

MOSFET - Power, Dual, N-Channel, TSOP-6

20 V, 3.5 A

NTGD3148N

Features

- Low Threshold Levels, $V_{GS(th)} < 1.5$ V
- Low Gate Charge (3.8 nC)
- Leading Edge Trench Technology of Low $R_{DS(on)}$
- High Power and Current Handling Capability
- This is a Pb-Free Device

Applications

- DC-DC Converters (Buck and Boost Circuits)
- Low Side Load Switch
- Optimized for Battery and Load Management Applications in Portable Equipment Like Cell Phones, DSCs, Media Player, Etc
- Battery Charging and Protection Circuits

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	20	V
Gate-to-Source Voltage			V_{GS}	± 12	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	3.0	A
		$T_A = 85^\circ\text{C}$		2.2	
Continuous Drain Current (Note 1)	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	I_D	3.5	A
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	0.9	W
	$t \leq 5$ s			1.1	
Pulsed Drain Current		$t_p = 10$ μs	I_{DM}	10	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-50 to 150	$^\circ\text{C}$
Source Current (Body Diode)			I_S	0.8	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

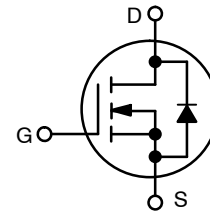
Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	140	$^\circ\text{C/W}$
Junction-to-Ambient – $t \leq 5$ s (Note 1)	$R_{\theta JA}$	110	$^\circ\text{C/W}$

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. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

N-CHANNEL MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	I_D Max
20 V	70 m Ω @ 4.5 V	3.5 A
	100 m Ω @ 2.5 V	

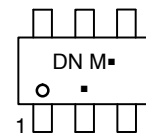


N-CHANNEL MOSFET



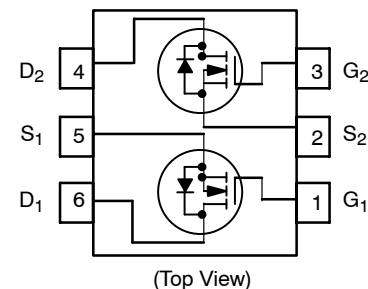
TSOP-6
CASE 318G
STYLE 13

MARKING DIAGRAM



DN = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

PIN CONNECTION



ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NTGD3148N

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\text{ }\mu\text{A}$, Ref to $25\text{ }^{\circ}\text{C}$		12.5		mV/ $^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$	$T_J = 25\text{ }^{\circ}\text{C}$		1.0	μA
			$T_J = 125\text{ }^{\circ}\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	0.5		1.5	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			3.28		mV/ $^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$		41.7	70	m Ω
		$V_{GS} = 2.5\text{ V}, I_D = 2.8\text{ A}$		58	100	
Forward Transconductance	g_{FS}	$V_{DS} = 5.0\text{ V}, I_D = 3.5\text{ A}$		6.2		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 10\text{ V}$		300		pF
Output Capacitance	C_{OSS}			73		
Reverse Transfer Capacitance	C_{RSS}			44		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.5\text{ A}$		3.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.3		
Gate-to-Source Charge	Q_{GS}			0.7		
Gate-to-Drain Charge	Q_{GD}			1.1		
Gate Resistance	R_G			2.8		Ω

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.5\text{ A}, R_G = 3.0\text{ }\Omega$		7.4		ns
Rise Time	t_r			11.2		
Turn-Off Delay Time	$t_{d(OFF)}$			12.8		
Fall Time	t_f			1.6		

DRAIN-TO-SOURCE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_D = 0.8\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$		0.71	V
			$T_J = 125\text{ }^{\circ}\text{C}$		0.57	
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 0.8\text{ A}$		9.0		ns
Charge Time	T_a			5.0		
Discharge Time	T_b			4.0		
Reverse Recovery Time	Q_{RR}			2.5		nC

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.

2. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTGD3148NT1G	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 Specifications Brochure, BRD8011/D.

