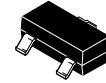


# Digital FET, P-Channel

## FDV304P, FDV304P-F169



SOT-23-3  
CASE 318-08

### General Description

This P-Channel enhancement mode field effect transistors is produced using onsemi's proprietary, high cell density, DMOS technology. This very high density process is tailored to minimize on-state resistance at low gate drive conditions. This device is designed especially for application in battery power applications such as notebook computers and cellular phones. This device has excellent on-state resistance even at gate drive voltages as low as 2.5 V.

### Features

- -25 V, -0.46 A Continuous, -1.5 A Peak
  - ◆  $R_{DS(on)} = 1.1 \Omega @ V_{GS} = -4.5 V$
  - ◆  $R_{DS(on)} = 1.5 \Omega @ V_{GS} = -2.7 V$
- Very Low Level Gate Drive Requirements Allowing Direct Operation in 3 V Circuits.  $V_{GS(th)} < 1.5 V$
- Gate-Source Zener for ESD Ruggedness. > 6 kV Human Body Model
- Compact Industry Standard SOT-23 Surface Mount Package
- This Device is Pb-Free and Halide Free

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ unless otherwise noted.)

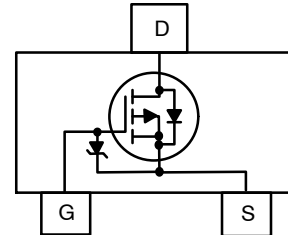
Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	-25	V
$V_{GSS}$	Gate-Source Voltage	-8	V
$I_D$	Drain Current - Continuous	-0.46	A
	Drain Current - Pulsed	-1.5	
$P_D$	Maximum Power Dissipation	0.35	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to 150	$^\circ C$
ESD	Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100 pF/1500 $\Omega$ )	6.0	kV

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.

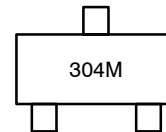
### THERMAL CHARACTERISTICS ( $T_A = 25^\circ C$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	$^\circ C/W$

### ELECTRICAL CONNECTION



### MARKING DIAGRAM



304 = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
FDV304P	SOT-23-3 (Pb-Free, Halide-Free)	3000 / Tape & Reel
FDV304P-F169	SOT-23-3 (Pb-Free, Halide-Free)	3000 / Tape & Reel

<sup>†</sup>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](#).

# FDV304P, FDV304P-F169

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-25	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	I <sub>D</sub> = -250 μA, Referenced to 25°C	-	-22	-	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C	-	-	-10	
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = -8 V, V <sub>DS</sub> = 0 V	-	-	-100	nA

### ON CHARACTERISTICS (Note 1)

ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate Threshold Voltage Temp. Coefficient	I <sub>D</sub> = -250 μA, Referenced to 25°C	-	2.1	-	mV/°C
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-0.65	-0.86	-1.5	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -2.7 V, I <sub>D</sub> = -0.25 A	-	1.22	1.5	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.5 A	-	0.87	1.1	
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.5 A, T <sub>J</sub> = 125°C	-	1.21	2	
I <sub>D(on)</sub>	On-State Drain Current	V <sub>GS</sub> = -2.7 V, V <sub>DS</sub> = -5 V	-0.5	-	-	A
		V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -5 V	-1	-	-	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -0.5 A	-	0.8	-	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	-	63	-	pF
C <sub>oss</sub>	Output Capacitance		-	34	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	10	-	

### SWITCHING CHARACTERISTICS (Note 1)

t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = -6 V, I <sub>D</sub> = -0.5 A, V <sub>GS</sub> = -4.5 V, R <sub>GEN</sub> = 50 Ω	-	7	20	ns
t <sub>r</sub>	Turn-On Rise Time		-	8	20	
t <sub>D(off)</sub>	Turn-Off Delay Time		-	55	110	
t <sub>f</sub>	Turn-Off Fall Time		-	35	70	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -0.25 A, V <sub>GS</sub> = -4.5 V	-	1.1	1.5	nC
Q <sub>gs</sub>	Gate-Source Charge		-	0.32	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	0.25	-	

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current	-	-	-0.5	A	
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -0.5 A (Note 1)	-	-0.89	-1.2	V

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%.

