

GP201MHS18

$\mathbf{Low}~\mathbf{V}_{\mathbf{CE}(\mathbf{SAT})}~\mathbf{Half}~\mathbf{Bridge}~\mathbf{IGBT}~\mathbf{Module}$

DS5290-2.1 January 2001

FEATURES

- Low V_{CE(SAT)}
- Non Punch Through Silicon
- Isolated Copper Baseplate
- Low Inductance Internal Construction
- 200A Per Arm

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Resonant Converters

The Powerline range of high power modules includes half bridge, dual and single switch configurations covering voltages from 600V to 3300V and currents up to 4800A.

The GP201MHS18 is a half bridge 1800V, n channel enhancement mode, insulated gate bipolar transistor (IGBT) Designed with low $V_{\text{CE}(\text{SAT})}$ to minimise conduction losses, the module is of particular relevance in low to medium frequency applications. The IGBT has a wide reverse bias safe operating area (RBSOA) ensuring reliability in demanding applications.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise earthed heat sinks for safety.

ORDERING INFORMATION

Order As:

GP201MHS18

Note: When ordering, please use the complete part number.

KEY PARAMETERS

V _{CES}		1800V
V _{CE(sat)}	(typ)	2.6V
I _C	(max)	200A
I _{C(PK)}	(max)	400A

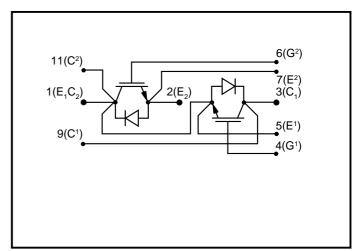


Fig. 1 Half bridge circuit diagram

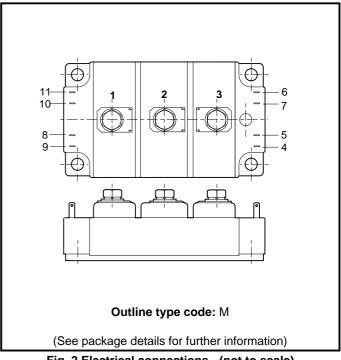


Fig. 2 Electrical connections - (not to scale)



ABSOLUTE MAXIMUM RATINGS - PER ARM

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	$V_{GE} = 0V$	1800	V
V _{GES}	Gate-emitter voltage	-	±20	V
I _c	Collector current	DC, $T_{case} = 80^{\circ}$ C for $T_{j} = 125^{\circ}$ C	200	А
I _{C(PK)}	Peak collector current	1ms, T _{case} = 120°C	400	Α
P _{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}C, T_{j} = 150^{\circ}C$	1500	W
V _{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance - transistor (per arm)	Continuous dissipation -	-	84	°C/kW
		junction to case			
R _{th(j-c)}	Thermal resistance - diode (per arm)	Continuous dissipation -	-	160	°C/kW
		junction to case			
R _{th(c-h)}	Thermal resistance - case to heatsink (per module)	Mounting torque 5Nm	-	15	°C/kW
		(with mounting grease)			
T _j	Junction temperature	Transistor	-	150	°C
		Diode	-	125	°C
T _{stg}	Storage temperature range	-	-40	125	°C
-	Screw torque	Mounting - M6	-	5	Nm



ELECTRICAL CHARACTERISTICS

 T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
I _{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$	-	-	1	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _{case} = 125°C	-	-	7	mA
I _{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	±1	μА
V _{GE(TH)}	Gate threshold voltage	$I_{\rm C}$ = 10mA, $V_{\rm GE} = V_{\rm CE}$	4.5	5.5	6.5	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 200A	-	2.6	3.2	V
		V _{GE} = 15V, I _C = 200A, T _{case} = 125°C	-	3.3	4	V
I _F	Diode forward current	DC	-	-	200	А
I _{FM}	Diode maximum forward current	t _p = 1ms	-	-	400	А
V _F	Diode forward voltage	I _F = 200A	-	2.2	2.5	V
		I _F = 200A, T _{case} = 125°C	-	2.3	2.6	V
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz	-	25	-	nF
L _M	Module inductance	-	-	30	-	nH