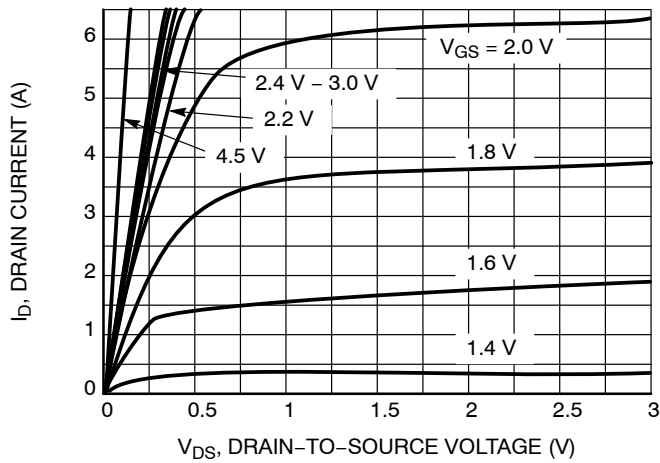


Figure 1. On-Region Characteristics

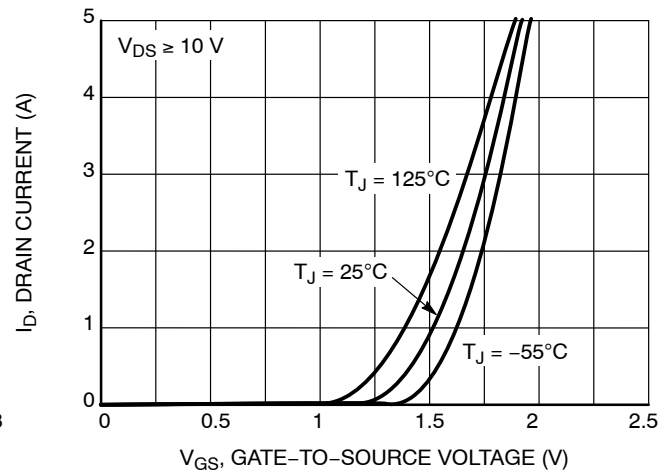


Figure 2. Transfer Characteristics

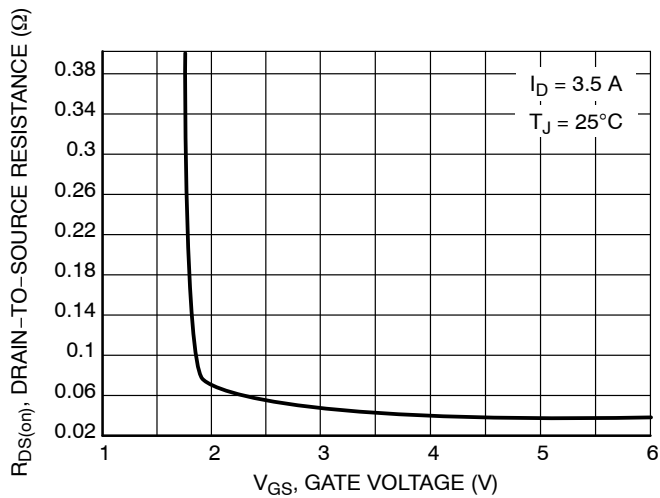


Figure 3. On-Resistance vs. Voltage

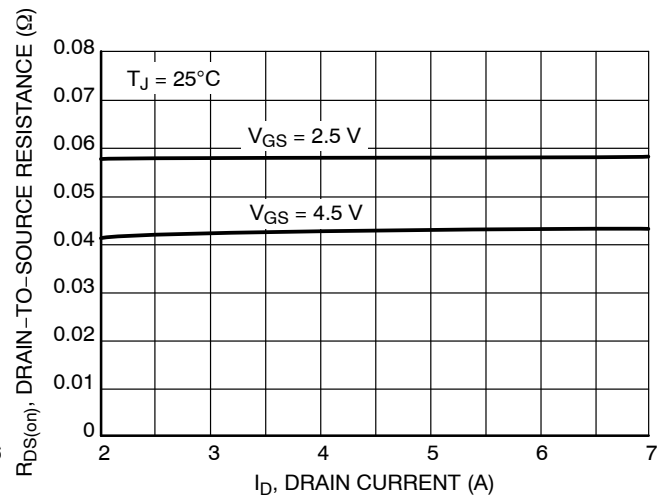


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

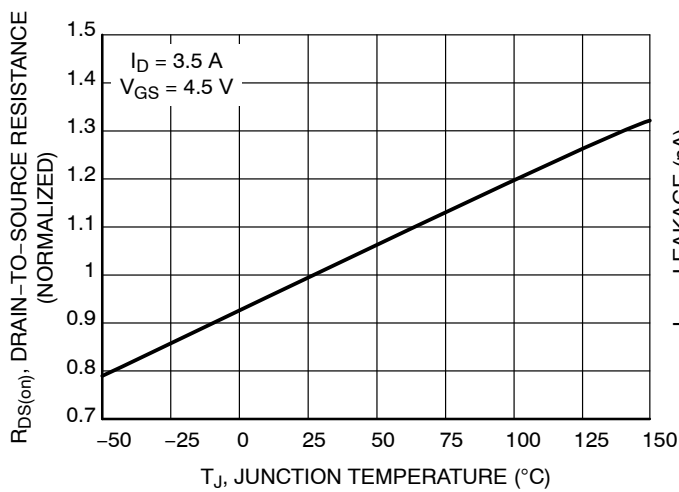


Figure 5. On-Resistance Variation vs. Temperature

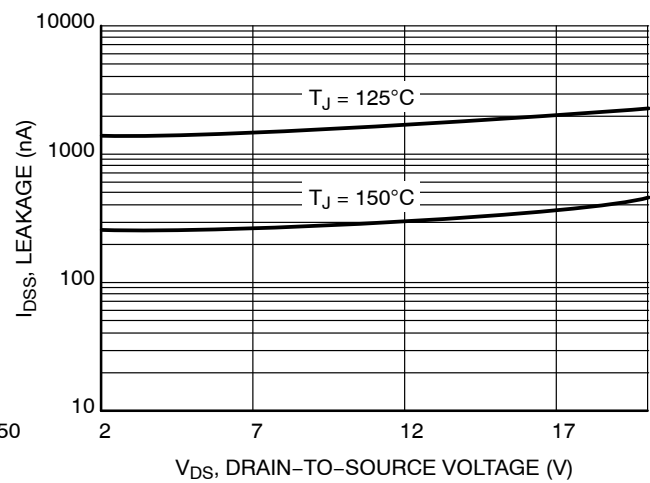


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTGD3148N

