BDW42G (NPN), BDW46G, BDW47G (PNP)

Darlington Complementary Silicon Power Transistors

This series of plastic, medium−power silicon NPN and PNP Darlington transistors are designed for general purpose and low speed switching applications.

Features

- High DC Current Gain − h_{FE} = 2500 (typ) @ I_C = 5.0 Adc.
- Collector Emitter Sustaining Voltage @ 30 mAdc:
  $V_{CEO(sus)}$ = 80 Vdc (min) − BDW46
  100 Vdc (min) − BDW42/BDW47
- Low Collector Emitter Saturation Voltage
  $V_{CE(sat)}$ = 2.0 Vdc (max) @ I_C = 5.0 Adc
  3.0 Vdc (max) @ I_C = 10.0 Adc
- Monolithic Construction with Built−In Base Emitter Shunt resistors
- TO−220 Compact Package
- These Devices are Pb−Free and are RoHS Compliant*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage BDW46 BDW42, BDW47	V_{CEO}	 80 100	Vdc
Collector-Base Voltage BDW46 BDW42, BDW47	V_{CB}	 80 100	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current	I_C	15	Adc
Base Current	I_B	0.5	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	 85 0.68	 W W/°C
Operating and Storage Junction Temperature Range	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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.47	°C/W

*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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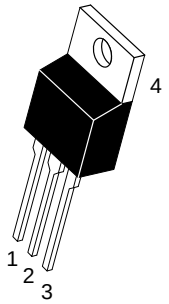
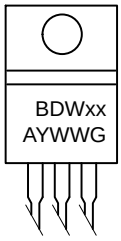
15 AMP DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS 80−100 VOLT, 85 WATT



TO−220
CASE 221A
STYLE 1

MARKING DIAGRAM



BDWxx = Device Code
x = 42, 46, or 47
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
BDW42G	TO−220 (Pb−Free)	50 Units/Rail
BDW46G	TO−220 (Pb−Free)	50 Units/Rail
BDW47G	TO−220 (Pb−Free)	50 Units/Rail

August, 2016 − Rev. 17

Publication Order Number:
BDW42/D

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector Emitter Sustaining Voltage (Note 1)		$V_{CEO(sus)}$			Vdc
(I_C = 30 mAdc, I_B = 0)	BDW46		80	−	
	BDW42/BDW47		100	−	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 40 Vdc, I_B = 0)	BDW46		−	2.0	
(V_{CE} = 50 Vdc, I_B = 0)	BDW42/BDW47		−	2.0	
Collector Cutoff Current		I_{CBO}			mAdc
(V_{CB} = 80 Vdc, I_E = 0)	BDW46		−	1.0	
(V_{CB} = 100 Vdc, I_E = 0)	BDW42/BDW47		−	1.0	
Emitter Cutoff Current		I_{EBO}	−	2.0	mAdc
(V_{BE} = 5.0 Vdc, I_C = 0)					
ON CHARACTERISTICS (Note 1)					
DC Current Gain		h_{FE}			
(I_C = 5.0 Adc, V_{CE} = 4.0 Vdc)			1000	−	
(I_C = 10 Adc, V_{CE} = 4.0 Vdc)			250	−	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 5.0 Adc, I_B = 10 mAdc)			−	2.0	
(I_C = 10 Adc, I_B = 50 mAdc)			−	3.0	
Base−Emitter On Voltage		$V_{BE(on)}$	−	3.0	Vdc
(I_C = 10 Adc, V_{CE} = 4.0 Vdc)					
SECOND BREAKDOWN (Note 2)					
Second Breakdown Collector		$I_{S/b}$			Adc
Current with Base Forward Biased					
BDW42	V_{CE} = 28.4 Vdc		3.0	−	
	V_{CE} = 40 Vdc		1.2	−	
BDW46/BDW47	V_{CE} = 22.5 Vdc		3.8	−	
	V_{CE} = 36 Vdc		1.2	−	
DYNAMIC CHARACTERISTICS					
Magnitude of common emitter small signal short circuit current transfer ratio		f_T	4.0	−	MHz
(I_C = 3.0 Adc, V_{CE} = 3.0 Vdc, f = 1.0 MHz)					
Output Capacitance		C_{ob}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	BDW42		−	200	
	BDW46/BDW47		−	300	
Small−Signal Current Gain		h_{fe}	300	−	
(I_C = 3.0 Adc, V_{CE} = 3.0 Vdc, f = 1.0 kHz)					

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2.0%.
2. Pulse Test non repetitive: Pulse Width = 250 ms.