ELECTRICAL CHARACTERISTICS

 $T_{case} = 25$ °C unless stated otherwise

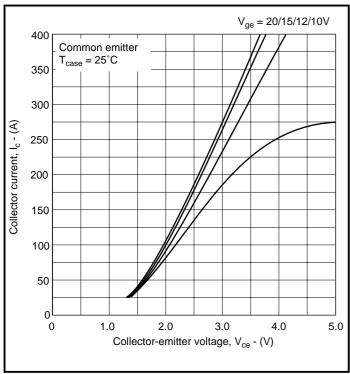
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 200A	-	500	650	ns
t _f	Fall time	$V_{GE} = \pm 15V$	-	250	350	ns
E _{OFF}	Turn-off energy loss	V _{CE} = 900V	-	90	180	mJ
t _{d(on)}	Turn-on delay time	$R_{G(ON)} = R_{G(OFF)} = 4.7\Omega$	-	450	600	ns
t _r	Rise time	L ~ 100nH	-	90	120	ns
E _{on}	Turn-on energy loss		-	70	100	mJ
Q _{rr}	Diode reverse recovery charge	$I_F = 200A, V_R = 50\% V_{CES},$	-	50	80	μС
		$dI_F/dt = 2500A/\mu s$				

T_{case} = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
t _{d(off)}	Turn-off delay time	I _c = 200A	-	600	800	ns
t _f	Fall time	V _{GE} = ±15V	-	350	450	ns
E _{OFF}	Turn-off energy loss	V _{CE} = 900V	-	130	200	mJ
$t_{d(on)}$	Turn-on delay time	$R_{G(ON)} = R_{G(OFF)} = 4.7\Omega$	-	540	700	ns
t _r	Rise time	L ~ 100nH	-	100	130	ns
E _{on}	Turn-on energy loss		-	120	150	mJ
Q _{rr}	Diode reverse recovery charge	$I_F = 200A, V_R = 50\% V_{CES},$	-	80	110	μС
		dl _F /dt = 2000A/μs				



TYPICAL CHARACTERISTICS



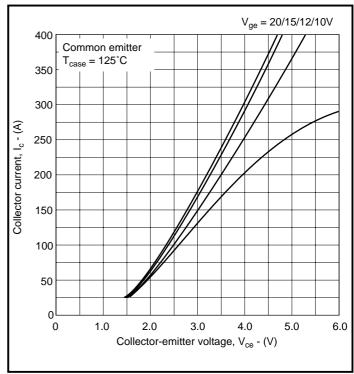
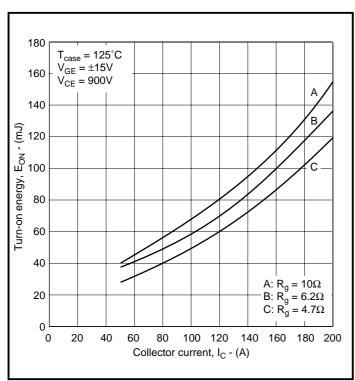
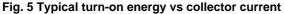


Fig. 3 Typical output characteristics

Fig. 4 Typical output characteristics





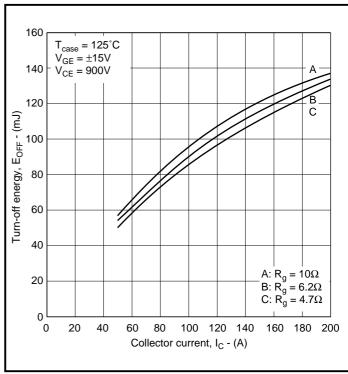
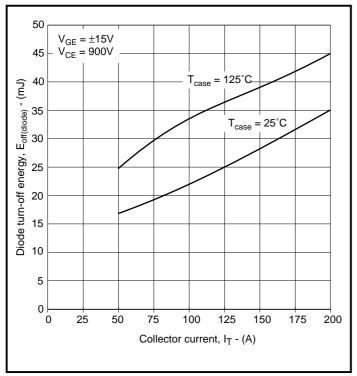