TYPICAL CHARACTERISTICS

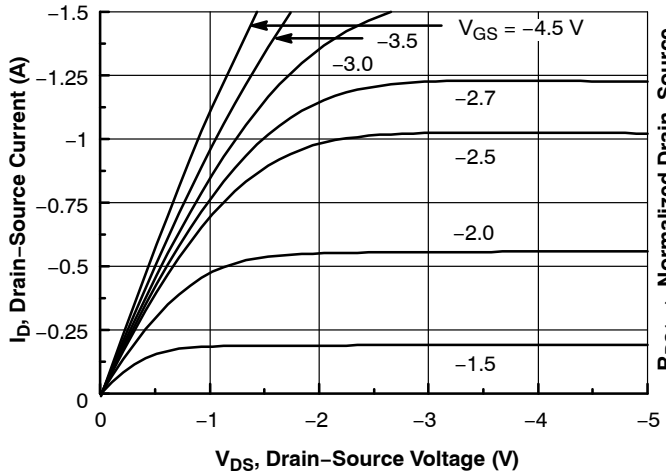


Figure 1. On-Region Characteristics

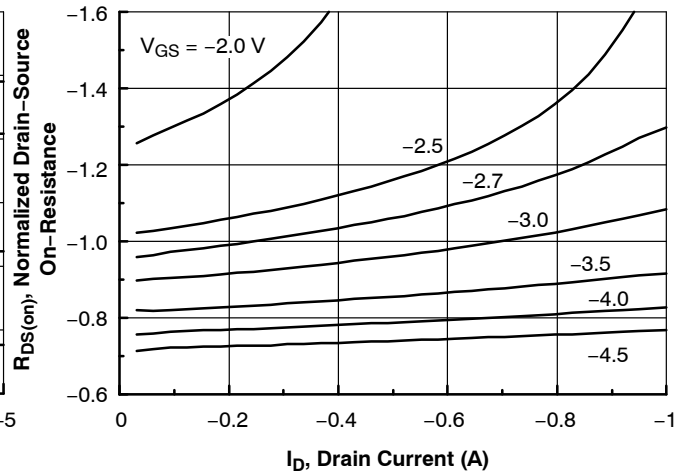


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

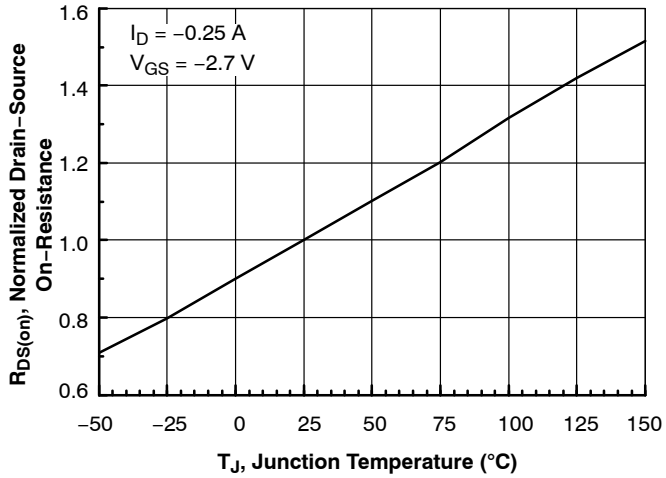


Figure 3. On-Resistance Variation with Temperature

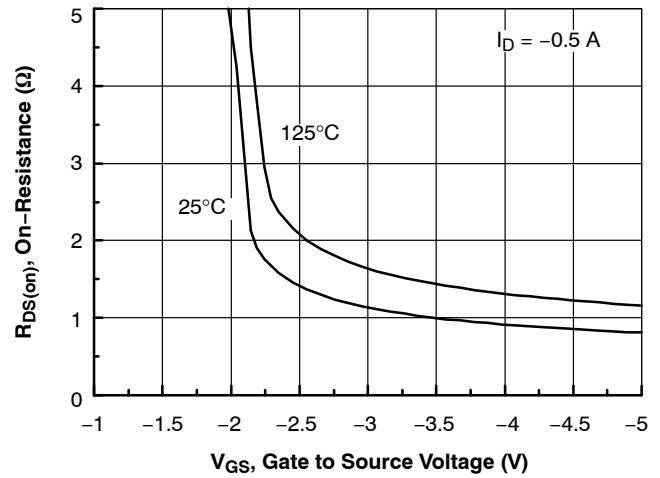


Figure 4. On Resistance Variation with Gate-To-Source Voltage

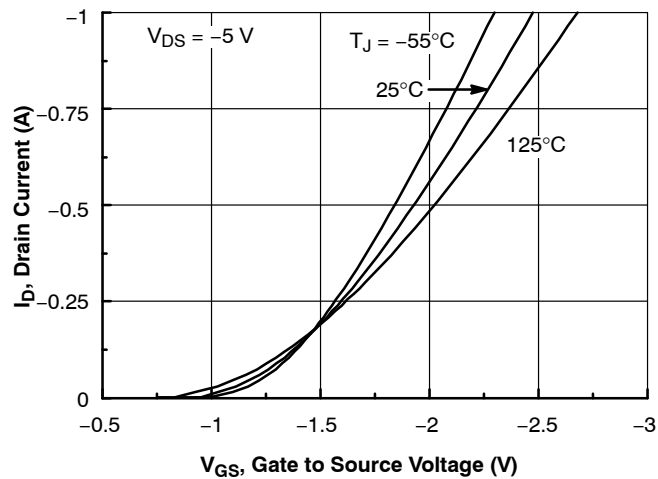


Figure 5. Transfer Characteristics

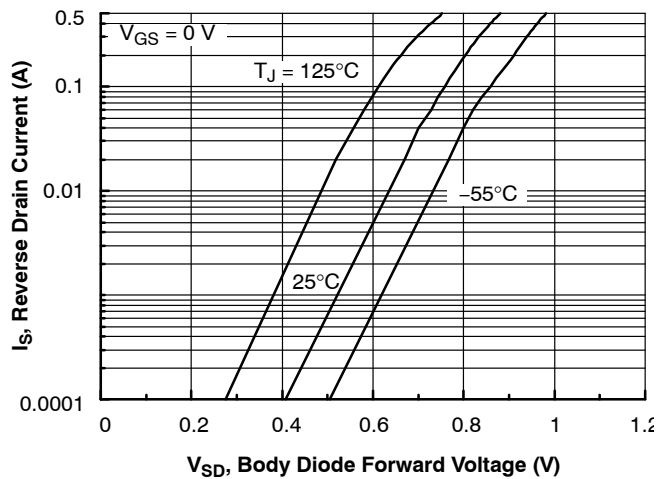


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS (continued)

