PNP - 2N6040, 2N6042,
NPN - 2N6043, 2N6045

Plastic Medium-Power Complementary Silicon Transistors

Plastic medium−power complementary silicon transistors are designed for general−purpose amplifier and low−speed switching applications.

Features

- High DC Current Gain − h_{FE} = 2500 (Typ) @ I_C = 4.0 Adc
- Collector−Emitter Sustaining Voltage − @ 100 mAdc −
  $V_{CEO(sus)}$ = 60 Vdc (Min) − 2N6040, 2N6043
  = 100 Vdc (Min) − 2N6042, 2N6045
- Low Collector−Emitter Saturation Voltage −
  $V_{CE(sat)}$ = 2.0 Vdc (Max) @ I_C = 4.0 Adc − 2N6043,44
  = 2.0 Vdc (Max) @ I_C = 3.0 Adc − 2N6042, 2N6045
- Monolithic Construction with Built−In Base−Emitter Shunt Resistors
- Epoxy Meets UL 94 V−0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
  Machine Model, C > 400 V
- These Devices are Pb−Free and are RoHS Compliant*

MAXIMUM RATINGS (Note 1)

Rating		Symbol	Value	Unit
Collector−Emitter Voltage	2N6040 2N6043 2N6042 2N6045	V_{CEO}	60 100	Vdc
Collector−Base Voltage	2N6040 2N6043 2N6042 2N6045	V_{CB}	60 100	Vdc
Emitter−Base Voltage		V_{EB}	5.0	Vdc
Collector Current	Continuous Peak	I_C	8.0 16	Adc
Base Current		I_B	120	mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C		P_D	75 0.60	W W/°C
Operating and Storage Junction Temperature Range		T_J, T_{stg}	−65 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.

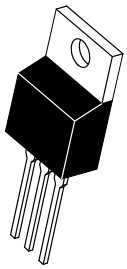
1. Indicates JEDEC Registered Data.

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

ON Semiconductor®

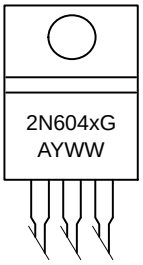
www.onsemi.com

DARLINGTON, 8 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 60 − 100 VOLTS, 75 WATTS



TO−220
CASE 221A
STYLE 1

MARKING DIAGRAM



2N604x = Device Code
x = 0, 2, 3, or 5
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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	θ_{JC}	1.67	°C/W
Thermal Resistance, Junction−to−Ambient	θ_{JA}	57	°C/W

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	2N6040, 2N6043 2N6042, 2N6045	$V_{CEO(sus)}$	 60 100	 – –	Vdc
Collector Cutoff Current (V_{CE} = 60 Vdc, I_B = 0) (V_{CE} = 100 Vdc, I_B = 0)	 2N6040, 2N6043 2N6042, 2N6045	I_{CEO}	 – –	 20 20	μA
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc) (V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc) (V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C) (V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C) (V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)	 2N6040, 2N6043 2N6042, 2N6045 2N6040, 2N6043 2N6041, 2N6044 2N6042, 2N6045	I_{CEX}	 – – – – –	 20 20 200 200 200	μA
Collector Cutoff Current (V_{CB} = 60 Vdc, I_E = 0) (V_{CB} = 100 Vdc, I_E = 0)	 2N6040, 2N6043 2N6042, 2N6045	I_{CBO}	 – –	 20 20	μA
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 4.0 Adc, V_{CE} = 4.0 Vdc) (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc) (I_C = 8.0 Adc, V_{CE} = 4.0 Vdc)	 2N6040, 2N6043, 2N6042, 2N6045 All Types	h_{FE}	 1000 1000 100	 20.000 20,000 –	–
Collector−Emitter Saturation Voltage (I_C = 4.0 Adc, I_B = 16 mAdc) (I_C = 3.0 Adc, I_B = 12 mAdc) (I_C = 8.0 Adc, I_B = 80 Adc)	 2N6040, 2N6043, 2N6042, 2N6045 All Types	$V_{CE(sat)}$	 – – –	 2.0 2.0 4.0	Vdc
Base−Emitter Saturation Voltage (I_C = 8.0 Adc, I_B = 80 mAdc)		$V_{BE(sat)}$	–	4.5	Vdc
Base−Emitter On Voltage (I_C = 4.0 Adc, V_{CE} = 4.0 Vdc)		$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS					
Small Signal Current Gain (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 MHz)		$\|h_{fe}\|$	4.0	–	
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	2N6040/2N6042 2N6043/2N6045	C_{ob}	– –	300 200	pF
Small−Signal Current Gain (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 kHz)		h_{fe}	300	–	–

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.
*Indicates JEDEC Registered Data.

