

NTGS3433T1

MOSFET – P-Channel, TSOP-6

-3.3 A, -12 V

Features

- Ultra Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package
- Pb-Free Package is Available

Applications

- Power Management in Portable and Battery-Powered Products, i.e.: Cellular and Cordless Telephones, and PCMCIA Cards

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted.)

| Rating | Symbol | Value | Unit |
|---|-----------------|------------|--------------------|
| Drain-to-Source Voltage | V_{DSS} | -12 | Volts |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 8.0 | Volts |
| Thermal Resistance Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_d | 2.0 | Watts |
| Drain Current | I_D | -3.3 | Amps |
| – Continuous @ $T_A = 25^\circ\text{C}$ | I_{DM} | -20 | Amps |
| – Pulsed Drain Current ($T_p < 10 \mu\text{s}$) | P_d | 1.0 | Watts |
| Maximum Operating Power Dissipation | I_D | -2.35 | Amps |
| Maximum Operating Drain Current | | | |
| Thermal Resistance Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 128 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_d | 1.0 | Watts |
| Drain Current | I_D | -2.35 | Amps |
| – Continuous @ $T_A = 25^\circ\text{C}$ | I_{DM} | -14 | Amps |
| – Pulsed Drain Current ($T_p < 10 \mu\text{s}$) | P_d | 0.5 | Watts |
| Maximum Operating Power Dissipation | I_D | -1.65 | Amps |
| Maximum Operating Drain Current | | | |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | $^\circ\text{C}$ |
| Maximum Lead Temperature for Soldering Purposes for 10 Seconds | T_L | 260 | $^\circ\text{C}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

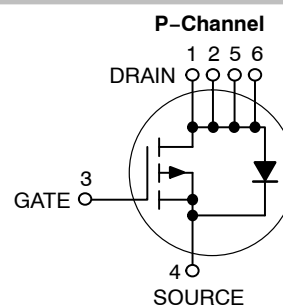
1. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu 0.06" thick single sided), $t < 5.0$ seconds.
2. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu 0.06" thick single sided), operating to steady state.



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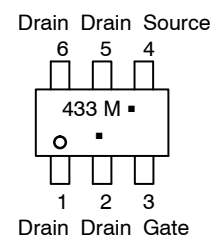
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D Max |
|---------------|------------------------|-----------|
| -12 V | 75 m Ω @ -4.5 V | -3.3 A |



MARKING DIAGRAM & PIN ASSIGNMENT



**TSOP-6
CASE 318G
STYLE 1**



433 = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|---------------------|------------------|
| NTGS3433T1 | TSOP-6 | 3000 Tape & Reel |
| NTGS3433T1G | TSOP-6 (Pb-Free) | 3000 Tape & Reel |

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

NTGS3433T1

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Notes 3 & 4)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|-----|---|--------------|-----------------|
| Drain-Source Breakdown Voltage ($V_{GS} = 0 \text{ Vdc}$, $I_D = -10 \mu\text{A}$) | $V_{(BR)DSS}$ | -12 | - | - | Vdc |
| Zero Gate Voltage Drain Current ($V_{GS} = 0 \text{ Vdc}$, $V_{DS} = -8 \text{ Vdc}$, $T_J = 25^\circ\text{C}$) ($V_{GS} = 0 \text{ Vdc}$, $V_{DS} = -8 \text{ Vdc}$, $T_J = 70^\circ\text{C}$) | I_{DSS} | - | - | -1.0 -5.0 | μAdc |
| Gate-Body Leakage Current ($V_{GS} = -8.0 \text{ Vdc}$, $V_{DS} = 0 \text{ Vdc}$) | I_{GSS} | - | - | -100 | nAdc |
| Gate-Body Leakage Current ($V_{GS} = +8.0 \text{ Vdc}$, $V_{DS} = 0 \text{ Vdc}$) | I_{GSS} | - | - | 100 | nAdc |

