

Darlington Complementary Silicon Power Transistors

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

These devices are designed for general purpose and low speed switching applications.

Features

- High DC Current Gain – $h_{FE} = 2500$ (typ.) at $I_C = 4.0$
- Collector–Emitter Sustaining Voltage at 100 mAdc
 $V_{CEO(sus)} = 80$ Vdc (min) – BDX33B, BDX334B
 $= 100$ Vdc (min) – BDX33C, BDX334C
- Low Collector–Emitter Saturation Voltage
 $V_{CE(sat)} = 2.5$ Vdc (max) at $I_C = 3.0$ Adc
 – BDX33B, 33C/34B, 34C
- Monolithic Construction with Build–In Base–Emitter Shunt Resistors
- These Devices are Pb–Free and are RoHS Compliant*

MAXIMUM RATINGS

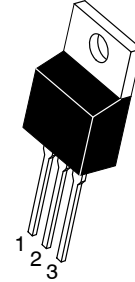
Rating	Symbol	Value	Unit
Collector–Emitter Voltage BDX33B, BDX34B BDX33C, BDX34C	V_{CEO}	80 100	Vdc
Collector–Base Voltage BDX33B, BDX34B BDX33C, BDX34C	V_{CB}	80 100	Vdc
Emitter–Base Voltage	V_{EB}	5.0	Vdc
Collector Current Continuous Peak	I_C	10 15	Adc
Base Current	I_B	0.25	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	70 0.56	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150	$^\circ\text{C}$

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

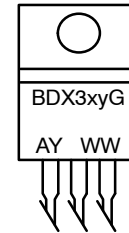
Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	1.78	$^\circ\text{C}/\text{W}$

DARLINGTON 10 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 80–100 VOLTS, 65 WATTS



**TO-220
CASE 221A
STYLE 1**

MARKING DIAGRAM



BDX3xy = Device Code
 x = 3 or 4
 y = B or C
 A = Assembly Location
 Y = Year
 WW = Work Week
 G = Pb–Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

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

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

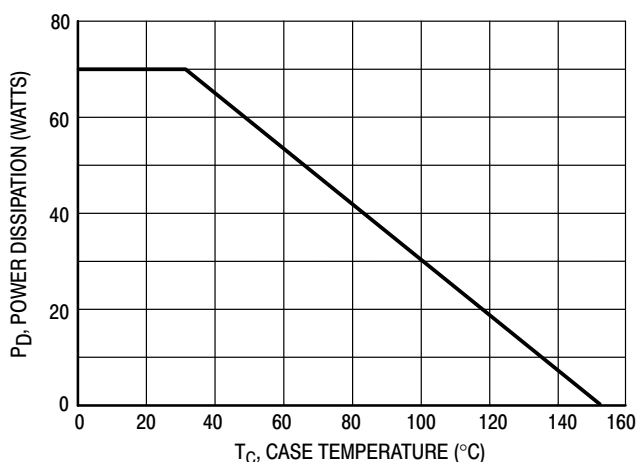


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$)	BDX33B/BDX34B BDX33C/BDX34C	$V_{CEO(sus)}$	80 100	- -	Vdc
Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$, $R_{BE} = 100$)	BDX33B/BDX34B BDX33C/BDX33C	$V_{CER(sus)}$	80 100	- -	Vdc
Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$, $V_{BE} = 1.5\text{ Vdc}$)	BDX33B/BDX34B BDX33C/BDX34C	$V_{CEX(sus)}$	80 100	- -	Vdc
Collector Cutoff Current ($V_{CE} = 1/2$ rated V_{CEO} , $I_B = 0$)	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_{CEO}	- -	0.5 10	mAdc
Collector Cutoff Current ($V_{CB} =$ rated V_{CBO} , $I_E = 0$)	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_{CBO}	- -	1.0 5.0	mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)		I_{EBO}	-	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (Note 1) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	BDX33B, 33C/34B, 34C	h_{FE}	750	-	-
Collector-Emitter Saturation Voltage ($I_C = 3.0\text{ Adc}$, $I_B = 6.0\text{ mAdc}$)	BDX33B, 33C/34B, 34C	$V_{CE(sat)}$	-	2.5	Vdc
Base-Emitter On Voltage ($I_C = 3.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	BDX33B, 33C/34B, 34C	$V_{BE(on)}$	-	2.5	Vdc
Diode Forward Voltage ($I_C = 8.0\text{ Adc}$)		V_F	-	4.0	Vdc

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 $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.
2. Pulse Test non repetitive: Pulse Width = 0.25 seconds.

