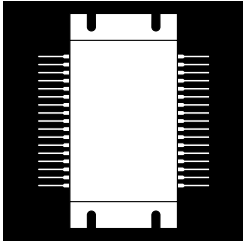


3 PHASE, LOW VOLTAGE, LOW $R_{DS(on)}$, MOSFET BRIDGE CIRCUIT IN A PLASTIC PACKAGE



Three Phase, 100 Volt, 15 To 45 Amp Bridge With Current And Temperature Sensing In A Low Profile Package

FEATURES

- Three Phase Power Switch Configuration
- Zener Gate Protection
- 10 Milliohm Shunt Resistor
- Linear Thermal Sensor
- Isolated Low Profile Package
- Output Currents Up To 45 Amps

DESCRIPTION

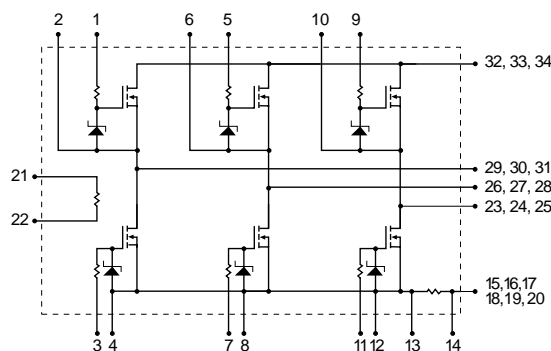
This series of MOSFET switches is configured in a 3 phase bridge with a common V_{DD} line, precision series shunt resistor in the source line, and a sensing element to monitor the substrate temperature. This device is ideally suited for Motor Control applications where size, performance, and efficiency are key.

2.1

MAXIMUM RATINGS (@ 25°C)

| Part Number | V_{DS} (Volts) | $R_{DS(on)}$ (m) | I_D (Amps) | Package |
|-------------|------------------|------------------|--------------|---------|
| OMS410 | 100 | 85 | 15 | MP-3 |
| OMS410A | 100 | 85 | 20 | MP-3 |
| OMS510 | 100 | 42 | 45 | MP-3 |

SCHEMATIC



OMS410, OMS410A, OMS510

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

| Parameter | OMS410 | OMS410A | OMS510 | Units |
|---|--------|---------|--------|-------|
| V_{DS} Drain-Source Voltage | 100 | 100 | 100 | V |
| V_{DGR} Drain-Gate Voltage ($R_{GS} = 1\text{ m}$) | 100 | 100 | 100 | V |
| $I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current | 15 | 20 | 45 | A |
| $I_D @ T_C = 70^\circ\text{C}$ Continuous Drain Current | 11 | 16 | 45 | A |
| I_{DM} Pulsed Drain Current ¹ | 110 | 110 | 180 | A |
| $P_D @ T_C = 25^\circ\text{C}$ Maximum Power Dissipation ² | 33 | 33 | 66 | W |
| $P_D @ T_C = 70^\circ\text{C}$ Maximum Power Dissipation ² | 18 | 18 | 36 | W |
| Junction-To-Case Linear Derating Factor | 0.33 | 0.33 | 0.66 | W/°C |
| Thermal Resistance Junction-To-Case | 3.0 | 3.0 | 1.5 | °C/W |
| Sense Resistor | 0.010 | 0.010 | 0.010 | Ohms |

Note 1: Pulse Test: Pulse width 300 sec. Duty Cycle 1.5%.

Note 2: Maximum Junction Temperature equal to 125°C.

