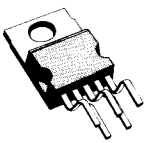
HIGH SIDE SMART SOLID STATE RELAY

ADVANCE DATA

- DRAIN CURRENT (continous) : 25A AT T_C = 25°C
- INRUSH CURRENT LIMITATION
- TTL/CMOS COMPATIBLE INPUT
- SHORT CIRCUIT PROTECTION
- LOAD OVER–VOLTAGE PROTECTION
- THERMAL SHUTDOWN
- OPEN DRAIN DIAGNOSTIC OUTPUT
- VERY LOW STAND–BY POWER DISSIPATION
- DIGITAL DIAGNOSTIC FILTERING



PENTAWATT

DESCRIPTION

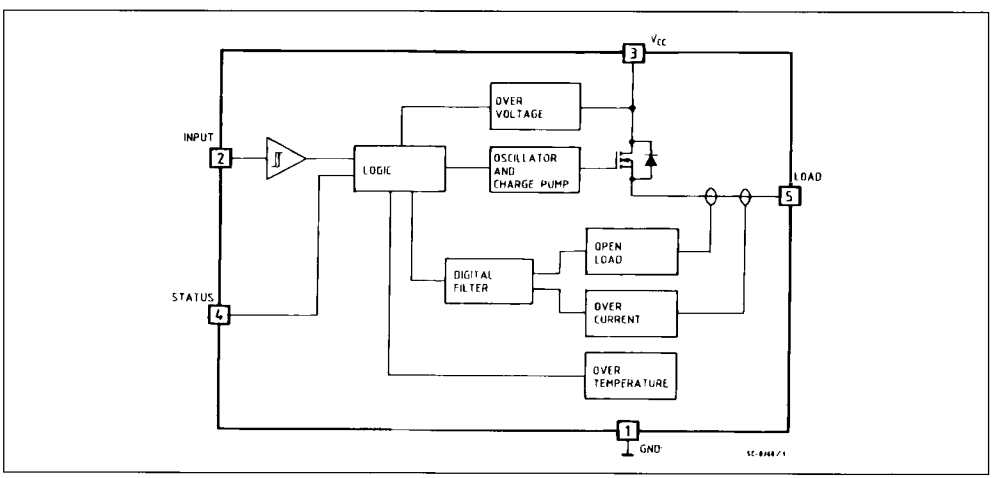
The VM200 is a Monolithic device made using SGS-THOMSON Microelectronics Vertical Intelligent Power Technology, intended for driving resistive or inductive loads, with one side connected to ground.

Built-in thermal shut-down protects the chip from over temperature. The power stage uses a low dissipation mosfet current sensing technique which provides short circuit and open load protection.

The input control is TTL/CMOS compatible. The diagnostic output provides an indication of open load and short circuit conditions, and thermal and overvoltage shut-down status.

Type	V_{DSS}	I_D*	$R_{DS\ (ON)}$
VM200	60V	25A	0.05Ω

TEST AND APPLICATION CIRCUIT

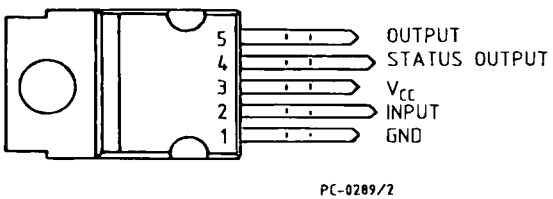


* See note 1.

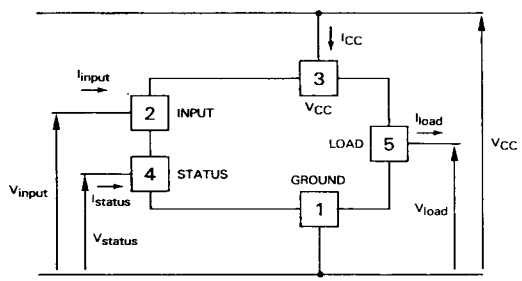
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain–source Breakdown Voltage	60	V
I_D	Drain Current (cont.)	25	A
I_R	Reverse Output Current	– 25	A
V_{IN}	Input Voltage	60	V
V_S	Status Voltage	60	V
I_O	Diagnostic Current (sink)	2	mA
V_{ESD}	Electrostatic Discharge (1.5KΩ, 100pF)	2000	V
P_{tot}	Power Dissipation	Internally Limited	
T_j	Junction Operating Temperature	– 40 to 150	°C
T_{stg}	Storage Temperature	– 55 to 150	°C

CONNECTION DIAGRAM



CURRENT AND VOLTAGE CONVENTIONS



THERMAL DATA

$R_{th\ j-case}$	Thermal Resistance Junction–case	Max.	1.67	°C/W
$R_{th\ j-amb}$	Thermal Resistance Junction–ambient	Max.	0.60	°C/W

