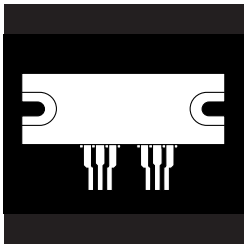
# UNCOMMITTED POWER MOSFET AND HIGH SPEED RECTIFIER IN 6-PIN PACKAGE



**100V Thru 1000V, 4A To 30A Power MOSFET And High Speed Rectifier In One Package**

## FEATURES

- MOSFET And Common Cathode Rectifier In One Package
- Isolated High Density Package
- Fast Switching
- Low $R_{DS(on)}$ MOSFET
- High Current

## DESCRIPTION

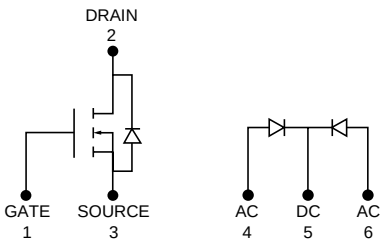
This series of Industrial products feature the latest advanced semiconductor and packaging technology. They are ideally suited where small size, high performance and high reliability are required. Ideal applications include switching power supplies, motor controls, inverters, amplifiers and high energy pulse circuits.

## MAXIMUM RATINGS @ 25°C

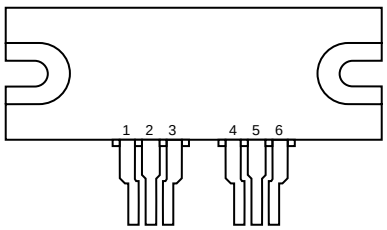
| | MOSFET | | | Rectifier | | | |
|---|---|---|---|---|---|---|---|
| PART NUMBER | $V_{DS}$ | $R_{DS(on)}$ | $I_D$ | PIV | $V_F$ | $I_O$ | $t_{rr}$ |
| OM9027SP1 | 100V | .065 | 30A | 100V | 1.1V | 10A | 50nsec |
| OM9028SP1 | 200V | 0.1 | 25A | 200V | 1.45V | 10A | 50nsec |
| OM9029SP1 | 500V | 0.4 | 12A | 500V | 1.45V | 10A | 50nsec |
| OM9030SP1 | 1000V | 3 | 4A | 1000V | 1.55V | 10A | 75nsec |

3.1

## SCHEMATIC




## PIN CONNECTION




Pin 1: Gate
Pin 2: Drain
Pin 3: Source
Pin 4: AC
Pin 5: DC
Pin 6: AC

Omnirel

## MOSFET ELECTRICAL CHARACTERISTICS: OM9027SP1 (100V)

($T_C$ = 25° unless otherwise noted)

