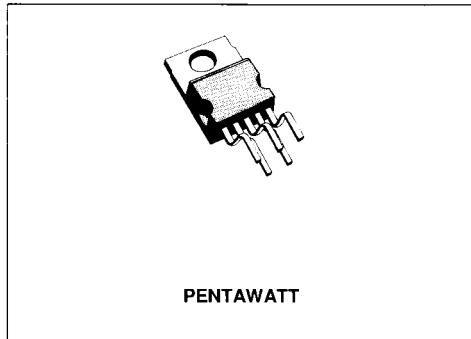


## HIGH SIDE SMART SOLID STATE RELAY

ADVANCE DATA

- DRAIN CURRENT (continuous) : 25A AT  $T_C = 25^\circ\text{C}$
- 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



### DESCRIPTION

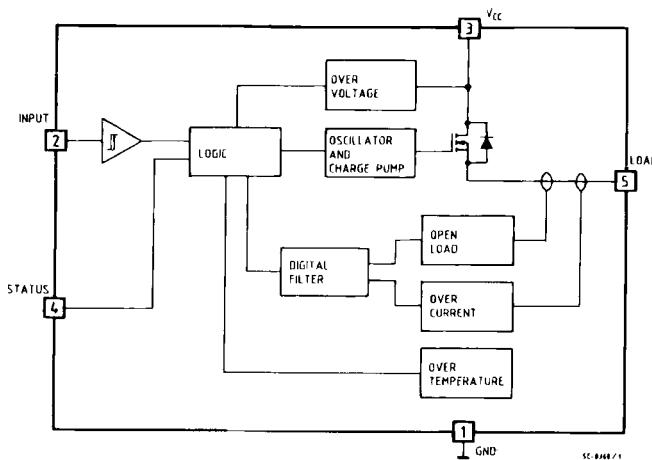
The VM200 is a Monolithic device made using SGS-THOMSON Microelectronics Vertical Intelligent Power Technology, intended for driving resistive or inductive loads, with one side connected to ground.

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 over-voltage shut-down status.

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

### TEST AND APPLICATION CIRCUIT

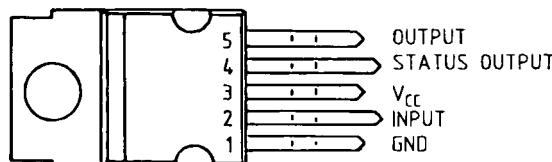


\* See note 1.

## ABSOLUTE MAXIMUM RATINGS

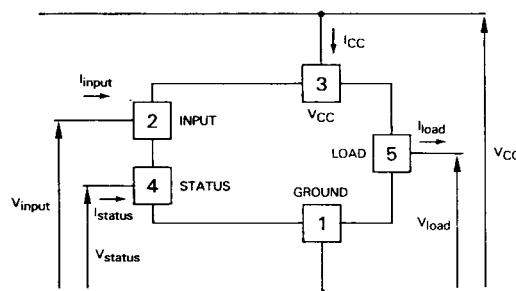
Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	60	V
$I_D$	Drain Current (cont.)	25	A
$I_R$	Reverse Output Current	- 25	A
$V_{IN}$	Input Voltage	60	V
$V_S$	Status Voltage	60	V
$I_D$	Diagnostic Current (sink)	2	mA
$V_{ESD}$	Electrostatic Discharge (1.5KΩ, 100pF)	2000	V
$P_{tot}$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

## CONNECTION DIAGRAM



PC-0289/2

## CURRENT AND VOLTAGE CONVENTIONS



**THERMAL DATA**

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

**ELECTRICAL CHARACTERISTICS** : ( $V_{CC} = 13\text{V}$ ;  $T_j = 25^{\circ}\text{C}$  unless otherwise specified)**POWER**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CC}$	Operating Voltage		6		30	V
$R_{on}$	On State Resistance	$I_D = 12\text{A}$ $T_j = 25^{\circ}\text{C}$			0.05	$\Omega$
$I_S$	Supply Current	Off State			100	$\mu\text{A}$