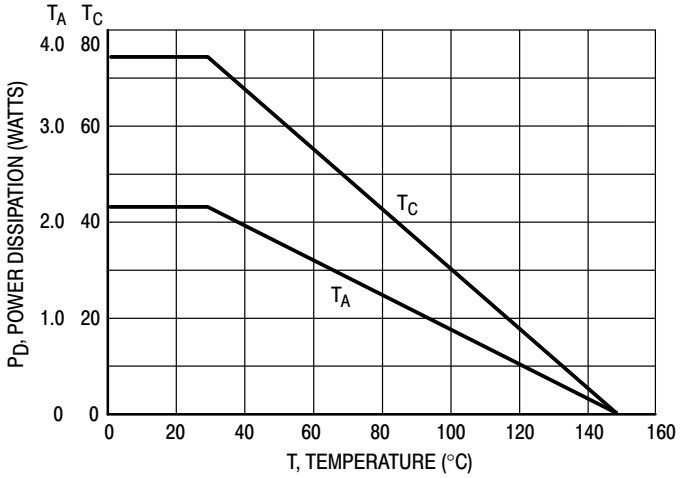


Figure 1. Power Derating

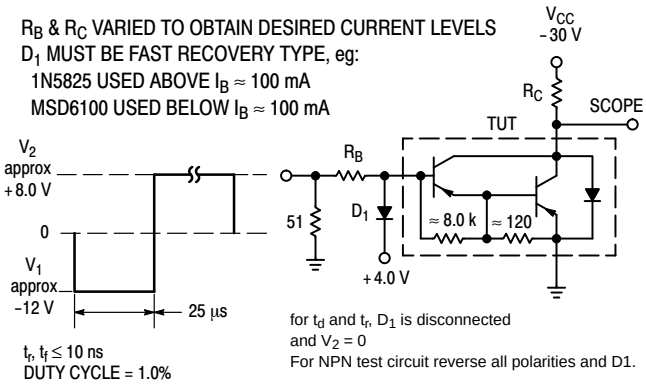


Figure 2. Switching Times Equivalent Circuit

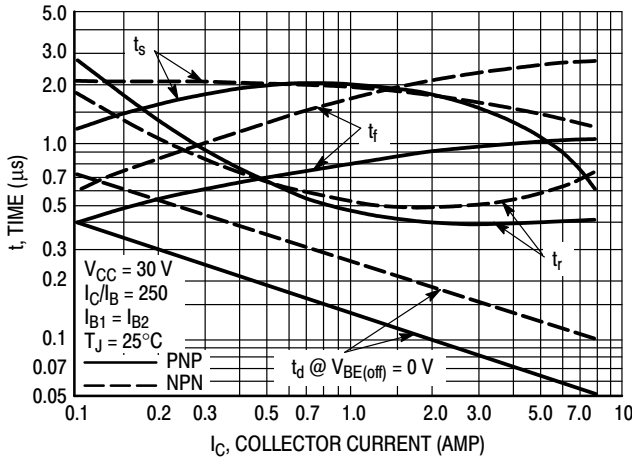


Figure 3. Switching Times

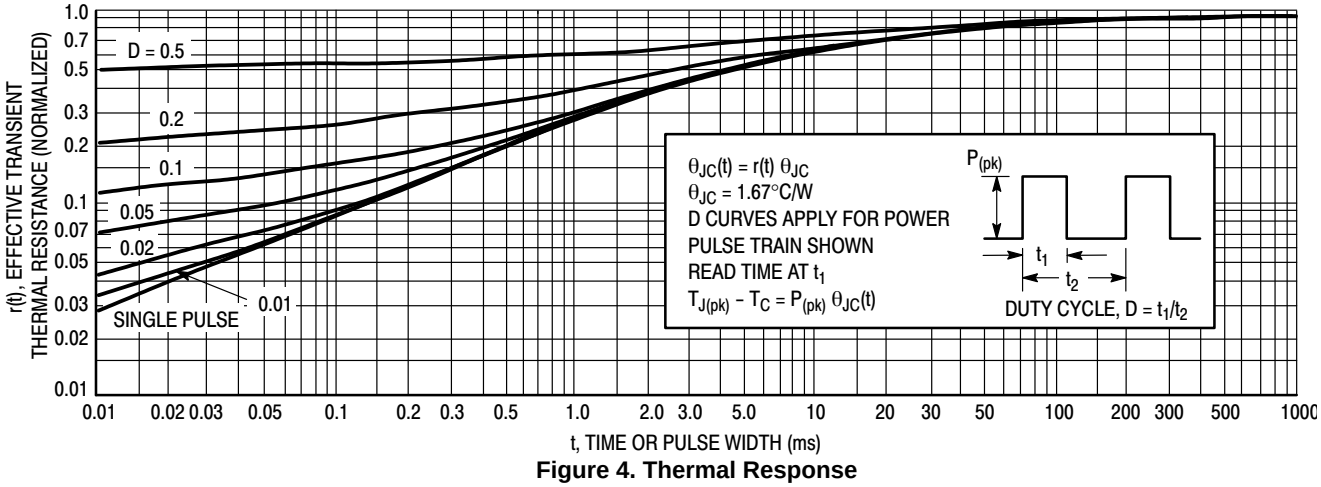


Figure 4. Thermal Response

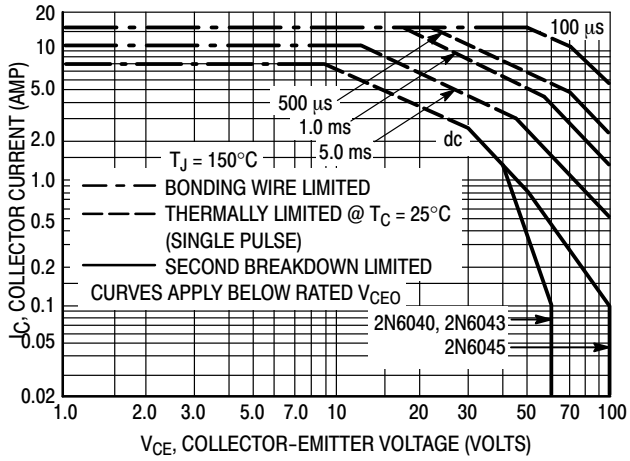


Figure 5. Active−Region Safe Operating Area

