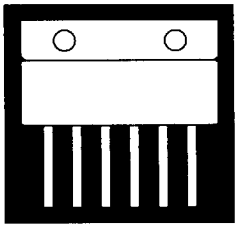
POWER MOSFET AND HIGH EFFICIENCY RECTIFIER IN A SINGLE HERMETIC ISOLATED SIP PACKAGE



100V Thru 500V, Up To 30 Amp, N-Channel MOSFET With Back To Back Zener Gate Clamp Protection And Uncommitted Ultra-Fast Recovery 35 To 50 nsec Rectifier

FEATURES

- Isolated Single In Line Hermetic Package
- Bi-Lateral Zener Gate Protection
- Uncommitted Power MOSFET And High Efficiency Power Rectifier
- Low $R_{DS(on)}$
- Available Hi-Rel Screened To MIL-S-19500, TX, TXV and S Levels

DESCRIPTION

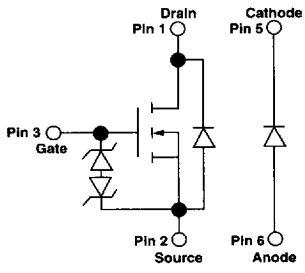
This series of products feature the latest advanced MOSFET and rectifier in a single, cost effective hermetically sealed package. They are ideally suited for Military requirements where small size, high performance and high reliability are required, and in applications such as flyback switching power supplies, motor control choppers, and high energy pulse circuits. The MOSFET gates are protected using bi-lateral zener clamps.

MAXIMUM RATINGS

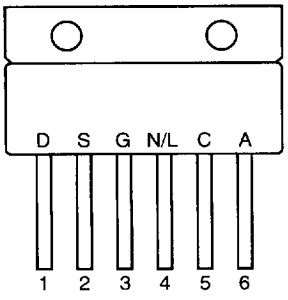
PART NUMBER	MOSFET			RECTIFIER		
	V_{DS}	$R_{DS(on)}$	I_D	PIV	V_{FM}	t_{rr}
OM9001SS	100 V	.065 Ω	30 A	100 V	1.40 A	35 ns
OM9002SS	200 V	.095 Ω	25 A	200 V	1.20 A	35 ns
OM9003SS	400 V	.3 Ω	15 A	400 V	1.40 A	50 ns
OM9004SS	500 V	.4 Ω	13 A	500 V	1.55 A	50 ns

2.1

SCHEMATIC



PIN CONNECTION



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Supersedes 1 07 R2

Omnirel

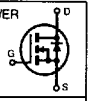
MOSFET CHARACTERISTICS: (T_C = 25°C unless otherwise noted)
STATIC P/N OM9001SS

Parameter		Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	100			V	V_{GS} = 0, I_D = 250 µA
$V_{GS(th)}$	Gate-Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}$, I_D = 250 µA
I_{GSSF}	Gate-Body Leakage Forward			+500	nA	V_{GS} = +12.8 V
I_{GSSR}	Gate-Body Leakage Reverse			- 500	nA	V_{GS} = -12.8 V
I_{DSS}	Zero Gate Voltage Drain Current		0.1	0.25	mA	V_{DS} = Max. Rat., V_{GS} = 0
			0.2	1.0	mA	V_{DS} = 0.8 Max. Rat., V_{GS} = 0 T_C = 125° C
$I_{D(on)}$	On-State Drain Current[1]	30			A	$V_{DS} \geq 2\ V_{DS(on)}$, V_{GS} = 10 V
$V_{DS(on)}$	Static Drain-Source On-State Voltage[1]		1.1	1.3	V	V_{GS} = 10 V, I_D = 20 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		.053	.065	Ω	V_{GS} = 10 V, I_D = 20 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		.09	.11	Ω	V_{GS} = 10 V, I_D = 20 A T_C = 125°C

DYNAMIC

g_{fs}	Forward Transductance[1]	9.0	10		S (℧)	$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 20 A
C_{iss}	Input Capacitance		2700		pF	V_{GS} = 0
C_{oss}	Output Capacitance		1300		pF	V_{DS} = 25 V
C_{rss}	Reverse Transfer Capacitance		470		pF	f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time		28		ns	V_{DD} = 30 V, I_D = 20 A
t_r	Rise Time		45		ns	R_g = 5.0 Ω, V_G = 10V
$t_{d(off)}$	Turn-Off Delay Time		100		ns	
t_f	Fall Time		50		ns	

BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS

I_S	Continuous Source Current (Body Diode)			- 30	A	Modified MOSPOWER symbol showing the integral P-N Junction rectifier. 
I_{SM}	Source Current[1] (Body Diode)			- 140	A	
V_{SD}	Diode Forward Voltage[1]			- 2.5	V	T_C = 25°C, I_S = -40 A, V_{GS} = 0
t_{rr}	Reverse Recovery Time		400		ns	T_J = 150°C, $I_F = I_S$, dI_F/ds = 100 A/µs

1 Pulse Test: Pulse Width ≤ 300µsec, Duty Cycle ≤ 2%.

POWER RECTIFIER CHARACTERISTICS

PIV	Max. Reverse Current		Max. Forward Voltage		*Max. Reverse Recovery Time
	T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C	
100 V	20 µA	1 mA	1.40 V @ 20 Amp	1.25 V @ 20 Amp	35 nsec

*Measured in circuit, I_F = .5 A, I_R = 1 A, I_{REC} = .250 A.

MOSFET CHARACTERISTICS: (T_C = 25°C unless otherwise noted)
STATIC P/N OM9002SS

Parameter		Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	200			V	V_{GS} = 0 I_D = 250 µA
$V_{GS(th)}$	Gate-Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}$, I_D = 250 µA
I_{GSSF}	Gate-Body Leakage Forward			+500	nA	V_{GS} = + 12.8 V
I_{GSSR}	Gate-Body Leakage Reverse			-500	nA	V_{GS} = - 12.8 V
I_{DSS}	Zero Gate Voltage Drain Current		0.1	0.25	mA	V_{DS} = Max. Rat., V_{GS} = 0
			0.2	1.0	mA	V_{DS} = 0.8 Max. Rat., V_{GS} = 0, T_C = 125° C
$I_{D(on)}$	On-State Drain Current[1]	25			A	$V_{DS} \geq 2\ V_{DS(on)}$, V_{GS} = 10 V
$V_{DS(on)}$	Static Drain-Source On-State Voltage[1]		1.36	1.52	V	V_{GS} = 10 V, I_D = 16 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		.085	.095	Ω	V_{GS} = 10 V, I_D = 16 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		0.14	0.17	Ω	V_{GS} = 10 V, I_D = 16 A, T_C = 125°C

DYNAMIC

g_{fs}	Forward Transductance[1]	10.0	12.5		S (℧)	$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 16 A
C_{iss}	Input Capacitance		2400		pF	V_{GS} = 0
C_{oss}	Output Capacitance		600		pF	V_{DS} = 25 V
C_{rss}	Reverse Transfer Capacitance		250		pF	f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time		25		ns	V_{DD} = 75 V, I_D = 16 A
t_r	Rise Time		60		ns	R_g = 5.0 Ω, V_{GS} = 10V
$t_{d(off)}$	Turn-Off Delay Time		85		ns	
t_f	Fall Time		38		ns	

BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS

I_S	Continuous Source Current (Body Diode)			- 25	A	Modified MOSPOWER symbol showing the integral P-N Junction rectifier. 
I_{SM}	Source Current[1] (Body Diode)			- 100	A	
V_{SD}	Diode Forward Voltage[1]			- 2	V	T_C = 25°C, I_S = -30 A, V_{GS} = 0
t_{rr}	Reverse Recovery Time		350		ns	T_J = 150°C, $I_F = I_S$, dI_F/ds = 100 A/µs

1 Pulse Test: Pulse Width ≤ 300µsec, Duty Cycle ≤ 2%.

POWER RECTIFIER CHARACTERISTICS

PIV	Max. Reverse Current		Max. Forward Voltage		*Max. Reverse Recovery Time
	T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C	
200 V	20 µA	1.0 mA	1.2 V @ 15 Amp	1.00 V @ 15 Amp	35 nsec

*Measured in circuit, I_F = .5 A, I_R = 1 A, I_{REC} = .250 A.