ELECTRICAL CHARACTERISTICS: OMS410 ($T_C = 25^\circ$ unless otherwise specified)

| Characteristic | Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|--|-----------------|-------------|------|------|-----------|---------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage, $I_D = 250\ \mu\text{A}$, $V_{GS} = 0$ | | V_{BRDSS} | -100 | - | - | V |
| Zero Gate Voltage Drain Current = V_{GS} , $V_{DS} = \text{Max. Rat.}$ | | I_{DSS} | - | - | 10 | μA |
| $V_{DS} = \text{Max. Rat.} \times 0.8$, $T_C = 70^\circ\text{C}$ | | | - | - | 100 | μA |
| Gate-Body Leakage, $V_{GS} = \pm 12\text{ V}$ | | I_{GSS} | - | - | ± 500 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--|--|--------------|-----|---|-------|---|
| Gate-Threshold Voltage, $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$ | | V_{GSth} | 2.0 | - | 4.0 | V |
| Static Drain-Source On-Resistance, $V_{GS} = 10\text{ Vdc}$, $I_D = 9.0\text{ A}$ | | $R_{DS(on)}$ | - | - | 0.058 | |
| $T_C = 70^\circ\text{C}$ | | | - | - | 0.1 | |
| On State Drain Current, $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max., $V_{GS} = 10$ | | I_{Don} | 15 | - | - | A |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|---|-----------|-----|---|------|-----|
| Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max., $I_D = 9.0\text{ A}$, $V_{DS} = 25\text{ V}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$ | g_{fs} | 9.0 | - | - | mho |
| Input Capacitance | | C_{iss} | - | - | 2600 | pF |
| Output Capacitance | | C_{oss} | - | - | 910 | pF |
| Reverse Transfer Capacitance | | C_{rss} | - | - | 350 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|---|------------|---|---|-----|----|
| Turn-On Delay Time | $V_{DD} = 100\text{ V}$, $I_D = 15\text{ A}$, $R_{GS} = 10$, $V_{GS} = 10\text{ V}$ | t_{don} | - | - | 35 | ns |
| Rise Time | | t_r | - | - | 290 | ns |
| Turn-Off Delay Time | | t_{doff} | - | - | 85 | ns |
| Fall Time | | t_f | - | - | 120 | ns |

SOURCE DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|---------------------------------|--|-------------|---|------|-----|---------------|
| Source - Drain Current | $I_{SD} = 28\text{ A}$, $V_{GS} = 0$, $I_{SD} = 13\text{ A}$, $di/dt = 100\text{ A}/\mu\text{Sec}$ | I_{SD} | - | - | 14 | A |
| Source - Drain Current (Pulsed) | | I_{SDM}^* | - | - | 56 | A |
| Forward On-Voltage | | V_{SD} | - | - | 2.5 | V |
| Reverse Recovery Time | | t_{rr} | - | 133 | - | ns |
| Reverse Recovered Charge | | Q_{rr} | - | 0.85 | - | μC |

RESISTOR CHARACTERISTICS

| | | | | | |
|---|----------|-----|-----|----|-----|
| Resistor Tolerance | R_S | 9.0 | 10 | 11 | m |
| Temperature Coefficient, -40°C to $+70^\circ\text{C}$ | T_{cr} | - | 100 | - | ppm |

* Indicates Pulse Test 300 μsec , Duty Cycle 1.5%

OMS410, OMS410A, OMS510

ELECTRICAL CHARACTERISTICS: OMS520 (T_C = 25° unless otherwise specified)

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

OFF CHARACTERISTICS

| | | | | | |
|---|--------------------|-----|---|------|----|
| Drain-Source Breakdown Voltage, I _D = 250 μA, V _{GS} = 0 | V _{BRDSS} | 100 | - | - | V |
| Zero Gate Voltage Drain Current = V _{GS} , V _{DS} = Max. Rat. | I _{DSS} | - | - | 10 | μA |
| V _{DS} = Max. Rat. x 0.8, T _C = 70°C | | - | - | 100 | μA |
| Gate-Body Leakage, V _{GS} = ±12 V | I _{GSS} | - | - | ±500 | nA |