ELECTRICAL CHARACTERISTICS : (V_{CC} = 13V; T_j = 25°C unless otherwise specified)

POWER

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Operating Voltage		6		30	V
R_{on}	On State Resistance	I_D = 12A T_j = 25°C			0.05	Ω
I_S	Supply Current	Off State			100	µA

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn–on Delay Time of Output Current	I_D = 12A Resistive Load Input Rise Time < 0.1µs		16		µs
t_r	Rise Time of Output Current	I_D = 12A Resistive Load Input Rise Time < 0.1µs		130		µs
$t_{d\ (off)}$	Turn–off Delay Time of Output Current	I_D = 12A Resistive Load Input Fall Time < 0.1µs		16		µs
t_f	Fall Time of Output Current	I_D = 12A Resistive Load Input Fall Time < 0.1µs		6		µs
$(di/dt)_{on}$	Turn–on Current Slope	I_D = 12A $I_D = I_{SC}$		0.1 2		A/µs
$(di/dt)_{off}$	Turn–off Current Slope	I_D = 12A $I_D = I_{SC}$		1.5		3

LOGIC INPUT

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input Low Level Voltage				0.8	V
V_{IH}	Input High Level Voltage		2			V
$V_{I\ (hyst)}$	Input Hysteresis Voltage			0.2		V
I_{IN}	Input Current	V_I = 5V		10		µA

ELECTRICAL CHARACTERISTICS (continued)

PROTECTIONS AND DIAGNOSTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DIAGL}	Diagnostic Voltage Output Low	I_{sink} = 1.6mA			0.8	V
I_{DIAGH}	Diagnostic Current Output High	V_{CC} = 5V			1	µA
V_{OSD}	Over Voltage Shut Down		30		40	V
I_{SC}	Short Circuit Current		25			A
I_{OL}	Open Load Current Level				50	mA
$t_{d\ (SC)}$	Short Circuit Delay Turn–off Time	IN TURN ON IN OPERATION	30 1		 1.5	ms
$t_{d\ (OL)}$	Open Load Delay Turn–off Time		1		1.5	ms
T_{TSD}	Thermal Shut Down Temperature		150			°C
$T_{RSD\ (hyst)}$	Thermal Shut Down Hysteresis		10		20	°C

The device has a diagnostic output which indicates open circuit (no load), short circuit, over current and over temperature conditions.

The truth table shows input, diagnostic output voltage level in normal operation and in fault condition.

The output signals are processed by internal logic.

The internally generated short circuit/over current signal is ignored for 33ms at turn-on, the load current is limited at the short circuit value without diagnostic signalling during this period. After this time if a fault is present the device is turned off and the diagnostic signal becomes low.

If, during normal conduction, a fault condition is detected for more than 1ms (see truth table), the device is turned off and the diagnostic output goes low. This allows short load current interruptions caused typically by brush contacts in a D. C. motor.

TRUTH TABLE

	Input	Diagnostic		Output
		Output	Delay (ms)	
Normal Operation	L H	H H		L H
Open Circuit (no load)	L H	H L	1	L H
Short-circuit/ Over-current	L H	H L	33 Turn–on 1 Normal Op.	L L
Over–temperature	L H	H L		L

L = Low Level
H = High Level
Note : 1. Internally limited by overcurrent protection (typical value).

SHORT–CIRCUIT BEHAVIOUR

Figure 1 : Test Circuit.

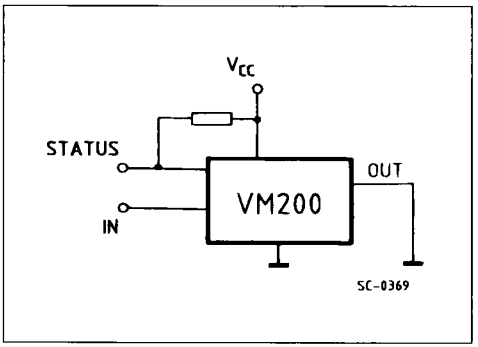
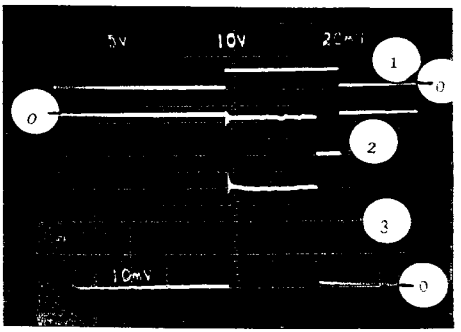


Photo 1 : Waveform.



1 : Input Voltage 5V/div.
2 : Status Voltage 10V/div.
3 : Output Current 10A/div.

SWITCHING A LAMP

Figure 2 : Application Circuit.