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

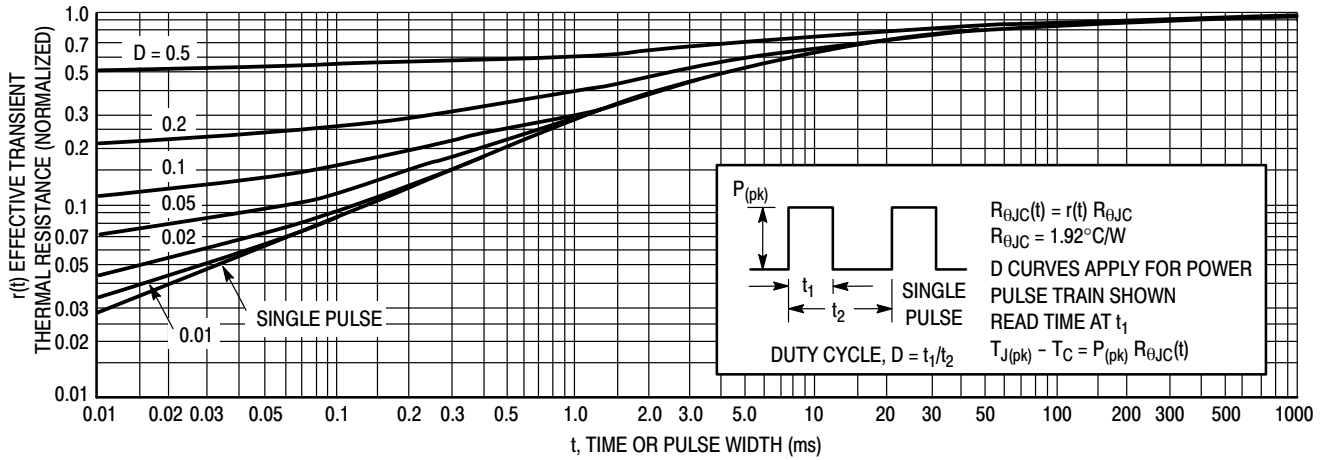


Figure 1. Thermal Response

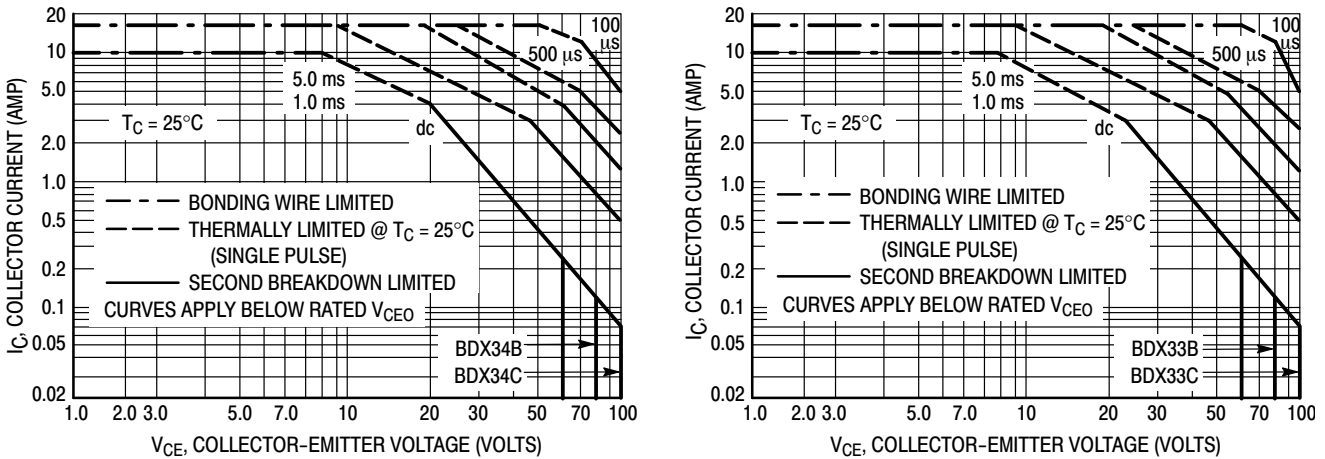


Figure 2. Active-Region Safe Operating Area

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 3 is based on

$T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} = 150^\circ\text{C}$. $T_{J(pk)}$ 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.