Fig. 6 Typical turn-off energy vs collector current





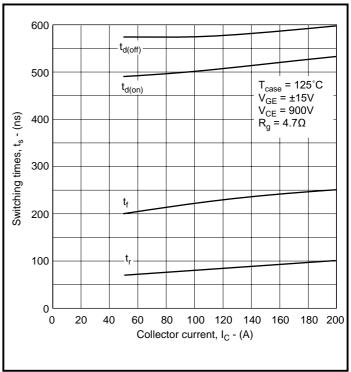


Fig. 7 Typical diode turn-off energy vs collector current

Fig. 7 Typical diode reverse recovery charge vs collector current

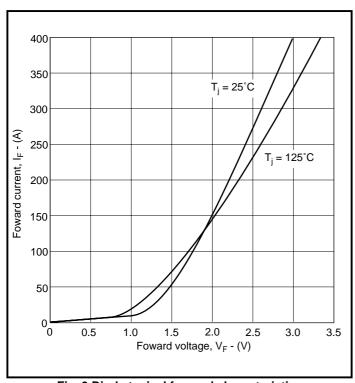


Fig. 9 Diode typical forward characteristics

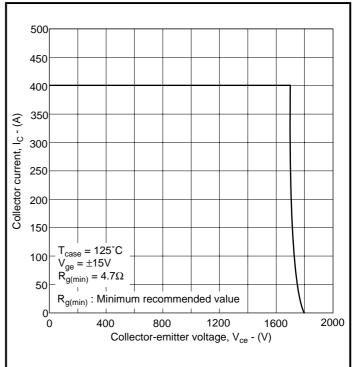
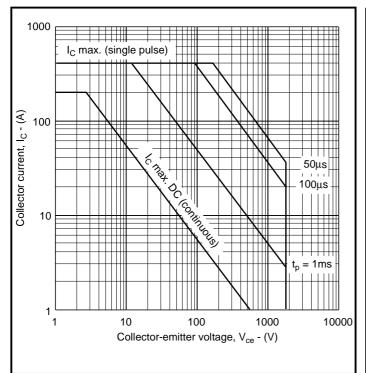


Fig. 10 Reverse bias safe operating area





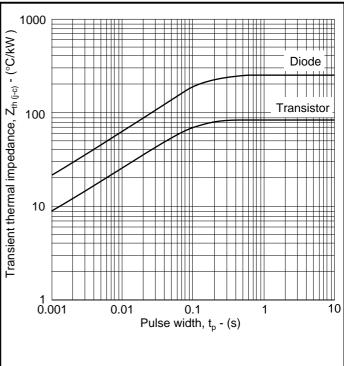


Fig. 11 Forward bias safe operating area

Fig. 12 Transient thermal impedance

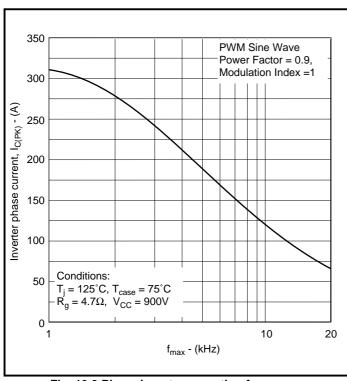


Fig. 13 3 Phase inverter operating frequency

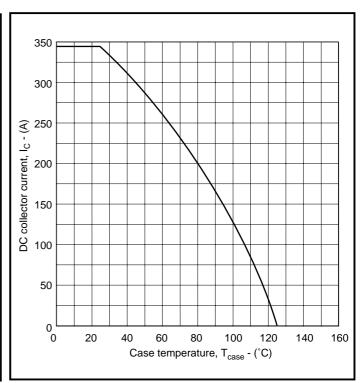
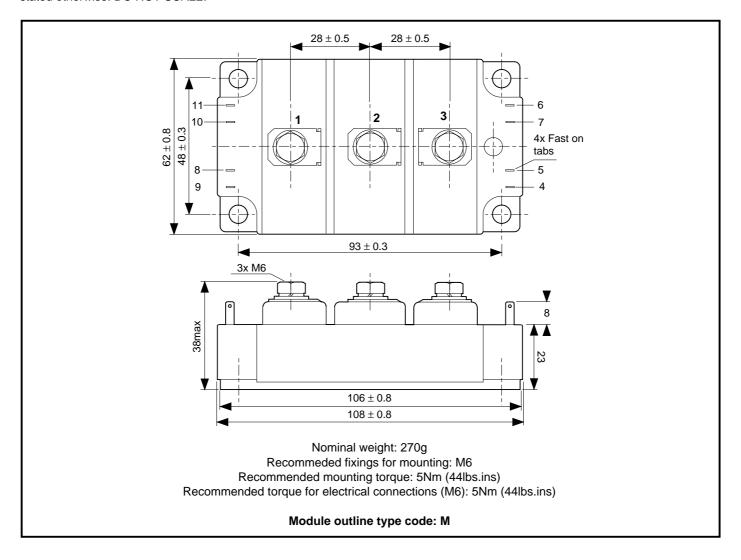


Fig. 14 DC current rating vs case temperature



PACKAGE DETAILS

For further package information, please visit our website or contact your nearest Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.





ASSOCIATED PUBLICATIONS

Title	Application Note	
	Number	
Electrostatic handling precautions	AN4502	
An introduction to IGBTs	AN4503	
IGBT ratings and characteristics	AN4504	
Heatsink requirements for IGBT modules	AN4505	
Calculating the junction temperature of power semiconductors	AN4506	
Gate drive considerations to maximise IGBT efficiency	AN4507	
Parallel operation of IGBTs – punch through vs non-punch through characteristics	AN4508	
Guidance notes for formulating technical enquiries	AN4869	
Principle of rating parallel connected IGBT modules	AN5000	
Short circuit withstand capability in IGBTs	AN5167	
Driving Dynex Semincoductor IGBT modules with Concept gate drivers	AN5384	

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We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

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