ON CHARACTERISTICS

| | | | | | |
|---|--------------|-------|----------------|----------------|----------|
| Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = -250 \mu\text{Adc}$) | $V_{GS(th)}$ | -0.50 | -0.70 | -1.50 | Vdc |
| Static Drain-Source On-State Resistance ($V_{GS} = -4.5 \text{ Vdc}$, $I_D = -3.3 \text{ Adc}$) ($V_{GS} = -2.5 \text{ Vdc}$, $I_D = -2.9 \text{ Adc}$) | $R_{DS(on)}$ | - | 0.055 0.075 | 0.075 0.095 | Ω |
| Forward Transconductance ($V_{DS} = -10 \text{ Vdc}$, $I_D = -3.3 \text{ Adc}$) | g_{FS} | - | 7.0 | - | mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|-----------|---|-----|----|----|
| Total Gate Charge | ($V_{DS} = -10 \text{ Vdc}$, $V_{GS} = -4.5 \text{ Vdc}$, $I_D = -3.3 \text{ Adc}$) | Q_{tot} | - | 7.0 | 15 | nC |
| Gate-Source Charge | | Q_{gs} | - | 2.0 | - | |
| Gate-Drain Charge | | Q_{gd} | - | 3.5 | - | |
| Input Capacitance | ($V_{DS} = -5.0 \text{ Vdc}$, $V_{GS} = 0 \text{ Vdc}$, $f = 1.0 \text{ MHz}$) | C_{iss} | - | 550 | - | pF |
| Output Capacitance | | C_{oss} | - | 450 | - | |
| Reverse Transfer Capacitance | | C_{rss} | - | 200 | - | |

SWITCHING CHARACTERISTICS

| | | | | | | |
|-----------------------|---|--------------|---|-----|-----|----|
| Turn-On Delay Time | ($V_{DD} = -10 \text{ Vdc}$, $I_D = -1.0 \text{ Adc}$, $V_{GS} = -4.5 \text{ Vdc}$, $R_g = 6.0 \Omega$) | $t_{d(on)}$ | - | 20 | 30 | ns |
| Rise Time | | t_r | - | 20 | 30 | |
| Turn-Off Delay Time | | $t_{d(off)}$ | - | 110 | 120 | |
| Fall Time | | t_f | - | 100 | 115 | |
| Reverse Recovery Time | ($I_S = -1.7 \text{ Adc}$, $di_S/dt = 100 \text{ A}/\mu\text{s}$) | t_{rr} | - | 30 | - | ns |

BODY-DRAIN DIODE RATINGS

| | | | | | | |
|--------------------------|---|----------|---|-------|------|-----|
| Diode Forward On-Voltage | ($I_S = -1.7 \text{ Adc}$, $V_{GS} = 0 \text{ Vdc}$) | V_{SD} | - | -0.80 | -1.5 | Vdc |
| Diode Forward On-Voltage | ($I_S = -3.3 \text{ Adc}$, $V_{GS} = 0 \text{ Vdc}$) | V_{SD} | - | -0.90 | - | Vdc |