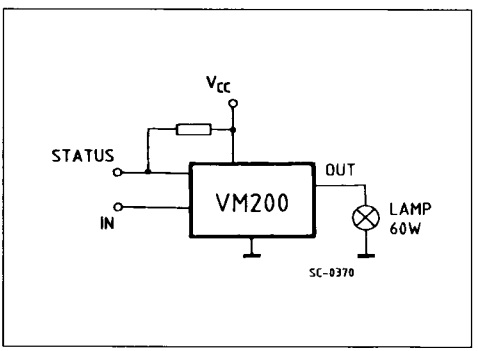
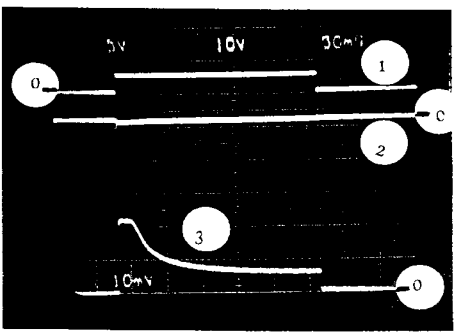


Photo 2 : Waveform.



1 : Input Voltage 5V/div.
2 : Status Voltage 10V/div.
3 : Output Current 10A/div.

SWITCHING A SOLENOID

Figure 3 : Application Circuit.

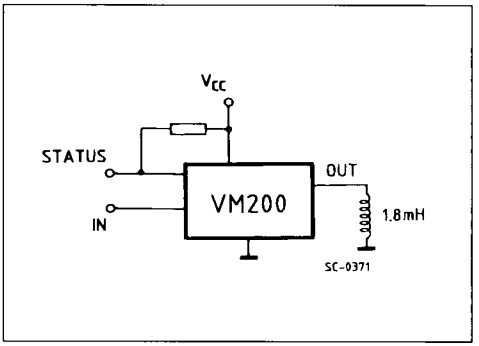
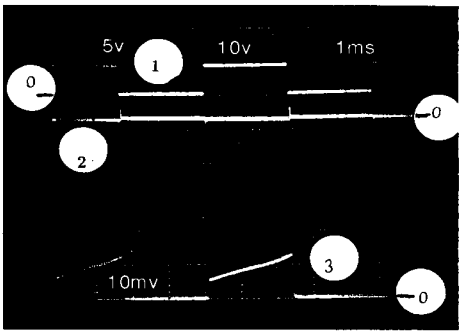


Photo 3 : Waveform.



1 : Input Voltage 5V/div.
2 : Status Voltage 10V/div.
3 : Output Current 10A/div.

OPEN LOAD BEHAVIOUR

Figure 4 : Test Circuit.

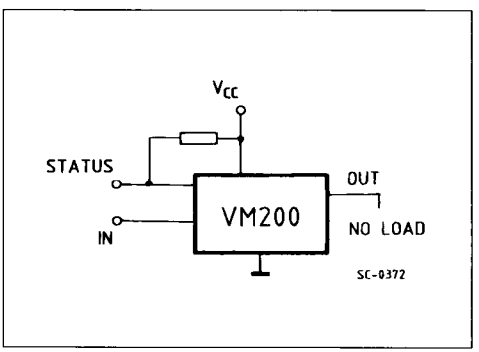
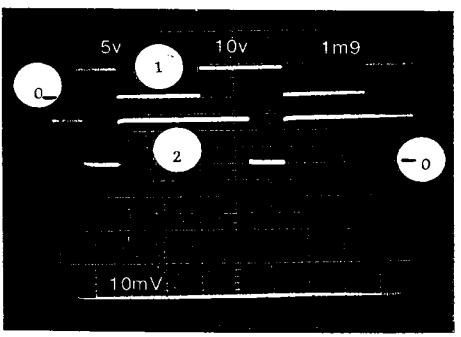
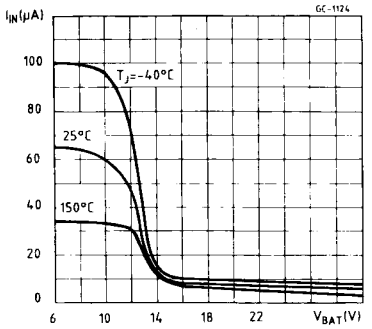


Photo 4 : Waveform.

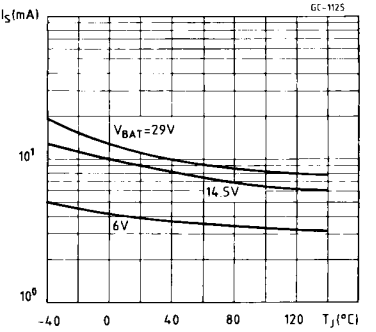


1 : Input Voltage 5V/div.
2 : Status Voltage 10V/div.
3 : Output Current 10A/div.

Input Current vs V_{bat}.



Status Current vs Junction Temperature.



On Resistance vs Junction Temperature.