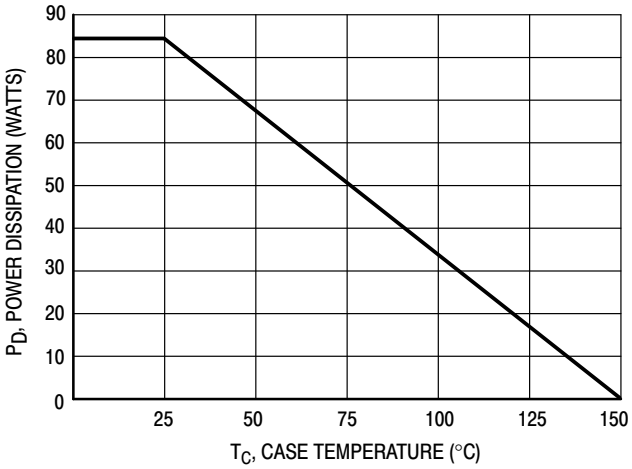


Figure 1. Power Temperature Derating Curve

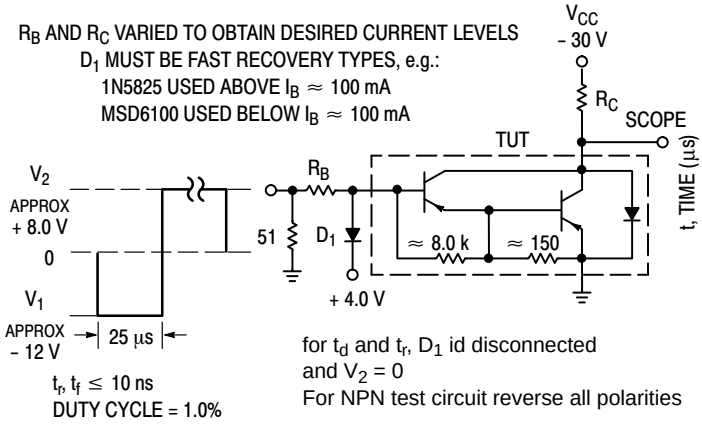


Figure 2. Switching Times Test Circuit

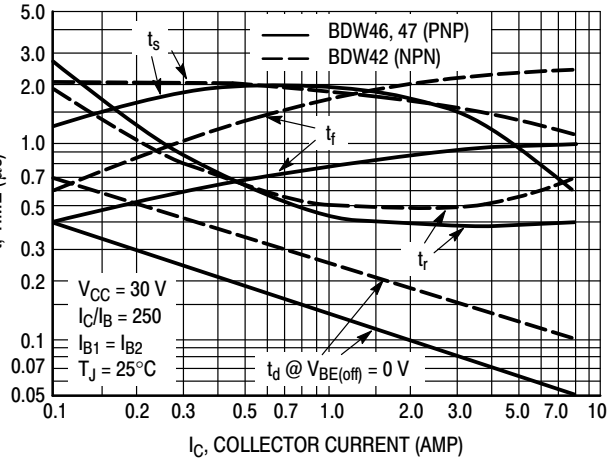


Figure 3. Switching Times

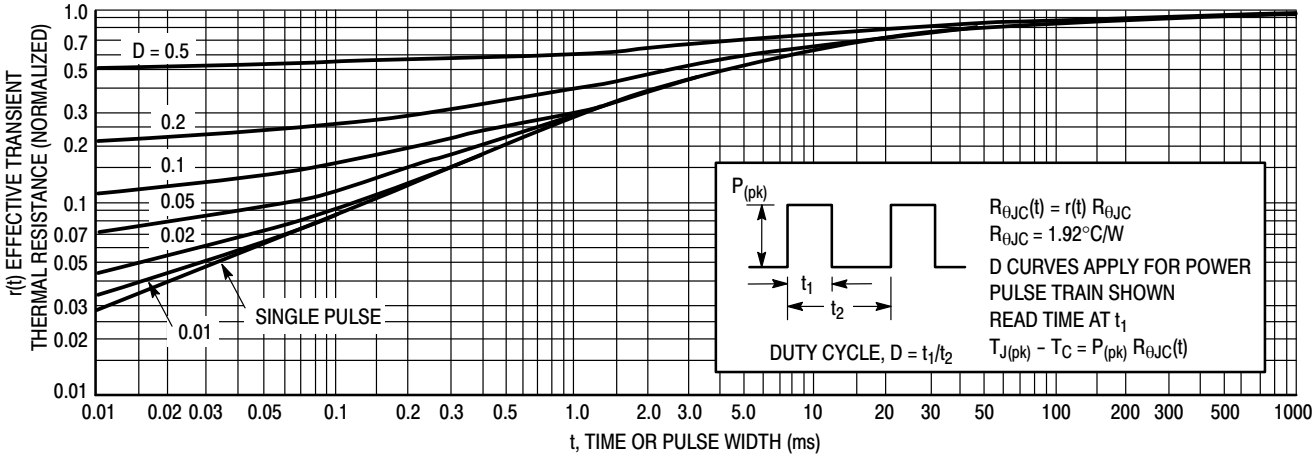


Figure 4. Thermal Response

ACTIVE−REGION SAFE OPERATING AREA