MOSFET CHARACTERISTICS: (T_C = 25°C unless otherwise noted)

STATIC P/N OM9003SS

Parameter		Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	400			V	V_{GS} = 0, I_D = 250 µA
$V_{GS(th)}$	Gate-Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}$, I_D = 250 µA
I_{GSSF}	Gate-Body Leakage Forward			+500	nA	V_{GS} = +12.8 V
I_{GSSR}	Gate-Body Leakage Reverse			- 500	nA	V_{GS} = - 12.8 V
I_{DSS}	Zero Gate Voltage Drain Current		0.1	0.25	mA	V_{DS} = Max. Rat., V_{GS} = 0
			0.2	1.0	mA	V_{DS} = 0.8 Max. Rat., V_{GS} = 0, T_C = 125° C
$I_{D(on)}$	On-State Drain Current[1]	15			A	$V_{DS} \geq 2\ V_{DS(on)}$, V_{GS} = 10 V
$V_{DS(on)}$	Static Drain-Source On-State Voltage[1]		2.0	2.4	V	V_{GS} = 10 V, I_D = 8.0 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		0.25	0.3	Ω	V_{GS} = 10 V, I_D = 8.0 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		0.50	0.60	Ω	V_{GS} = 10 V, I_D = 8.0 A, T_C = 125°C

DYNAMIC

g_{fs}	Forward Transductance[1]	6.0	9.6		S (℧)	$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 8.0 A
C_{iss}	Input Capacitance		2900		pF	V_{GS} = 0
C_{oss}	Output Capacitance		450		pF	V_{DS} = 25 V
C_{rss}	Reverse Transfer Capacitance		150		pF	f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time		30		ns	V_{DD} = 200 V, $I_D \cong$ 8.0 A
t_r	Rise Time		40		ns	R_g = 5.0 Ω, V_G = 10 V
$t_{d(off)}$	Turn-Off Delay Time		80		ns	
t_f	Fall Time		30		ns	

BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS

I_S	Continuous Source Current (Body Diode)			- 15	A	Modified MOSPOWER symbol showing the integral P-N Junction rectifier.
I_{SM}	Source Current[1] (Body Diode)			- 60	A	
V_{SD}	Diode Forward Voltage[1]			- 1.6	V	T_C = 25°C, I_S = -15 A, V_{GS} = 0
t_{rr}	Reverse Recovery Time		400		ns	T_J = 100°C, $I_F = I_S$, dI_F/ds = 100 A/µs

1 Pulse Test: Pulse Width ≤ 300µsec, Duty Cycle ≤ 2%.

POWER RECTIFIER CHARACTERISTICS

PIV	Max. Reverse Current		Max. Forward Voltage		*Max. Reverse Recovery Time
	T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C	
400 V	20 µA	1.0mA	1.40 V @ 8 Amp	1.25 V @ 8 Amp	50 nsec

*Measured in circuit, I_F = .5 A, I_R = 1 A, I_{REC} = .250 A.

MOSFET CHARACTERISTICS: (T_C = 25°C unless otherwise noted)

STATIC P/N OM9004SS

Parameter		Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	500			V	V_{GS} = 0, I_D = 250 µA
$V_{GS(th)}$	Gate-Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}$, I_D = 250 µA
I_{GSSF}	Gate-Body Leakage Forward			+500	nA	V_{GS} = +12.8 V
I_{GSSR}	Gate-Body Leakage Reverse			- 500	nA	V_{GS} = - 12.8 V
I_{DSS}	Zero Gate Voltage Drain Current		0.1	0.25	mA	V_{DS} = Max. Rat., V_{GS} = 0
			0.2	1.0	mA	V_{DS} = 0.8 Max. Rat., V_{GS} = 0, T_C = 125° C
$I_{D(on)}$	On-State Drain Current[1]	13			A	$V_{DS} \geq 2\ V_{DS(on)}$, V_{GS} = 10 V
$V_{DS(on)}$	Static Drain-Source On-State Voltage[1]		2.1	2.8	V	V_{GS} = 10 V, I_D = 7.0 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		0.3	0.4	Ω	V_{GS} = 10 V, I_D = 7.0 A
$R_{DS(on)}$	Static Drain-Source On-State Resistance[1]		0.66	0.88	Ω	V_{GS} = 10 V, I_D = 7.0 A, T_C = 125°C

DYNAMIC

g_{fs}	Forward Transductance[1]	5.0	7.5		S (℧)	$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 7.0 A
C_{iss}	Input Capacitance		2600		pF	V_{GS} = 0
C_{oss}	Output Capacitance		280		pF	V_{DS} = 25 V
C_{rss}	Reverse Transfer Capacitance		40		pF	f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time		30		ns	V_{DD} = 210 V, $I_D \cong$ 7.0 A
t_r	Rise Time		46		ns	R_g = 5.0 Ω, V_{GS} = 10 V
$t_{d(off)}$	Turn-Off Delay Time		75		ns	
t_f	Fall Time		31		ns	

BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS

I_S	Continuous Source Current (Body Diode)			- 13	A	Modified MOSPOWER symbol showing the integral P-N Junction rectifier.
I_{SM}	Source Current[1] (Body Diode)			- 52	A	
V_{SD}	Diode Forward Voltage[1]			- 1.4	V	T_C = 25°C, I_S = -13 A, V_{GS} = 0
t_{rr}	Reverse Recovery Time		400		ns	T_J = 150°C, $I_F = I_S$, dI_F/ds = 100 A/µs

1 Pulse Test: Pulse Width ≤ 300µsec, Duty Cycle ≤ 2%.

POWER RECTIFIER CHARACTERISTICS

PIV	Max. Reverse Current		Max. Forward Voltage		*Max. Reverse Recovery Time
	T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C	
500 V	20 µA	1.0 mA	1.55 V @ 8 Amp	1.40 V @ 8 Amp	50 nsec

*Measured in circuit, I_F = .5 A, I_R = 1 A, I_{REC} = .250 A.

MOSFET ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

	Parameter	OM9001SS	OM9002SS	OM9003SS	OM9004SS	Units
V_{DS}	Drain-Source Voltage	100	200	400	500	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 1 MΩ)	100	200	400	500	V
I_D @ T_C = 25°C	Continuous Drain Current [2]	±30	±25	±15	±13	A
I_D @ T_C = 100°C	Continuous Drain Current [2]	±20	±16	±9	±8	A
I_{DM}	Pulsed Drain Current[1]	±140	±100	±60	±52	A
V_{GS}	Gate-Source Voltage (Clamped Gate)	±16	±16	±16	±16	V
P_D @ T_C = 25°C	Maximum Power Dissipation	125	125	125	125	W
P_D @ T_C = 100°C	Maximum Power Dissipation	50	50	50	50	W
Junction-To-Case	Linear Derating Factor[1]	1.0	1.0	1.0	1.0	W/°C
Junction-To-Ambient	Linear Derating Factor	.026	.026	.026	.026	W/°C
T_J T_{stg}	Operating and Storage Temperature Range	-55 to 150	-55 to 150	-55 to 150	-55 to 150	°C
Lead Temperature	(1/16" from case for 10 secs.)	300	300	300	300	°C

1 Pulse Test: Pulse width ≤ 300 μsec. Duty Cycle ≤ 2%.

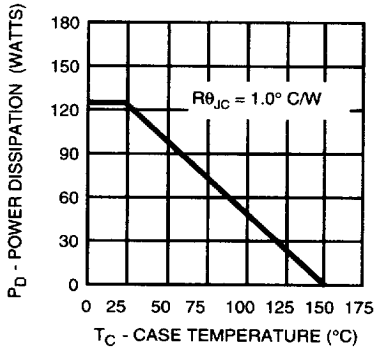
2 Package PIN Limitation: = 35 Amps

THERMAL RESISTANCE

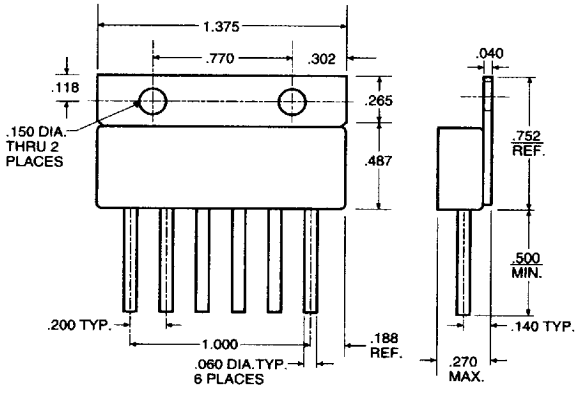
		MOSFET	RECTIFIER
R_{thJC}	Junction-to-Case	1.0°C/W	1.2°C/W
R_{thJA}	Junction-to-Ambient	40°C/W	40°C/W

2.1

POWER DERATING (MOSFET)



MECHANICAL OUTLINE



Unless otherwise specified, the general tolerance is ±.010.