| Characteristic | | Symbol | Min. | Max. | Units |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS}$ = 0, $I_D$ = 0.25mA) | | $V_{(BR)DSS}$ | 100 | - | Vdc |
| Zero Gate Voltage Drain Current | | $I_{DSS}$ | | | mAdc |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0) | | | - | 0.2 | |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0, $T_J$ = 125°C) | | | - | 1 | |
| Gate-Body Leakage Current, Forward ($V_{GSF}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSF}$ | - | 100 | nAdc |
| Gate-Body Leakage Current, Reverse ($V_{GSR}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSR}$ | - | 100 | nAdc |
| **ON CHARACTERISTICS*** | | | | | |
| Gate Threshold Voltage | | $V_{GS(th)}$ | | | Vdc |
| ($V_{DS}$ = $V_{GS}$, $I_D$ = 1mA) | | | 2 | 4 | |
| ($T_J$ = 100°C) | | | 1.5 | 3.5 | |
| Static Drain-Source On-Resistance ($V_{GS}$ = 10 Vdc, $I_D$ = 20 Adc) | | $r_{DS(on)}$ | - | 0.065 | Ohm |
| Drain-Source-On-Voltage ($V_{GS}$ = 10 V) | | $V_{DS(on)}$ | | | Vdc |
| ($I_D$ = 30 Adc) | | | - | 2.3 | |
| ($I_D$ = 20 Adc, $T_J$ = 100°C) | | | - | 2.6 | |
| Forward Transconductance ($V_{DS}$ = 15 V, $I_D$ = 20A) | | $g_{FS}$ | 10 | - | mhos |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Input Capacitance | ($V_{DS}$ = 25V, | $C_{iss}$ | 2800 (Typ) | - | pF |
| Output Capacitance | $V_{GS}$ = 0, | $C_{oss}$ | 1200 (Typ) | - | |
| Reverse Transfer Capacitance | f = 1MHz) | $C_{rss}$ | 400 (Typ) | - | |
| **SWITCHING CHARACTERISTICS*** ($T_J$ = 100°C) | | | | | |
| Turn-On Delay Time | ($V_{DD}$ = 50V, | $t_{d(on)}$ | - | 40 | ns |
| Rise Time | $I_D$ = 20A, | $t_r$ | - | 120 | |
| Turn-Off Delay Time | $R_{gen}$ = 4.7 Ohms) | $t_{d(off)}$ | - | 150 | |
| Fall Time | | $t_f$ | - | 100 | |
| Total Gate Charge | ($V_{DS}$ = 80V, | $Q_g$ | 105 (Typ) | 130 | nC |
| Gate-Source Charge | $I_D$ = 30A, | $Q_{gs}$ | 15 (Typ) | 28 | |
| Gate-Drain Charge | $V_{GS}$ = 10V) | $Q_{gd}$ | 45 (Typ) | 70 | |
| **SOURCE-DRAIN DIODE CHARACTERISTICS*** | | | | | |
| Forward On-Voltage | ($I_S$ = 30A, | $V_{SD}$ | - | 2.2 | Vdc |
| Forward Turn-On Time | $V_{GS}$ = 0) | $t_{on}$ | Limited By Stray Inductance | | |
| Reverse Recovery Time | | $t_{rr}$ | 200 (Typ) | - | ns |

***Pulse Test:** Pulse Width = 300$\mu$s, Duty Cycle 2%.

## MOSFET ELECTRICAL CHARACTERISTICS: OM9028SP1 (200V)

($T_C$ = 25° unless otherwise noted)

| Characteristic | | Symbol | Min. | Max. | Units |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS}$ = 0, $I_D$ = 0.25mA) | | $V_{(BR)DSS}$ | 200 | - | Vdc |
| Zero Gate Voltage Drain Current | | $I_{DSS}$ | | | mAdc |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0) | | | - | 0.2 | |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0, $T_J$ = 125°C) | | | - | 1 | |
| Gate-Body Leakage Current, Forward ($V_{GSF}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSF}$ | - | 100 | nAdc |
| Gate-Body Leakage Current, Reverse ($V_{GSR}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSR}$ | - | 100 | nAdc |
| **ON CHARACTERISTICS*** | | | | | |
| Gate Threshold Voltage | | $V_{GS(th)}$ | | | Vdc |
| ($V_{DS}$ = $V_{GS}$, $I_D$ = 1mA) | | | 2 | 4 | |
| ($T_J$ = 100°C) | | | 1.5 | 3.5 | |
| Static Drain-Source On-Resistance ($V_{GS}$ = 10 Vdc, $I_D$ = 16 Adc) | | $r_{DS(on)}$ | - | 0.1 | Ohm |
| Drain-Source-On-Voltage ($V_{GS}$ = 10 V) | | $V_{DS(on)}$ | | | Vdc |
| ($I_D$ = 25 Adc) | | | - | 3.5 | |
| ($I_D$ = 16 Adc, $T_J$ = 100°C) | | | - | 3.2 | |
| Forward Transconductance ($V_{DS}$ = 15 V, $I_D$ = 16A) | | $g_{FS}$ | 10 | - | mhos |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Input Capacitance | ($V_{DS}$ = 25V, | $C_{iss}$ | 2850 (Typ) | - | pF |
| Output Capacitance | $V_{GS}$ = 0, | $C_{oss}$ | 700 (Typ) | - | |
| Reverse Transfer Capacitance | f = 1MHz) | $C_{rss}$ | 170 (Typ) | - | |
| **SWITCHING CHARACTERISTICS*** ($T_J$ = 100°C) | | | | | |
| Turn-On Delay Time | ($V_{DD}$ = 100V, | $t_{d(on)}$ | - | 40 | ns |
| Rise Time | $I_D$ = 16A, | $t_r$ | - | 90 | |
| Turn-Off Delay Time | $R_{gen}$ = 4.7 Ohms) | $t_{d(off)}$ | - | 150 | |
| Fall Time | | $t_f$ | - | 100 | |
| Total Gate Charge | ($V_{DS}$ = 100V, | $Q_g$ | 85 (Typ) | 130 | nC |
| Gate-Source Charge | $I_D$ = 25A, | $Q_{gs}$ | 15 (Typ) | 28 | |
| Gate-Drain Charge | $V_{GS}$ = 10V) | $Q_{gd}$ | 40 (Typ) | 65 | |
| **SOURCE-DRAIN DIODE CHARACTERISTICS*** | | | | | |
| Forward On-Voltage | ($I_S$ = 25A, | $V_{SD}$ | - | 2 | Vdc |
| Forward Turn-On Time | $V_{GS}$ = 0) | $t_{on}$ | Limited By Stray Inductance | | |
| Reverse Recovery Time | | $t_{rr}$ | 200 (Typ) | - | ns |