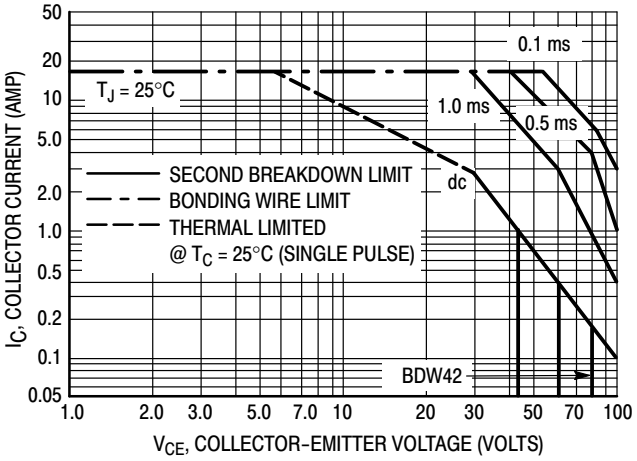


Figure 5. BDW42

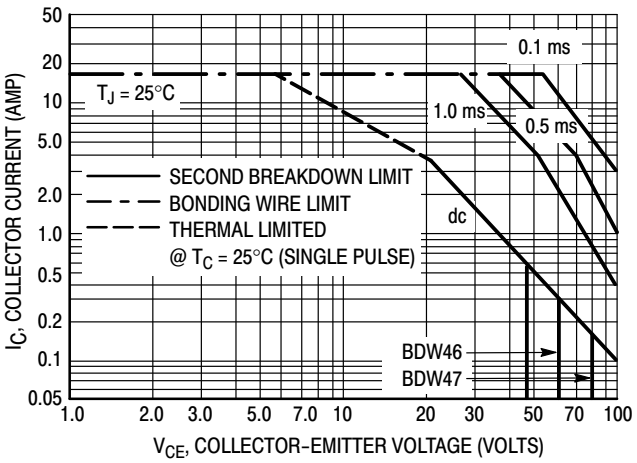


Figure 6. BDW46 and BDW47

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 Figure 5 and 6 is based on $T_{J(pk)}$ = 200°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200°C$. $T_{J(pk)}$ 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.