3. Indicates Pulse Test: P.W. = 300 μsec max, Duty Cycle = 2%.

4. Class 1 ESD rated - Handling precautions to protect against electrostatic discharge are mandatory.

NTGS3433T1

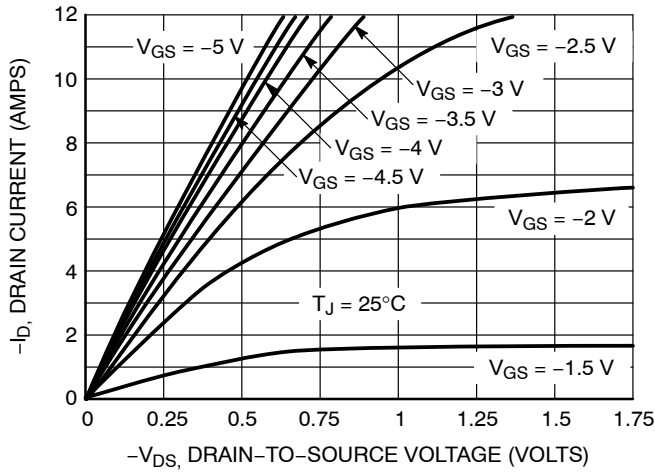


Figure 1. On-Region Characteristics

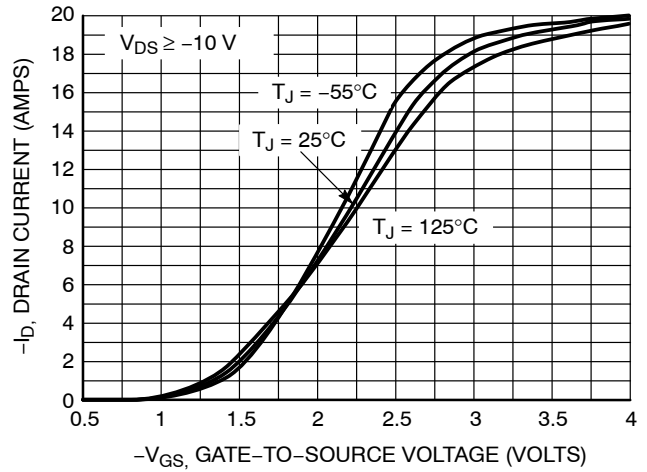


Figure 2. Transfer Characteristics

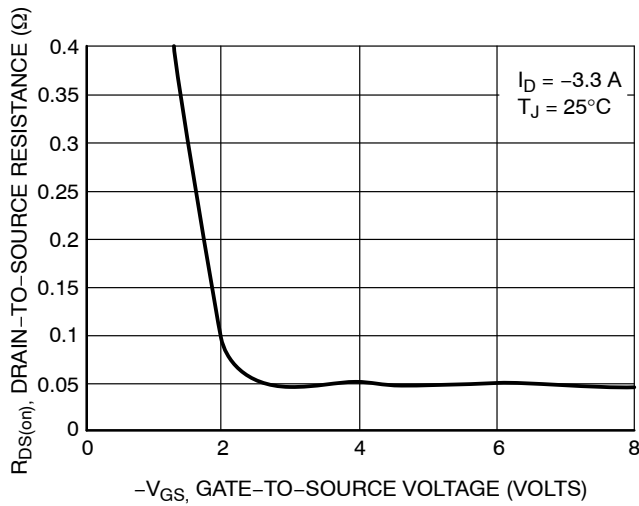