***Pulse Test:** Pulse Width = 300$\mu$s, Duty Cycle 2%.

## MOSFET ELECTRICAL CHARACTERISTICS: OM9029SP1 (500V) ($T_C$ = 25° unless otherwise noted)

| Characteristic | | Symbol | Min. | Max. | Units |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS}$ = 0, $I_D$ = 0.25mA) | | $V_{(BR)DSS}$ | 500 | - | Vdc |
| Zero Gate Voltage Drain Current | | $I_{DSS}$ | | | mAdc |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0) | | | - | 0.2 | |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0, $T_J$ = 125°C) | | | - | 1 | |
| Gate-Body Leakage Current, Forward ($V_{GSF}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSF}$ | - | 100 | nAdc |
| Gate-Body Leakage Current, Reverse ($V_{GSR}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSR}$ | - | 100 | nAdc |
| **ON CHARACTERISTICS*** | | | | | |
| Gate Threshold Voltage | | $V_{GS(th)}$ | | | Vdc |
| ($V_{DS}$ = $V_{GS}$, $I_D$ = 1mA) | | | 2 | 4.5 | |
| ($T_J$ = 100°C) | | | 1.5 | 4 | |
| Static Drain-Source On-Resistance ($V_{GS}$ = 10 Vdc, $I_D$ = 7 Adc) | | $r_{DS(on)}$ | - | 0.4 | Ohm |
| Drain-Source-On-Voltage ($V_{GS}$ = 10 V) | | $V_{DS(on)}$ | | | Vdc |
| ($I_D$ = 12 Adc) | | | - | 6 | |
| ($I_D$ = 7 Adc, $T_J$ = 100°C) | | | - | 5.4 | |
| Forward Transconductance ($V_{DS}$ = 15 V, $I_D$ = 7A) | | $g_{FS}$ | 4 | - | mhos |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Input Capacitance | ($V_{DS}$ = 25V, | $C_{iss}$ | 2300 (Typ) | - | pF |
| Output Capacitance | $V_{GS}$ = 0, | $C_{oss}$ | 330 (Typ) | - | |
| Reverse Transfer Capacitance | f = 1MHz) | $C_{rss}$ | 155 (Typ) | - | |
| **SWITCHING CHARACTERISTICS*** ($T_J$ = 100°C) | | | | | |
| Turn-On Delay Time | ($V_{DD}$ = 250V, | $t_{d(on)}$ | - | 40 | ns |
| Rise Time | $I_D$ = 7A, | $t_r$ | - | 65 | |
| Turn-Off Delay Time | $R_{gen}$ = 4.7 Ohms) | $t_{d(off)}$ | - | 150 | |
| Fall Time | | $t_f$ | - | 80 | |
| Total Gate Charge | ($V_{DS}$ = 250V, | $Q_g$ | 110 (Typ) | 160 | nC |
| Gate-Source Charge | $I_D$ = 12A, | $Q_{gs}$ | 14 (Typ) | 25 | |
| Gate-Drain Charge | $V_{GS}$ = 10V) | $Q_{gd}$ | 60 (Typ) | 95 | |
| **SOURCE-DRAIN DIODE CHARACTERISTICS*** | | | | | |
| Forward On-Voltage | ($I_S$ = 12A, | $V_{SD}$ | 1.1 (Typ) | 2 | Vdc |
| Forward Turn-On Time | $V_{GS}$ = 0) | $t_{on}$ | Limited By Stray Inductance | | |
| Reverse Recovery Time | | $t_{rr}$ | 1200 (Typ) | - | ns |