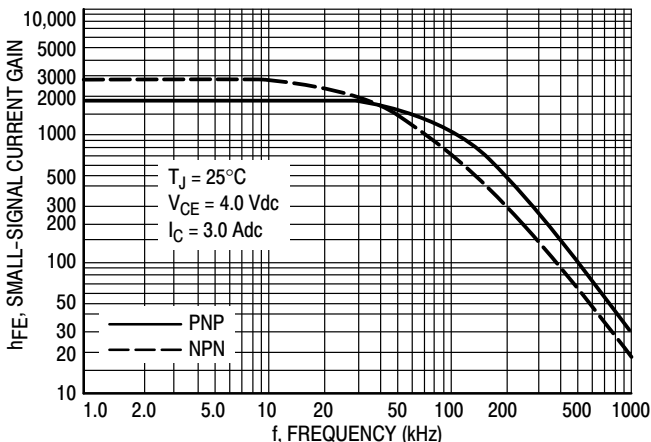


Figure 3. Small-Signal Current Gain

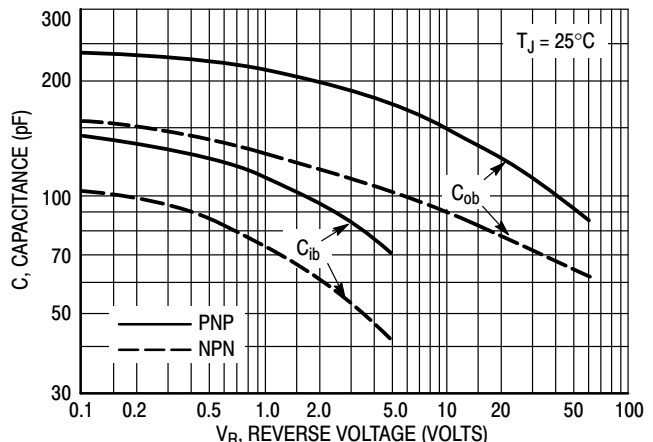


Figure 4. Capacitance

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

NPN
BDX33B, 33C

PNP
BDX34B, 34C

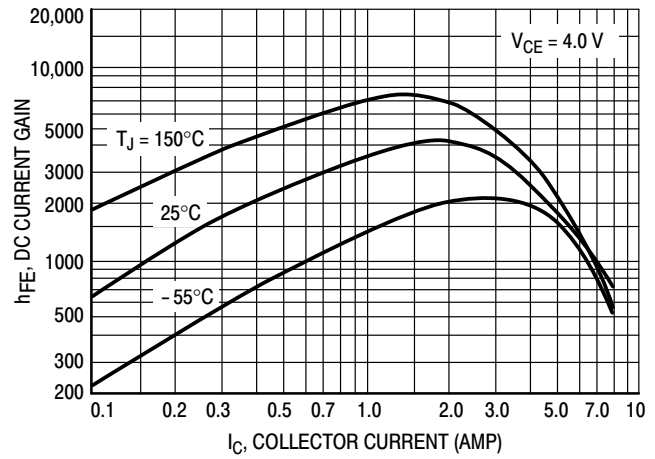
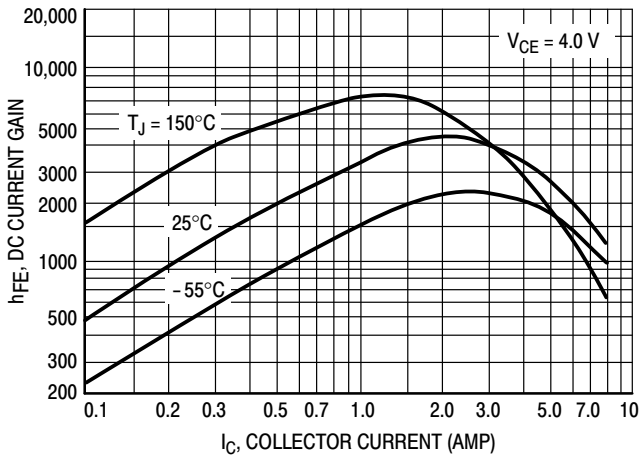