**SWITCHING**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time of Output Current	$I_D = 12\text{A}$ Resistive Load Input Rise Time < $0.1\mu\text{s}$		16		$\mu\text{s}$
$t_r$	Rise Time of Output Current	$I_D = 12\text{A}$ Resistive Load Input Rise Time < $0.1\mu\text{s}$		130		$\mu\text{s}$
$t_{d(off)}$	Turn-off Delay Time of Output Current	$I_D = 12\text{A}$ Resistive Load Input Fall Time < $0.1\mu\text{s}$		16		$\mu\text{s}$
$t_f$	Fall Time of Output Current	$I_D = 12\text{A}$ Resistive Load Input Fall Time < $0.1\mu\text{s}$		6		$\mu\text{s}$
$(di/dt)_{on}$	Turn-on Current Slope	$I_D = 12\text{A}$ $I_D = I_{SC}$		0.1 2		$\text{A}/\mu\text{s}$
$(di/dt)_{off}$	Turn-off Current Slope	$I_D = 12\text{A}$ $I_D = I_{SC}$		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	$V_I = 5\text{V}$		10		$\mu\text{A}$

**ELECTRICAL CHARACTERISTICS** (continued)**PROTECTIONS AND DIAGNOSTICS**

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

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		L
	H	H		
Open Circuit (no load)	L	H	1	L
	H	L		
Short-circuit/ Over-current	L	H	33 Turn-on 1 Normal Op.	L
	H	L		
Over-temperature	L	H		L
	H	L		

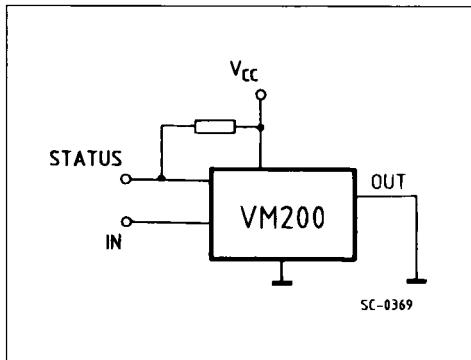
L = Low Level

H = High Level

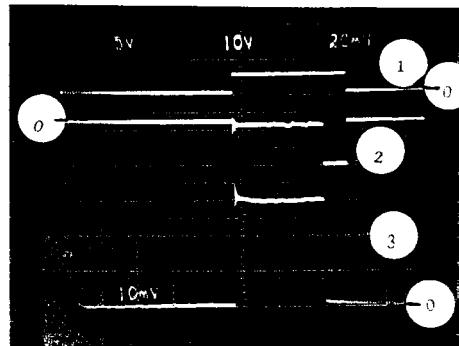
Note : 1. Internally limited by overcurrent protection (typical value).

## SHORT-CIRCUIT BEHAVIOUR

**Figure 1** : Test Circuit.



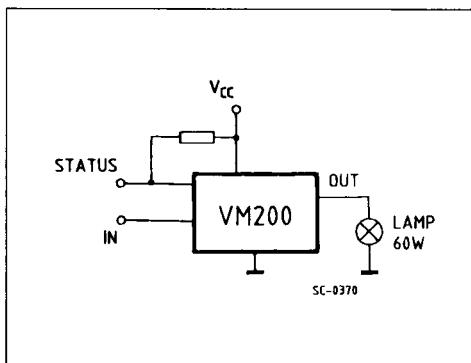
**Photo 1** : Waveform.



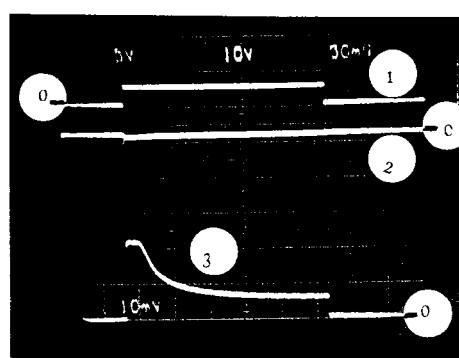
1 : Input Voltage 5V/div.  
2 : Status Voltage 10V/div.  
3 : Output Current 10A/div.