***Pulse Test:** Pulse Width = 300$\mu$s, Duty Cycle 2%.

## MOSFET ELECTRICAL CHARACTERISTICS: OM9030SP1 (1000V) ($T_C$ = 25° unless otherwise noted)

| Characteristic | | Symbol | Min. | Max. | Units |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS}$ = 0, $I_D$ = 0.25mA) | | $V_{(BR)DSS}$ | 1000 | - | Vdc |
| Zero Gate Voltage Drain Current | | $I_{DSS}$ | | | mAdc |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0) | | | - | 0.2 | |
| ($V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0, $T_J$ = 125°C) | | | - | 1 | |
| Gate-Body Leakage Current, Forward ($V_{GSF}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSF}$ | - | 100 | nAdc |
| Gate-Body Leakage Current, Reverse ($V_{GSR}$ = 20 Vdc, $V_{DS}$ = 0) | | $I_{GSSR}$ | - | 100 | nAdc |
| **ON CHARACTERISTICS*** | | | | | |
| Gate Threshold Voltage | | $V_{GS(th)}$ | | | Vdc |
| ($V_{DS}$ = $V_{GS}$, $I_D$ = 1mA) | | | 2 | 4.5 | |
| ($T_J$ = 100°C) | | | 1.5 | 4 | |
| Static Drain-Source On-Resistance ($V_{GS}$ = 10 Vdc, $I_D$ = 2.5 Adc) | | $r_{DS(on)}$ | - | 3 | Ohm |
| Drain-Source-On-Voltage ($V_{GS}$ = 10 V) | | $V_{DS(on)}$ | | | Vdc |
| ($I_D$ = 4 Adc) | | | - | 15 | |
| ($I_D$ = 2.5 Adc, $T_J$ = 100°C) | | | - | 12.5 | |
| Forward Transconductance ($V_{DS}$ = 15 V, $I_D$ = 2.5A) | | $g_{FS}$ | 2 | - | mhos |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Input Capacitance | ($V_{DS}$ = 25V, | $C_{iss}$ | 2200 (Typ) | - | pF |
| Output Capacitance | $V_{GS}$ = 0, | $C_{oss}$ | 220 (Typ) | - | |
| Reverse Transfer Capacitance | f = 1MHz) | $C_{rss}$ | 100 (Typ) | - | |
| **SWITCHING CHARACTERISTICS*** ($T_J$ = 100°C) | | | | | |
| Turn-On Delay Time | ($V_{DD}$ = 250V, | $t_{d(on)}$ | - | 40 | ns |
| Rise Time | $I_D$ = 2.5A, | $t_r$ | - | 60 | |
| Turn-Off Delay Time | $R_{gen}$ = 4.7 Ohms) | $t_{d(off)}$ | - | 160 | |
| Fall Time | | $t_f$ | - | 80 | |
| Total Gate Charge | ($V_{DS}$ = 400V, | $Q_g$ | 110 (Typ) | 140 | nC |
| Gate-Source Charge | $I_D$ = 4A, | $Q_{gs}$ | 14 (Typ) | 25 | |
| Gate-Drain Charge | $V_{GS}$ = 10V) | $Q_{gd}$ | 50 (Typ) | 90 | |
| **SOURCE-DRAIN DIODE CHARACTERISTICS*** | | | | | |
| Forward On-Voltage | ($I_S$ = 4A, | $V_{SD}$ | - | 1.6 | Vdc |
| Forward Turn-On Time | $V_{GS}$ = 0) | $t_{on}$ | Limited By Stray Inductance | | |
| Reverse Recovery Time | | $t_{rr}$ | 1.2 (Typ) | - | µs |