Figure 3. On-Resistance vs. Gate-to-Source Voltage

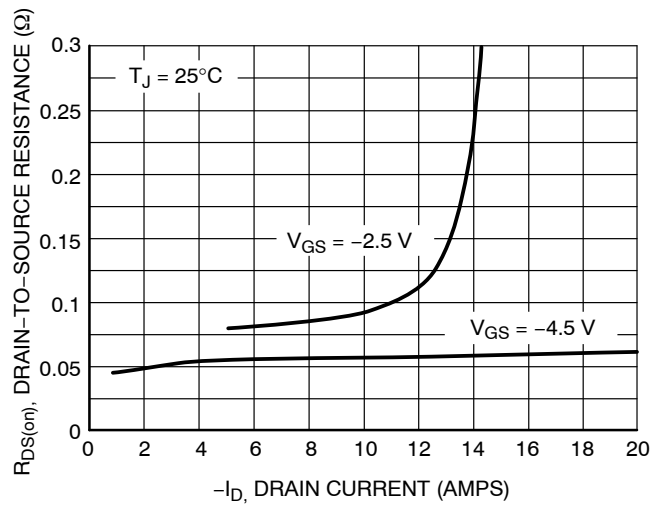


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

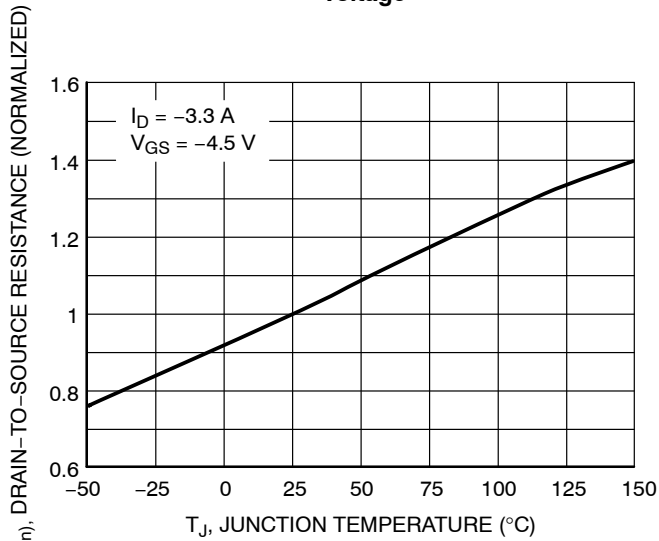


Figure 5. On-Resistance Variation with Temperature

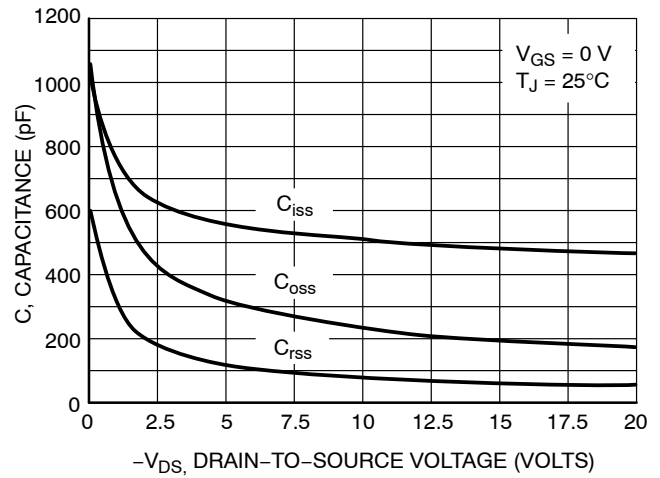


Figure 6. Capacitance Variation

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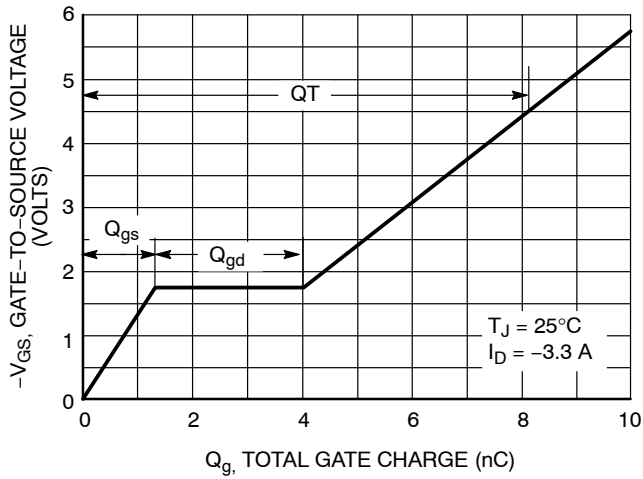