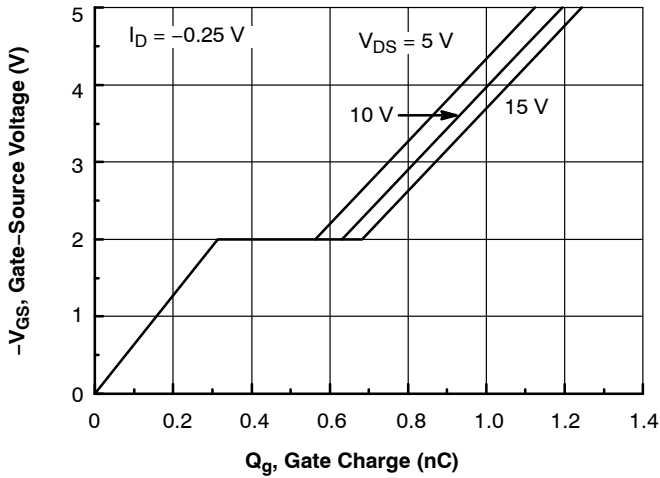


Figure 7. Gate Charge Characteristics

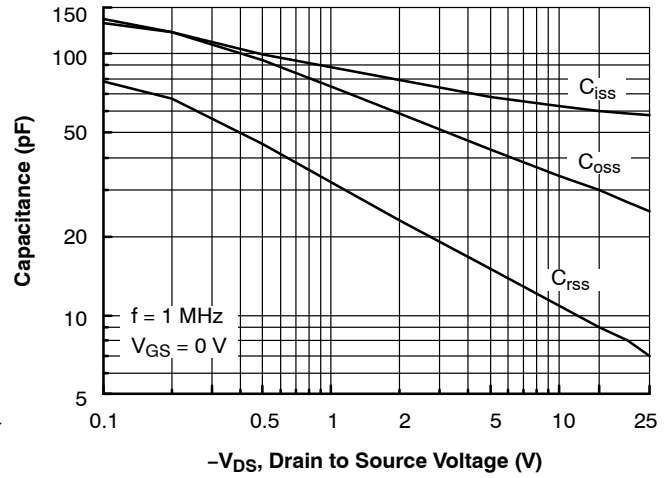


Figure 8. Capacitance Characteristics

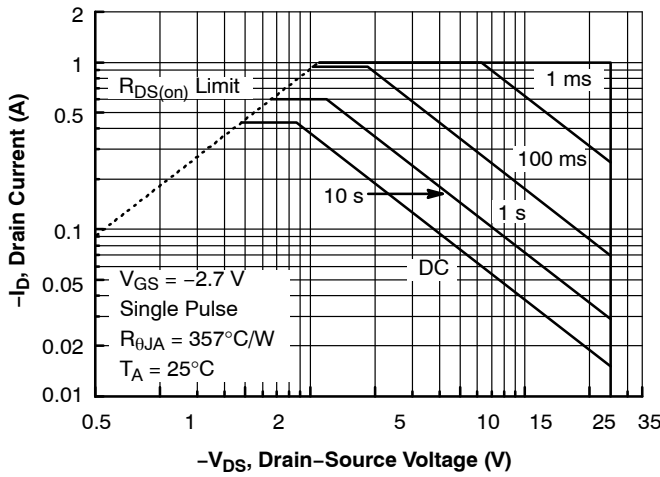


Figure 9. Maximum Safe Operating Area

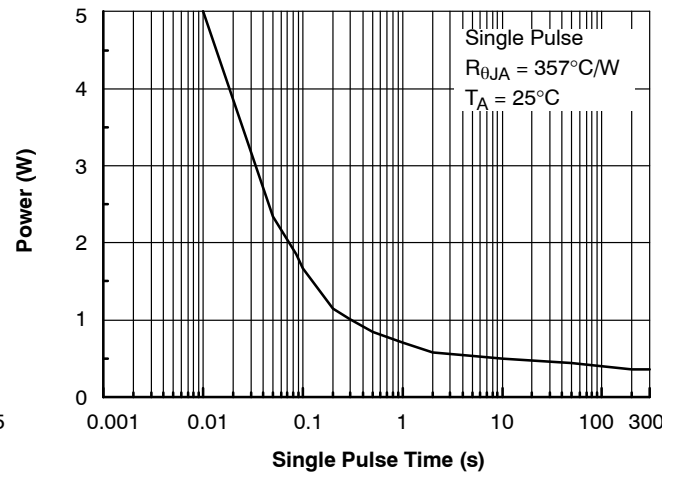


Figure 10. Maximum Pulse Maximum Power Dissipation

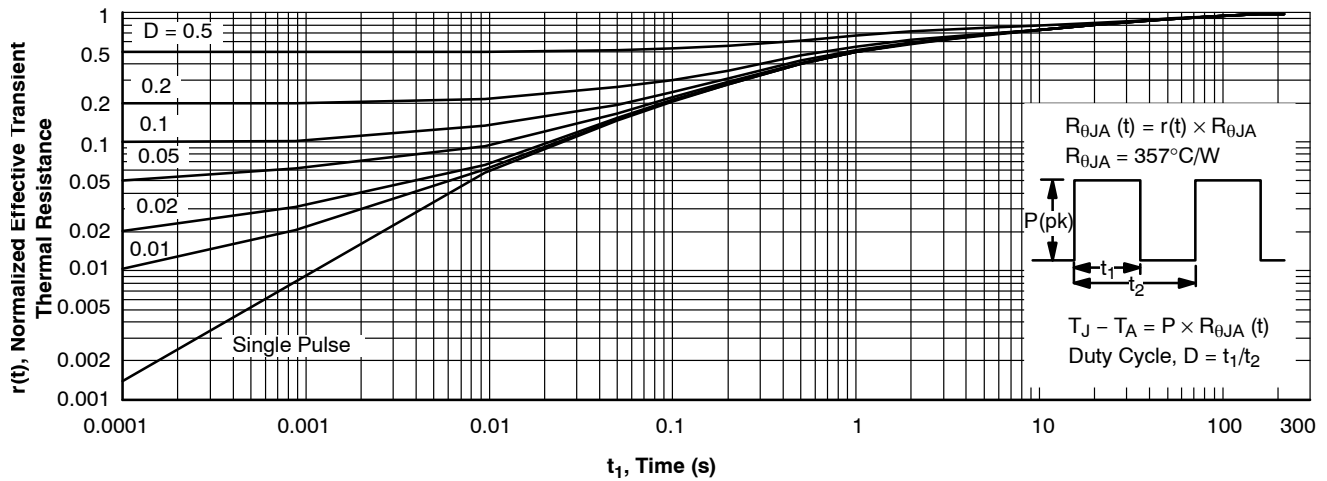


Figure 11. Transient Thermal Response Curve

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT-23 (TO-236)**  
CASE 318-08  
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

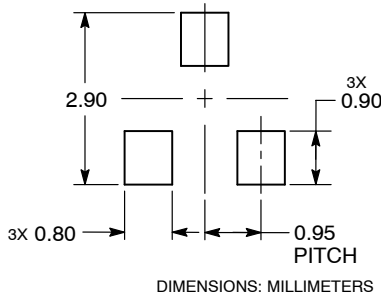


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**RECOMMENDED SOLDERING FOOTPRINT**



**GENERIC MARKING DIAGRAM\***



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.

STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

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

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

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