*Linear extrapolation

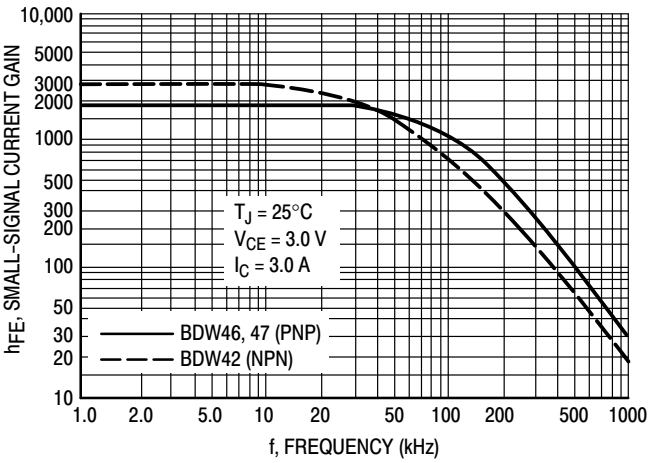


Figure 7. Small−Signal Current Gain

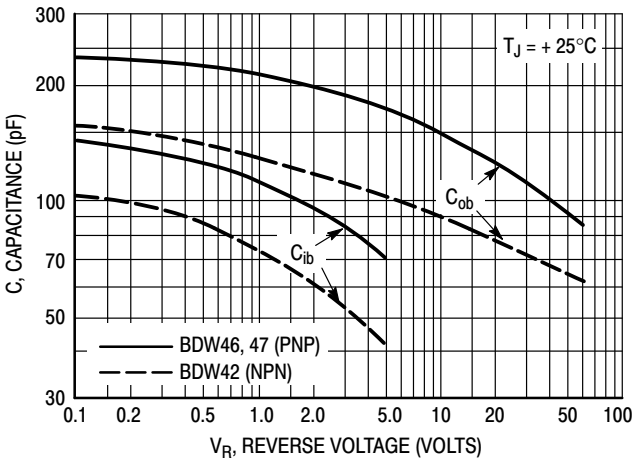
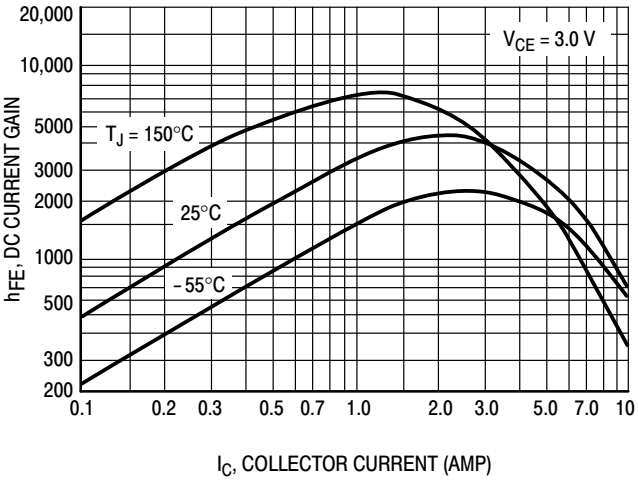


Figure 8. Capacitance

BDW42 (NPN)



BDW46, 47 (PNP)

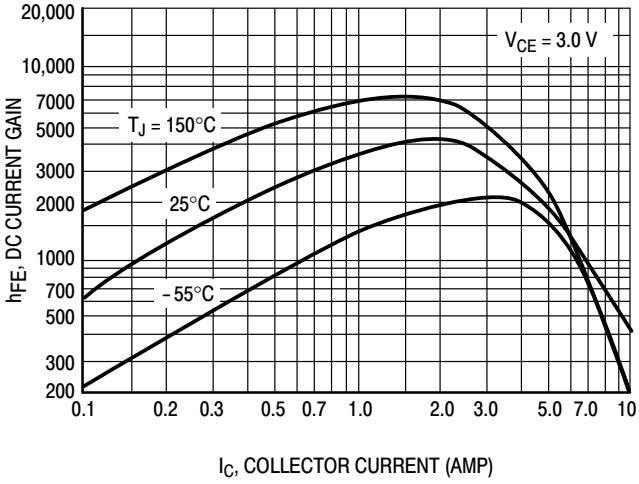
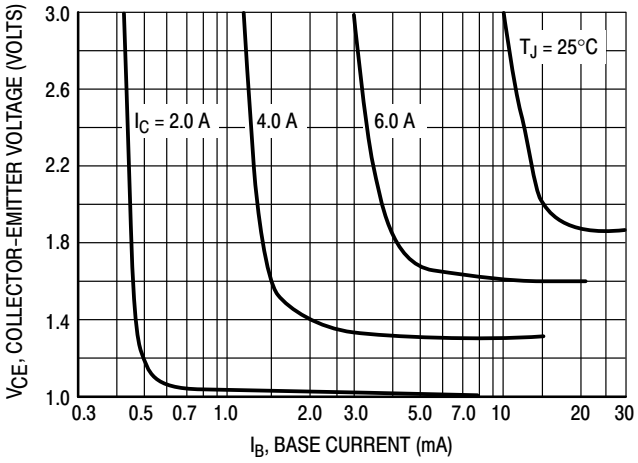