***Pulse Test:** Pulse Width = 300$\mu$s, Duty Cycle 2%.

## RECTIFIER ELECTRICAL CHARACTERISTICS (Per Diode)

| Type | PIV | Maximum Forward Voltage (Volts) @ (1) | | Maximum Reverse Current @ PIV | | Maximum Reverse Recovery Time (2) |
|---|---|---|---|---|---|---|
| | | $T_j$ = 25°C | $T_j$ = 100°C | $T_j$ = 25°C | $T_j$ = 100°C | |
| OM9027SP1 | 100 | 1.1V @ 10A | 0.92V @ 10A | 15µA | 550µA | 50 nsec |
| OM9028SP1 | 200 | 1.45V @ 10A | 1.25V @ 10A | 30µA | 1.1mA | 50 nsec |
| OM9029SP1 | 500 | 1.45V @ 10A | 1.25V @ 10A | 30µA | 1.1mA | 50 nsec |
| OM9030SP1 | 1000 | 1.55V @ 10A | 1.35V @ 10A | 30µA | 1.1mA | 75 nsec |

**(1) Pulse Test:** Pulse Width 300*µ*sec, Duty Cycle 2%.
**(2) Measured in Circuit:** $I_F$ = 0.5A, $I_R$ = 1.0A, $I_{REC}$ = 0.25A, $T_P$ = 300 µsec.

## ABSOLUTE MAXIMUM RATINGS: ($T_C$ = 25°C unless otherwise noted)

| MOSFET | Parameter | OM9027 | OM9028 | OM9029 | OM9030 | Units |
|---|---|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 100 | 200 | 500 | 1000 | V |
| $V_{DGR}$ | Drain-Gate Voltage ($R_{GS}$ = 1M ) | 100 | 200 | 500 | 1000 | V |
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current | 30 | 25 | 12 | 4 | A |
| $V_{GS}$ | Continuous Gate-Source Voltage | ±20 | ±20 | ±20 | ±20 | V |
| $V_{GSM}$ | Gate-Source Voltage Non-Repetitive ($t_p$ 50$\mu$s) | ±40 | ±40 | ±40 | ±40 | V |
| $I_{DM}$ | Pulsed Drain Current[1] | 90 | 50 | 55 | 12 | A |
| **RECTIFIER** | | | | | | |
| PIV | Peak Inverse Voltage | 100 | 200 | 500 | 1000 | V |
| $I_O$ | Max. Avg. DC Output Current @$T_C$ = 100°C | 10 | 10 | 10 | 10 | A |
| $I_S$ | Non-Repetitive Sinusoidal Surge Current 8.3 msec | 80 | 80 | 80 | 80 | A |
| **TEMPERATURE RANGE** | | | | | | |
| $T_J$ $T_{stg}$ | Operating and Storage Temperature Range | -65 to 125 | -65 to 125 | -65 to 125 | -65 to 125 | °C |
| Lead Temperature | ($^1/_8$" from case for 5 seconds) | 225 | 225 | 225 | 225 | °C |

**1 Pulse Test:** Pulse Width 300*µ*sec, Duty Cycle 2%.

## THERMAL RESISTANCE (MAXIMUM) at $T_A$ = 25°C

| | | | |
|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | 1.0 | °C/W |
| $R_{thJA}$ | Junction-to-Ambient | 40 | °C/W Free Air Operation |

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# MECHANICAL OUTLINE