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

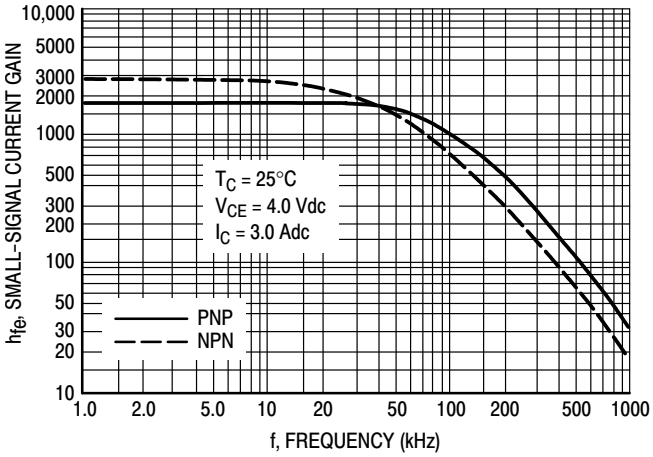


Figure 6. Small−Signal Current Gain

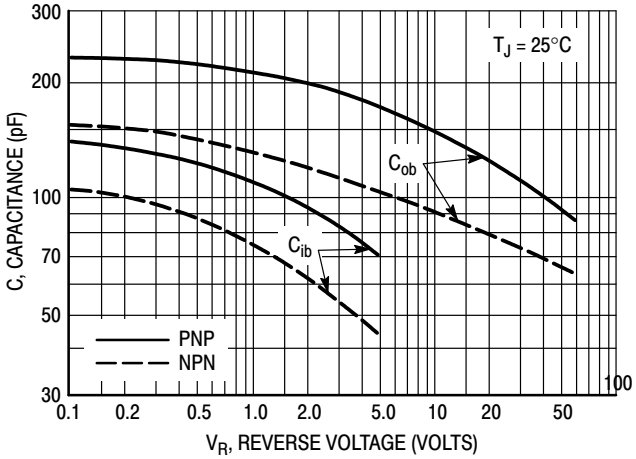


Figure 7. Capacitance

PNP
2N6040, 2N6042

NPN
2N6043, 2N6045

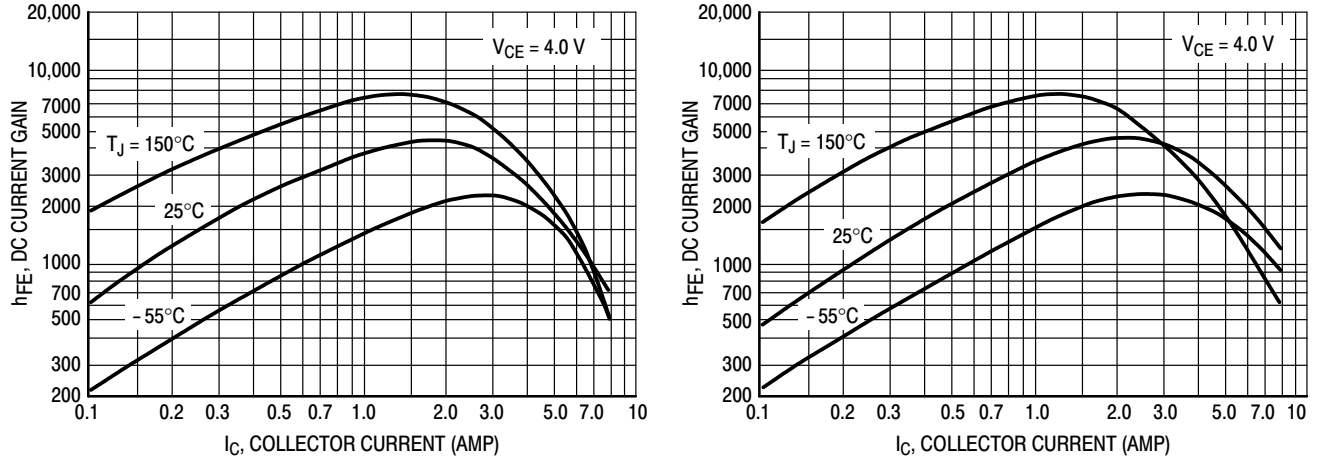


Figure 8. DC Current Gain

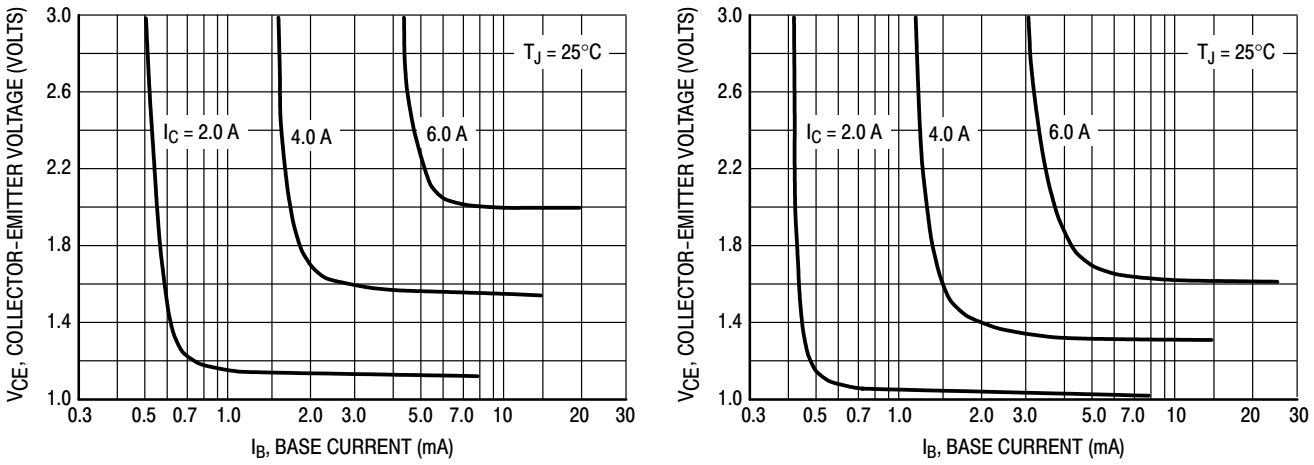


Figure 9. Collector Saturation Region