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

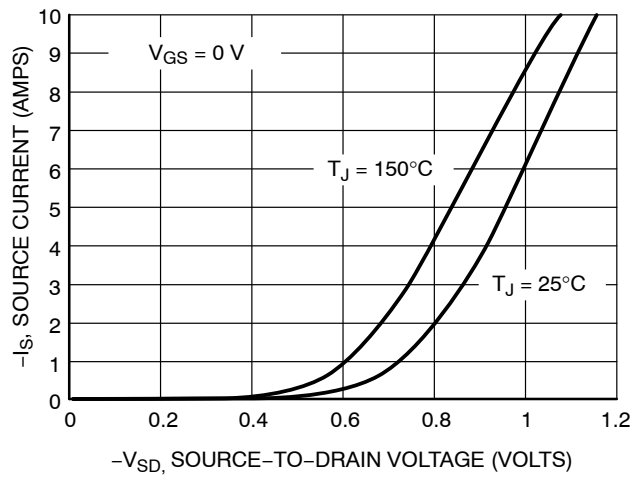


Figure 8. Diode Forward Voltage vs. Current

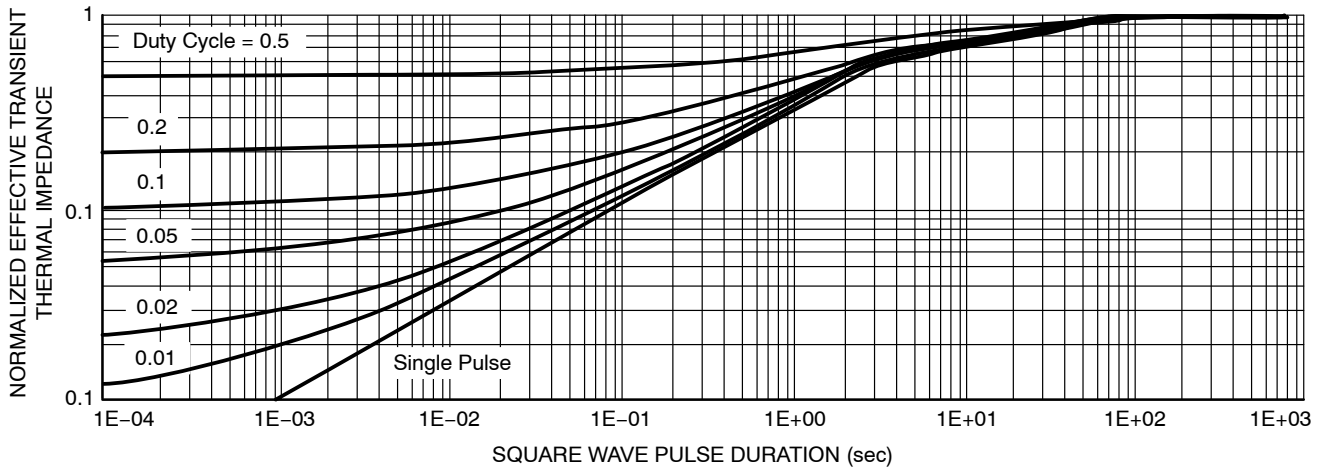


Figure 9. Normalized Thermal Transient Impedance, Junction-to-Ambient

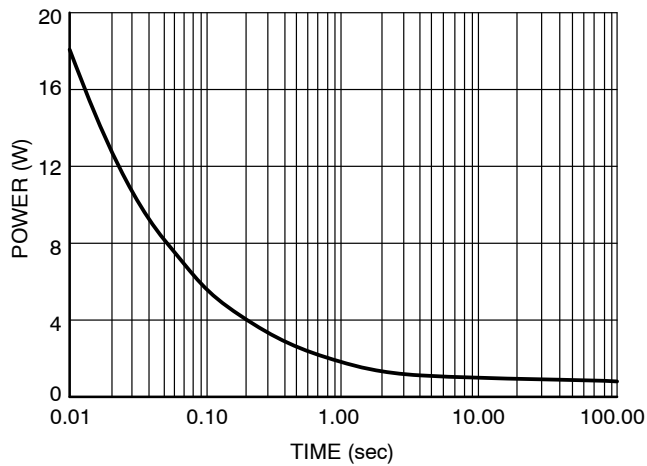


Figure 10. Single Pulse Power

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

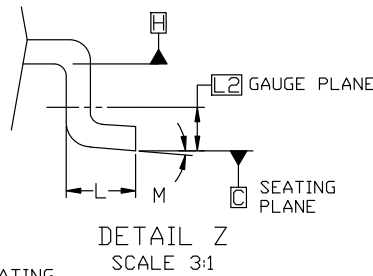
DATE 26 FEB 2024



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
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 E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN 1 INDICATOR MUST BE LOCATED IN THE INDICATED ZONE

| MILLIMETERS | | | |
|-------------|----------|------|------|
| DIM | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.01 | 0.06 | 0.10 |
| A2 | 0.80 | 0.90 | 1.00 |
| b | 0.25 | 0.38 | 0.50 |
| c | 0.10 | 0.18 | 0.26 |
| D | 2.90 | 3.00 | 3.10 |
| E | 2.50 | 2.75 | 3.00 |
| E1 | 1.30 | 1.50 | 1.70 |
| e | 0.85 | 0.95 | 1.05 |
| L | 0.20 | 0.40 | 0.60 |
| L2 | 0.25 BSC | | |
| M | 0° | --- | 10° |



*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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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

DATE 26 FEB 2024

GENERIC MARKING DIAGRAM*



IC



STANDARD

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb-Free Package

XXX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*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.

- | | | | | | |
|--|--|---|---|---|--|
| <p>STYLE 1: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN</p> | <p>STYLE 2: PIN 1. EMITTER 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. BASE 2 6. COLLECTOR 2</p> | <p>STYLE 3: PIN 1. ENABLE 2. N/C 3. R BOOST 4. Vz 5. V in 6. V out</p> | <p>STYLE 4: PIN 1. N/C 2. V in 3. NOT USED 4. GROUND 5. ENABLE 6. LOAD</p> | <p>STYLE 5: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2</p> | <p>STYLE 6: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR</p> |
| <p>STYLE 7: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. N/C 5. COLLECTOR 6. EMITTER</p> | <p>STYLE 8: PIN 1. Vbus 2. D(in) 3. D(in)+ 4. D(out)+ 5. D(out) 6. GND</p> | <p>STYLE 9: PIN 1. LOW VOLTAGE GATE 2. DRAIN 3. SOURCE 4. DRAIN 5. DRAIN 6. HIGH VOLTAGE GATE</p> | <p>STYLE 10: PIN 1. D(OUT)+ 2. GND 3. D(OUT)- 4. D(IN)- 5. VBUS 6. D(IN)+</p> | <p>STYLE 11: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1/GATE 2</p> | <p>STYLE 12: PIN 1. I/O 2. GROUND 3. I/O 4. I/O 5. VCC 6. I/O</p> |
| <p>STYLE 13: PIN 1. GATE 1 2. SOURCE 2 3. GATE 2 4. DRAIN 2 5. SOURCE 1 6. DRAIN 1</p> | <p>STYLE 14: PIN 1. ANODE 2. SOURCE 3. GATE 4. CATHODE/DRAIN 5. CATHODE/DRAIN 6. CATHODE/DRAIN</p> | <p>STYLE 15: PIN 1. ANODE 2. SOURCE 3. GATE 4. DRAIN 5. N/C 6. CATHODE</p> | <p>STYLE 16: PIN 1. ANODE/CATHODE 2. BASE 3. EMITTER 4. COLLECTOR 5. ANODE 6. CATHODE</p> | <p>STYLE 17: PIN 1. EMITTER 2. BASE 3. ANODE/CATHODE 4. ANODE 5. CATHODE 6. COLLECTOR</p> | |

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