Figure 5. DC Current Gain

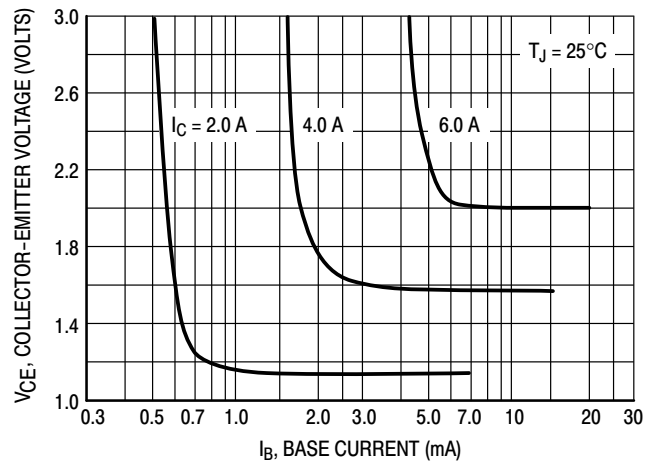
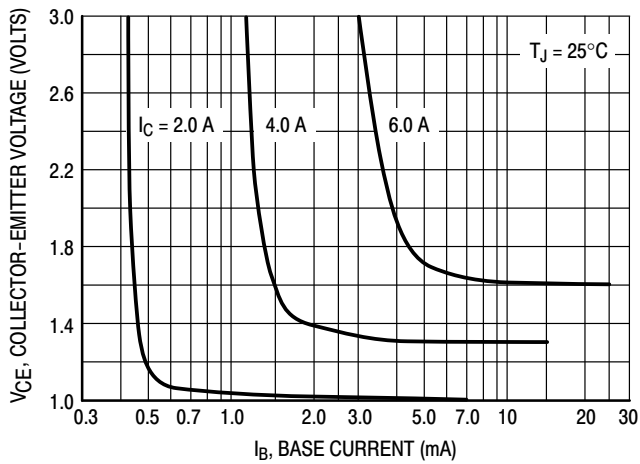


Figure 6. Collector Saturation Region

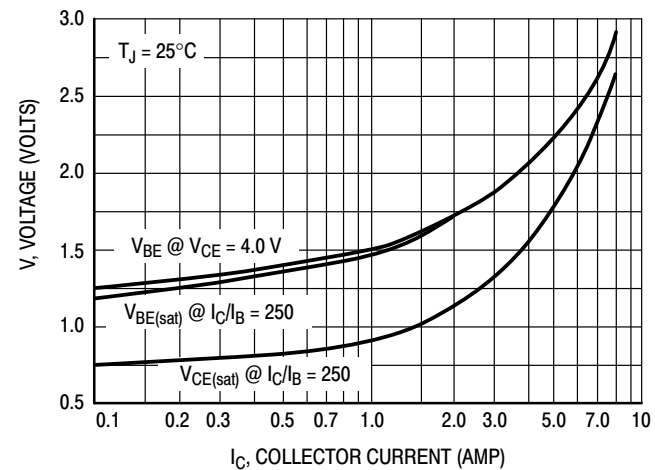
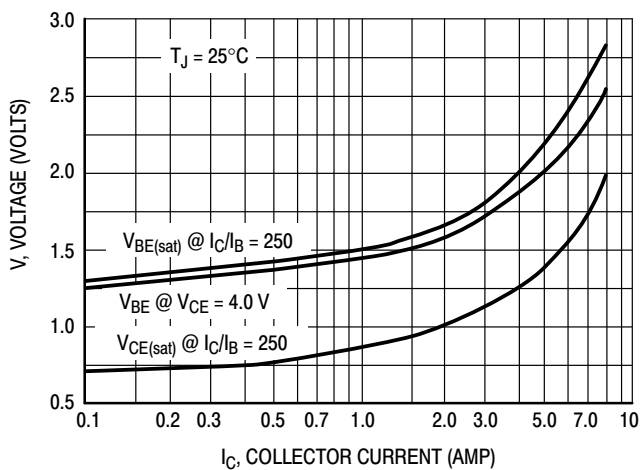