ON CHARACTERISTICS

| | | | | | |
|---|---------------------|-----|---|-------|---|
| Gate-Threshold Voltage, V _{DS} = V _{GS} , I _D = 250 μA | V _{GS(th)} | 2.0 | - | 4.0 | V |
| Static Drain-Source On-Resistance, V _{GS} = 10 Vdc, I _D = 10 A | R _{DS(on)} | - | - | 0.058 | |
| T _C = 70°C | | - | - | 0.100 | |
| On State Drain Current, V _{DS} > I _{D(on)} X R _{DS(on)} Max., V _{GS} = 10 | I _{D(on)} | 20 | - | - | A |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|------------------|-----|---|------|-----|
| Forward Transconductance | V _{DS} > I _{D(on)} X R _{DS(on)} Max., I _D = 10 A V _{DS} = 25 V, V _{GS} = 0, f = 1.0 mHz | g _{fs} | 9.0 | - | - | mho |
| Input Capacitance | | C _{iss} | - | - | 2600 | pF |
| Output Capacitance | | C _{oss} | - | - | 910 | pF |
| Reverse Transfer Capacitance | | C _{rss} | - | - | 350 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|---|---------------------|---|---|-----|----|
| Turn-On Delay Time | V _{DD} = 100 V, I _D = 20 A, R _{GS} = 10 Ω, V _{GS} = 10 V | t _{d(on)} | - | - | 35 | ns |
| Rise Time | | t _r | - | - | 290 | ns |
| Turn-Off Delay Time | | t _{d(off)} | - | - | 85 | ns |
| Fall Time | | t _f | - | - | 120 | ns |

SOURCE DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|---------------------------------|---|--------------------|---|------|-----|----|
| Source - Drain Current | I _{SD} = 28 A, V _{GS} = 0, I _{SD} = 20 A, di/dt = 100 A/μSec | I _{SD} | - | - | 20 | A |
| Source - Drain Current (Pulsed) | | I _{SDM} * | - | - | 56 | A |
| Forward On-Voltage | | V _{SD} | - | - | 2.5 | V |
| Reverse Recovery Time | | t _{rr} | - | 133 | - | ns |
| Reverse Recovered Charge | | Q _{rr} | - | 0.85 | - | μC |

RESISTOR CHARACTERISTICS

| | | | | | |
|---|-----------------|-----|-----|----|-----|
| Resistor Tolerance | R _S | 9.0 | 10 | 11 | m |
| Temperature Coefficient, -40°C to +70°C | T _{cr} | - | 100 | - | ppm |

* Indicates Pulse Test 300 μsec, Duty Cycle 1.5%.

2.1

OMS410, OMS410A, OMS510

ELECTRICAL CHARACTERISTICS: OMS510 (T_C = 25° unless otherwise specified)

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

OFF CHARACTERISTICS

| | | | | | |
|---|--------------------|-----|---|------|----|
| Drain-Source Breakdown Voltage, I _D = 250 μA, V _{GS} = 0 | V _{BRDSS} | 100 | - | - | V |
| Zero Gate Voltage Drain Current = V _{GS} , V _{DS} = Max. Rat. | I _{DSS} | - | - | 20 | μA |
| V _{DS} = Max. Rat. x 0.8, T _C = 70°C | | - | - | 200 | μA |
| Gate-Body Leakage, V _{GS} = ±12 V | I _{GSS} | - | - | ±500 | nA |

ON CHARACTERISTICS

| | | | | | |
|---|---------------------|-----|---|-------|---|
| Gate-Threshold Voltage, V _{DS} = V _{GS} , I _D = 250 μA | V _{GS(th)} | 2.0 | - | 4.0 | V |
| Static Drain-Source On-Resistance, V _{GS} = 10 Vdc, I _D = 22.5 A | R _{DS(on)} | - | - | 0.029 | |
| T _C = 70°C | | - | - | 0.050 | |
| On State Drain Current, V _{DS} > I _{D(on)} X R _{DS(on)} Max., V _{GS} = 10 | I _{D(on)} | 45 | - | - | A |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|------------------|----|---|------|-----|
| Forward Transconductance | V _{DS} > I _{D(on)} X R _{DS(on)} Max., I _D = 40 A | g _{fs} | 18 | - | - | mho |
| Input Capacitance | V _{DS} = 100 V, | C _{iss} | - | - | 5200 | pF |
| Output Capacitance | V _{GS} = 0, | C _{oss} | - | - | 1820 | pF |
| Reverse Transfer Capacitance | f = 1.0 MHz | C _{rss} | - | - | 700 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|--|---------------------|---|---|-----|----|
| Turn-On Delay Time | V _{DD} = 100 V, I _D = 45 A, R _{GS} = 10 Ω, V _{GS} = 10 V, | t _{don} | - | - | 70 | ns |
| Rise Time | | t _r | - | - | 580 | ns |
| Turn-Off Delay Time | | t _{d(off)} | - | - | 170 | ns |
| Fall Time | | t _f | - | - | 240 | ns |

