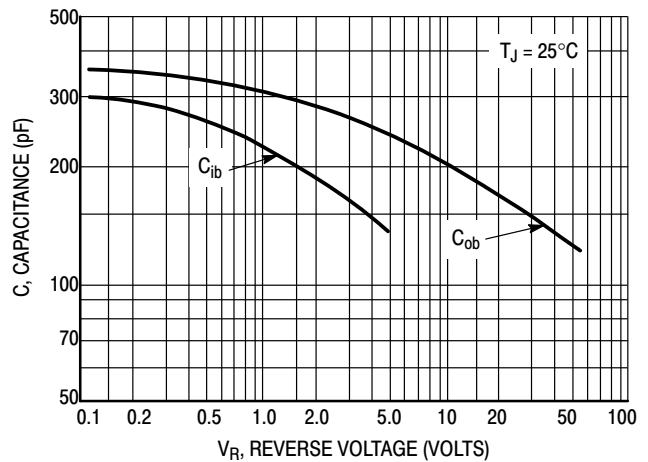


Figure 7. Capacitance

2N6052

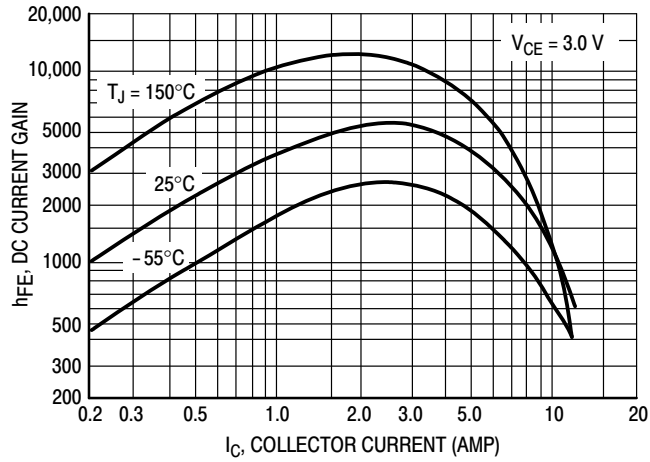


Figure 8. DC Current Gain

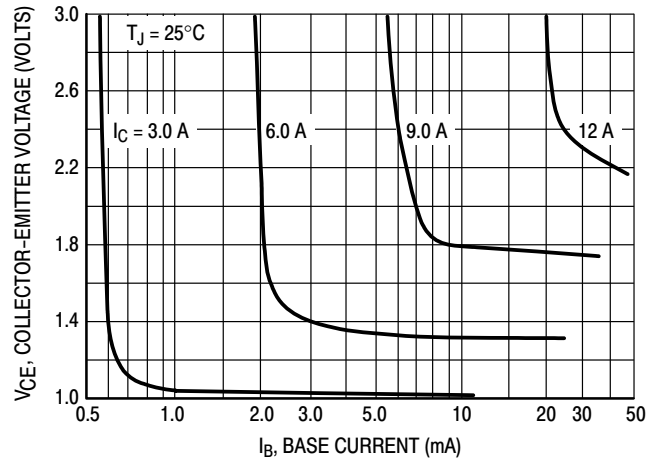


Figure 9. Collector Saturation Region

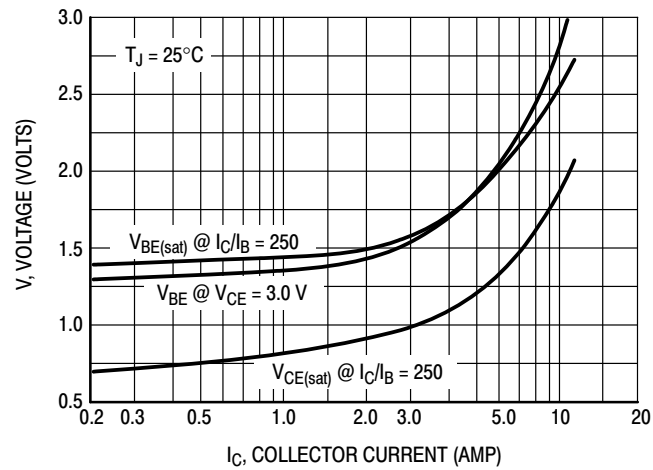


Figure 10. "On" Voltages

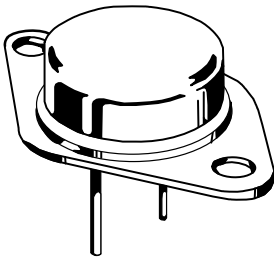
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor

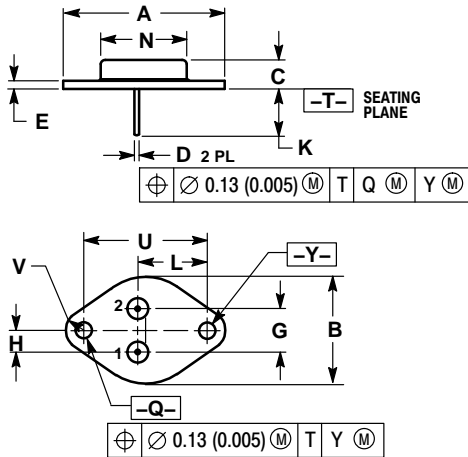


TO-204 (TO-3)
CASE 1-07
ISSUE Z

DATE 05/18/1988



SCALE 1:1



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF	---	39.37 REF	---
B	---	1.050	---	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC	---	10.92 BSC	---
H	0.215 BSC	---	5.46 BSC	---
K	0.440	0.480	11.18	12.19
L	---	0.665 BSC	---	16.89 BSC
N	---	0.830	---	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC	---	30.15 BSC	---
V	0.131	0.188	3.33	4.77

- | | | | | |
|--|--|---|---|---|
| <p>STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR</p> | <p>STYLE 2:
PIN 1. BASE
2. COLLECTOR
CASE: EMITTER</p> | <p>STYLE 3:
PIN 1. GATE
2. SOURCE
CASE: DRAIN</p> | <p>STYLE 4:
PIN 1. GROUND
2. INPUT
CASE: OUTPUT</p> | <p>STYLE 5:
PIN 1. CATHODE
2. EXTERNAL TRIP/DELAY
CASE: ANODE</p> |
| <p>STYLE 6:
PIN 1. GATE
2. EMITTER
CASE: COLLECTOR</p> | <p>STYLE 7:
PIN 1. ANODE
2. OPEN
CASE: CATHODE</p> | <p>STYLE 8:
PIN 1. CATHODE #1
2. CATHODE #2
CASE: ANODE</p> | <p>STYLE 9:
PIN 1. ANODE #1
2. ANODE #2
CASE: CATHODE</p> | |

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