## SWITCHING A LAMP

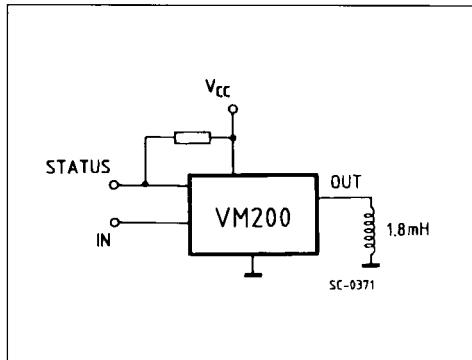
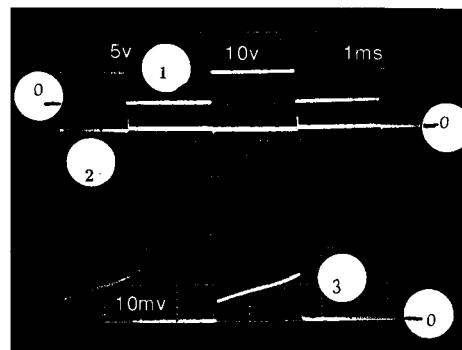
**Figure 2** : Application Circuit.



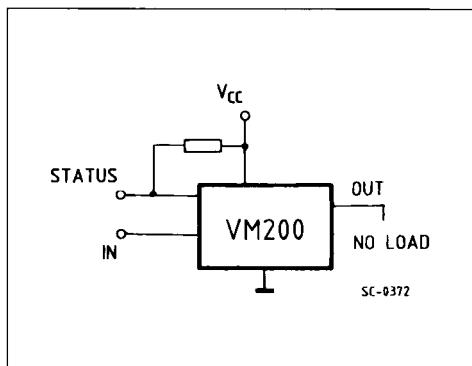
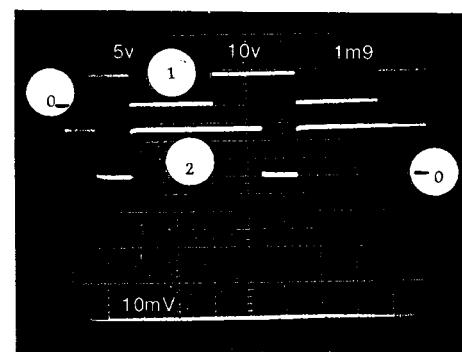
**Photo 2** : Waveform.



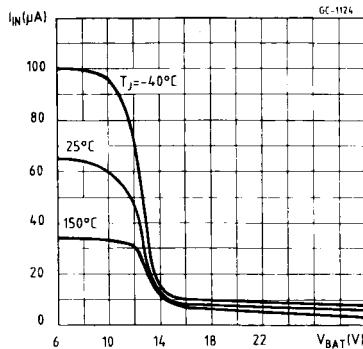
1 : Input Voltage 5V/div.  
2 : Status Voltage 10V/div.  
3 : Output Current 10A/div.

**SWITCHING A SOLENOID****Figure 3 : Application Circuit.****Photo 3 : Waveform.**

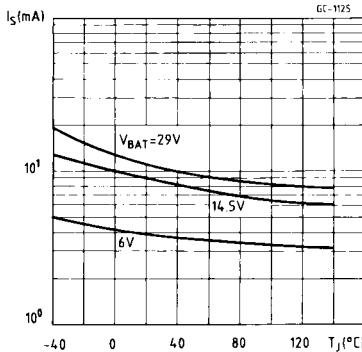
1 : Input Voltage 5V/div.  
2 : Status Voltage 10V/div.  
3 : Output Current 10A/div.

**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.