Figure 9. DC Current Gain



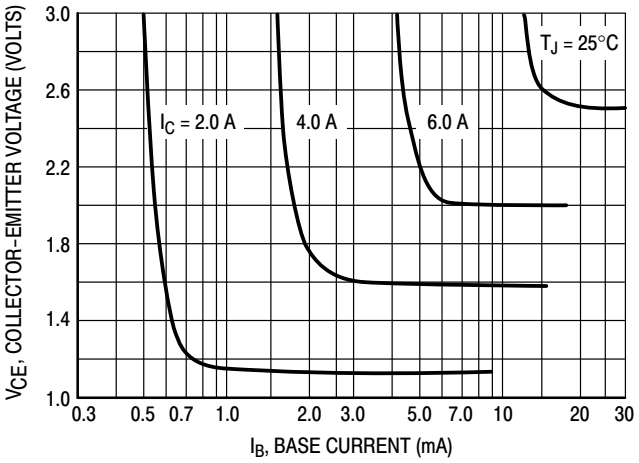
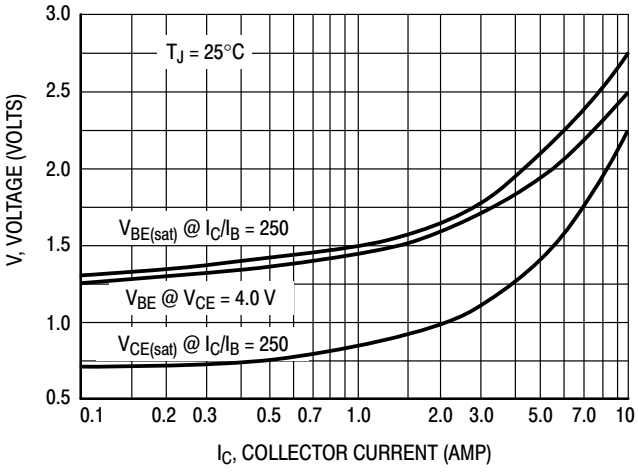