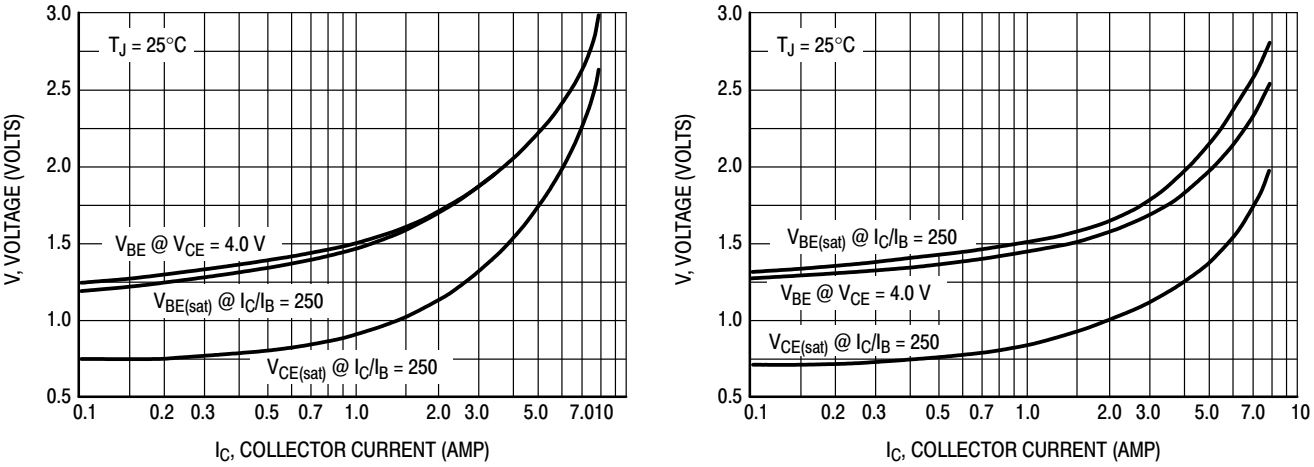


Figure 10. “On” Voltages

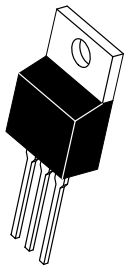
ORDERING INFORMATION

Device	Package	Shipping
2N6040G	TO−220 (Pb−Free)	50 Units / Rail
2N6042G	TO−220 (Pb−Free)	50 Units / Rail
2N6043G	TO−220 (Pb−Free)	50 Units / Rail
2N6045G	TO−220 (Pb−Free)	50 Units / Rail

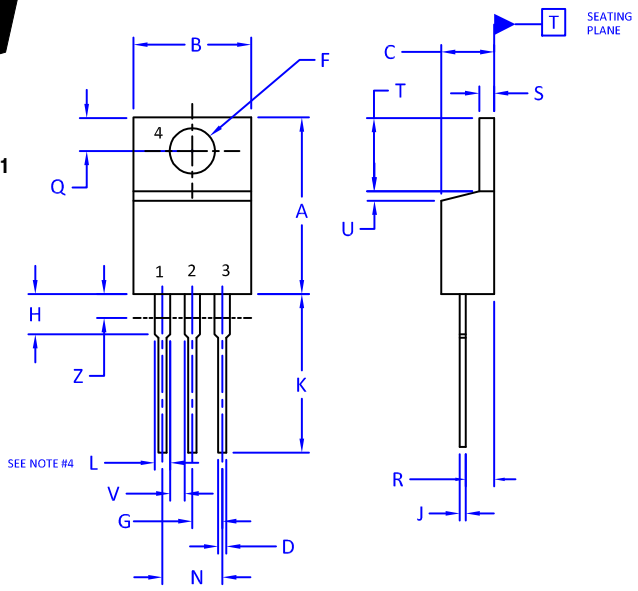
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

TO−220
CASE 221A
ISSUE AK

DATE 13 JAN 2022



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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DESCRIPTION:	**TO−220**	**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

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onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
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