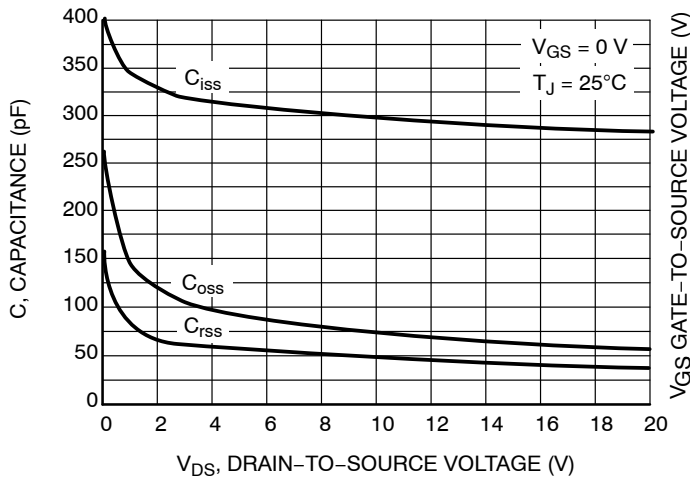


Figure 7. Capacitance Variation

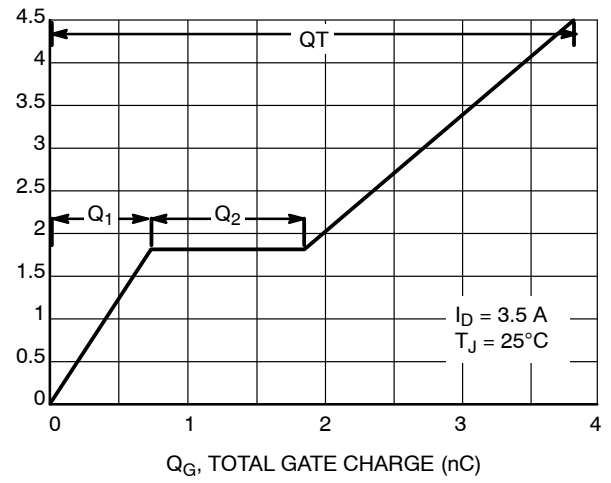


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

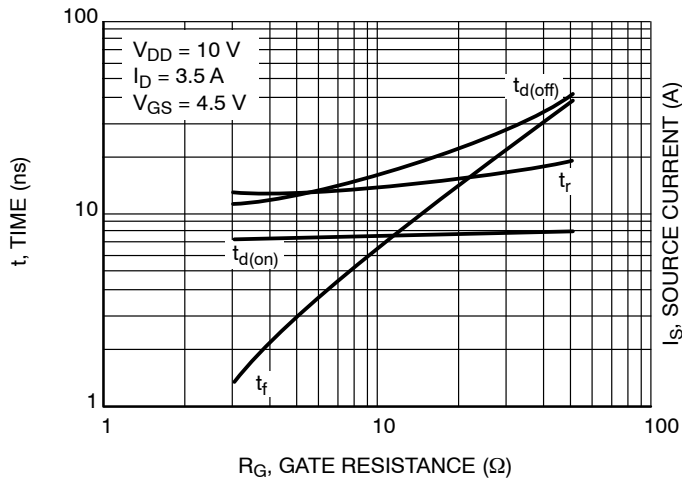


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

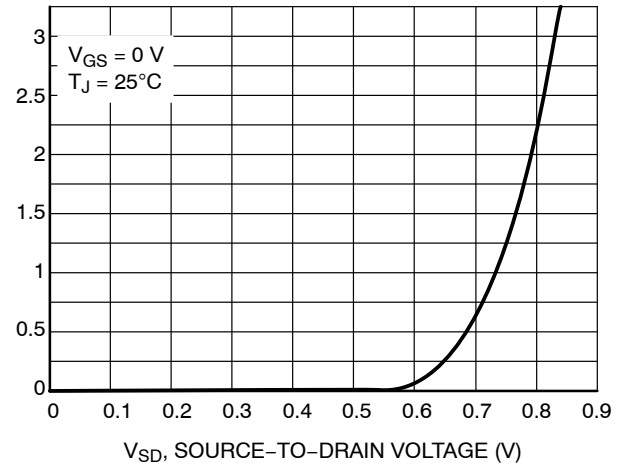
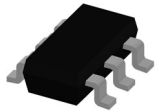
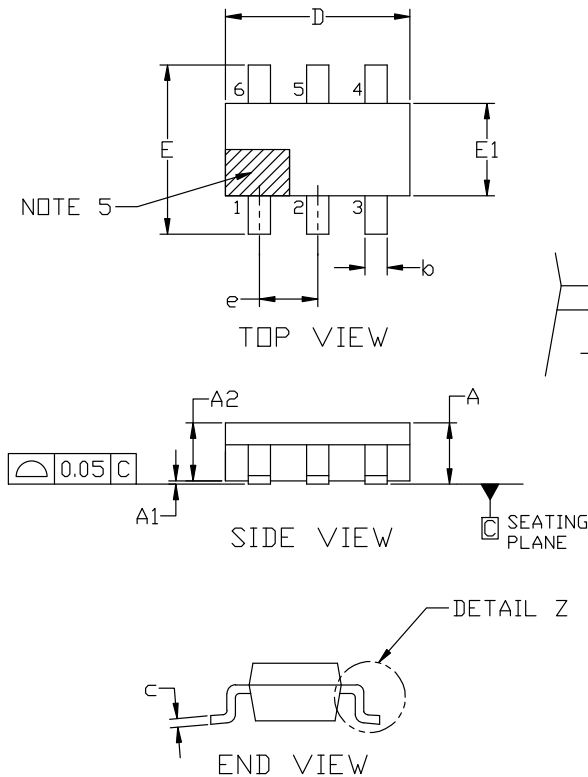


Figure 10. Diode Forward Voltage vs. Current


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

DATE 26 FEB 2024

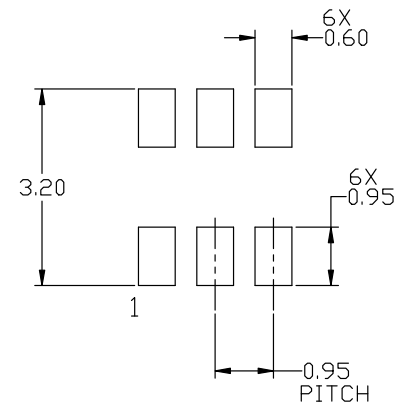


NOTES:

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°



RECOMMENDED MOUNTING FOOTPRINT

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

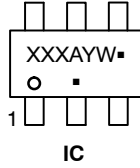
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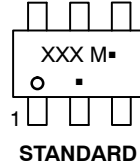
TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

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.

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

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