Figure 10. Collector Saturation Region



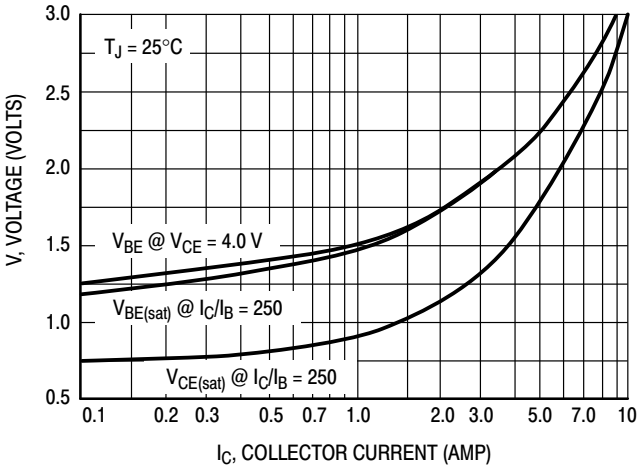


Figure 11. “On” Voltages

BDW42 (NPN) **BDW46, 47 (PNP)**

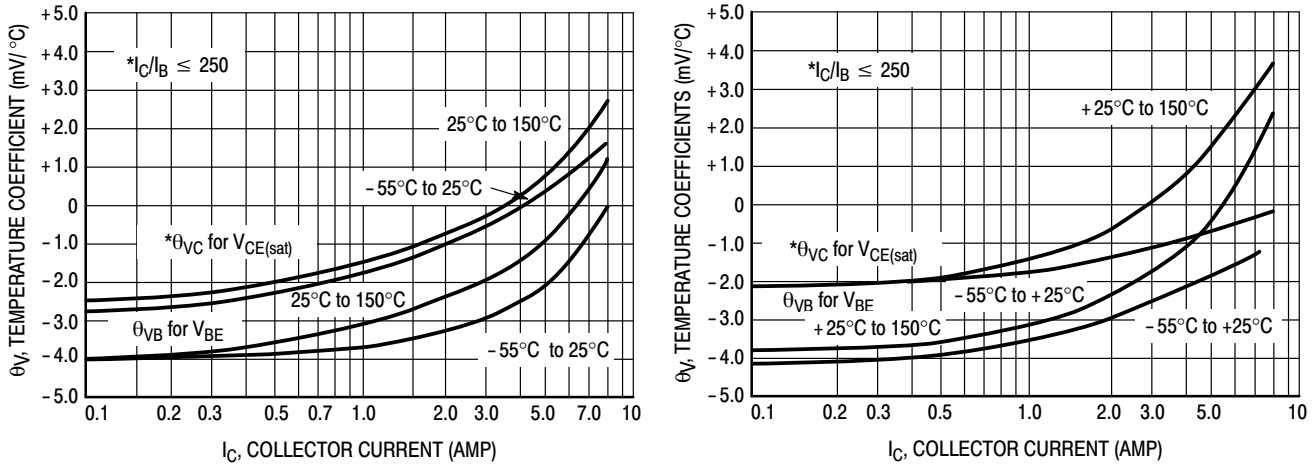


Figure 12. Temperature Coefficients

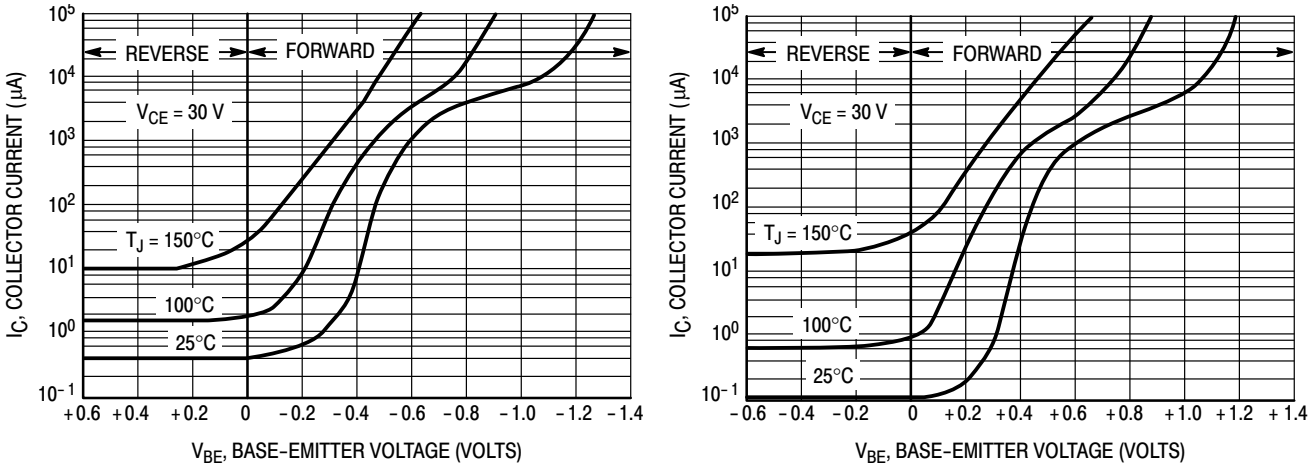


Figure 13. Collector Cut−Off Region

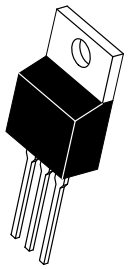
Figure 14. Darlington Schematic

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

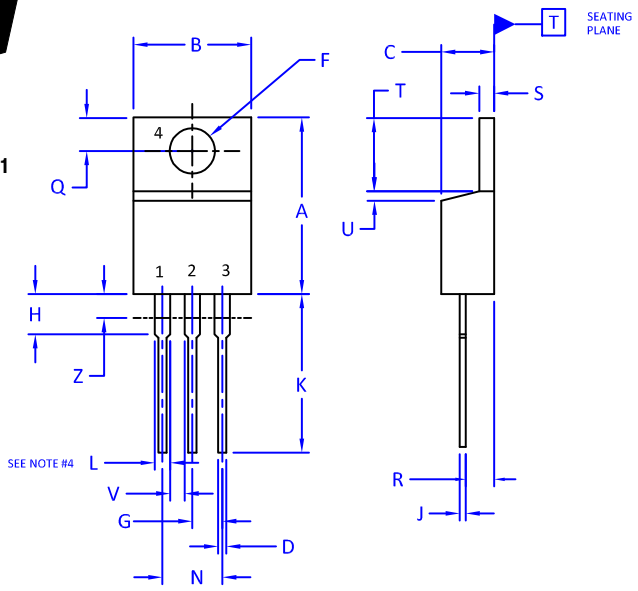
ON Semiconductor®

TO−220
CASE 221A−09
ISSUE AJ

DATE 05 NOV 2019



SCALE 1:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	----	1.15	---
Z	----	0.080	---	2.04

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

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

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

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

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

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

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