SOURCE DRAIN DIODE CHARACTERISTICS

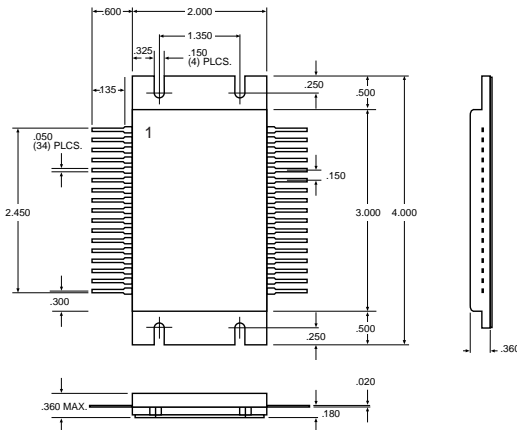
| | | | | | | |
|---------------------------------|---|--------------------|---|-------|-----|----|
| Source - Drain Current | I _{SD} = 45 A, V _{GS} = 0, I _{SD} = 45 A, di/dt = 100 A/μSec | I _{SD} | - | - | 45 | A |
| Source - Drain Current (Pulsed) | | I _{SDM} * | - | - | 120 | A |
| Forward On-Voltage | | V _{SD} | - | - | 2.5 | V |
| Reverse Recovery Time | | t _{rr} | - | 240 | - | ns |
| Reverse Recovered Charge | | Q _{rr} | - | 1.605 | - | μC |

RESISTOR CHARACTERISTICS

| | | | | | |
|---|-----------------|-----|-----|----|-----|
| Resistor Tolerance | R _S | 9.0 | 10 | 11 | m |
| Temperature Coefficient, -40°C to +70°C | T _{cr} | - | 100 | - | ppm |

* Indicates Pulse Test 300 μsec, Duty Cycle 1.5%.

Mechanical Outline



| | |
|---------------------|-------------------------|
| Pin 1: Gate Q1 | Pin 34: V _{DD} |
| Pin 2: Source Q1 | Pin 33: V _{DD} |
| Pin 3: Gate Q2 | Pin 32: V _{DD} |
| Pin 4: Source Q2 | Pin 31: Output Phase A |
| Pin 5: Gate Q3 | Pin 30: Output Phase A |
| Pin 6: Source Q3 | Pin 29: Output Phase A |
| Pin 7: Gate Q4 | Pin 28: Output Phase B |
| Pin 8: Source Q4 | Pin 17: Output Phase B |
| Pin 9: Gate Q5 | Pin 26: Output Phase B |
| Pin 10: Source Q5 | Pin 25: Output Phase C |
| Pin 11: Gate Q6 | Pin 24: Output Phase C |
| Pin 12: Source Q6 | Pin 23: Output Phase C |
| Pin 13: +Sense Res. | Pin 22: +PTC |
| Pin 14: -Sense Res. | Pin 21: -PTC |
| Pin 15: Power GND | Pin 20: Power GND |
| Pin 16: Power GND | Pin 19: Power GND |
| Pin 17: Power GND | Pin 18: Power GND |

Notes: •Contact factory for lead bending options.

•Mounting Recommendations: Maximum Mounting Torque: 3.0 mN.
The module must be attached to a flat heat sink (flatness 100μm maximum).