Figure 7. "On" Voltages

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

ORDERING INFORMATION

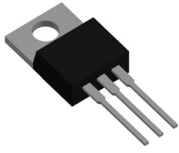
Device	Package	Shipping†
BDX33BG	TO-220 (Pb-Free)	50 Units / Rail
BDX33CG	TO-220 (Pb-Free)	50 Units / Rail

DISCONTINUED (Note NO TAG)

BDX34BG	TO-220 (Pb-Free)	50 Units / Rail
BDX34CG	TO-220 (Pb-Free)	50 Units / Rail

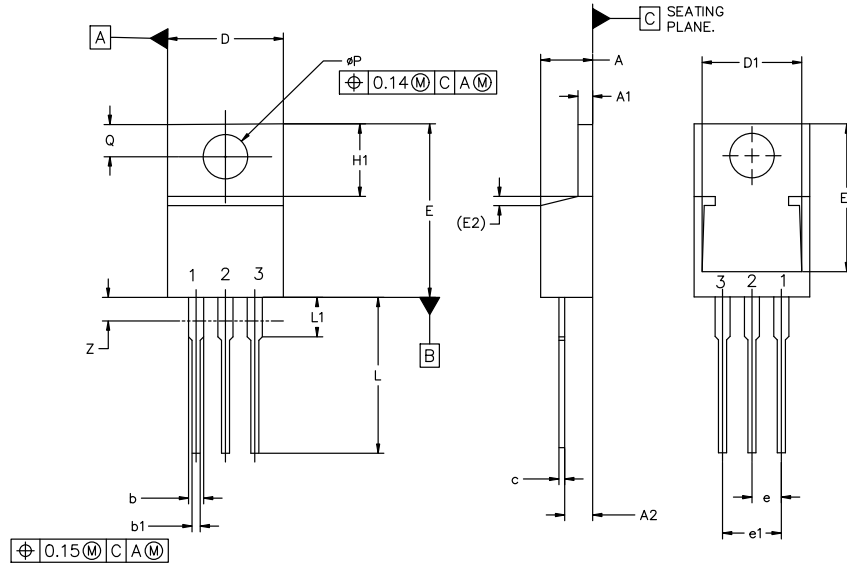
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

3. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



TO-220-3 10.10x15.12x4.45, 2.54P
CASE 221A
ISSUE AL

DATE 05 FEB 2025



MILLIMETERS			
DIM	MIN	NOM	MAX
A	4.07	4.45	4.83
A1	1.15	1.28	1.41
A2	2.04	2.42	2.79
b	1.15	1.34	1.52
b1	0.64	0.80	0.96
c	0.36	0.49	0.61
D	9.66	10.10	10.53
D1	8.43	8.63	8.83
E	14.48	15.12	15.75
E1	12.58	12.78	12.98
E2	1.27 REF		

MILLIMETERS			
DIM	MIN	NOM	MAX
e	2.42	2.54	2.66
e1	4.83	5.08	5.33
H1	5.97	6.22	6.47
L	12.70	13.49	14.27
L1	2.80	3.45	4.10
Q	2.54	2.79	3.04
φP	3.60	3.85	4.09
Z	---	---	3.48

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

- | | | | |
|--|--|---|--|
| <p>STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. EMITTER</p> | <p>STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE</p> | <p>STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2</p> |
| <p>STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN</p> | <p>STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE</p> | <p>STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE</p> | <p>STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE</p> |
| <p>STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE</p> | <p>STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE</p> | <p>STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED</p> |

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