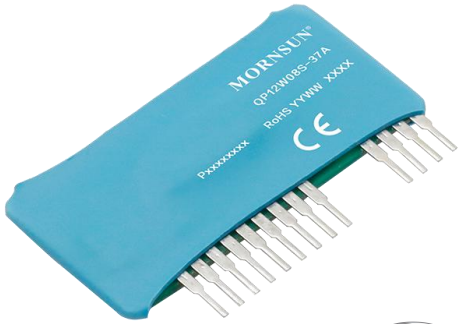
IGBT Driver
QP12W08S-37A

MORNSUN®

Hybrid integrated IGBT driver



Patent protection CE Report EN62368-1 RoHS

FEATURES

- Built-in isolated DC-DC power supply; Single power supply drive topology
- High isolation voltage of 3750VAC
- Input signal frequency up to 20kHz
- Built-in fault circuit with a pin for fault feedback
- Drive signal ignored during blocking time, fault circuit reset after blocking time end
- Adjustable controlled time of fault detection circuit
- Adjustable protective soft cut-off time
- SIP package

Matched IGBT

- 600V series IGBT (current ≤600A)
- 1,200V series IGBT (current ≤400A)
- 1,700V series IGBT (current ≤200A)

Applications

- Universal inverter
- AC servo drive system
- Uninterruptible Power Supply (UPS)
- Electric welding machine

QP12W08S-37A is an integrated hybrid IGBT driver designed with a built-in isolation DC-DC converter. This device is a fully isolated gate drive circuit consisting of an optimally isolated gate drive amplifier and an isolated DC-DC converter. The gate driver provides a fault protection function based on desaturation detection and fault output.

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output			Maximum capacitive load（uF）
			Output High-level Voltage V_{OH} (VDC)	Output Low-level Voltage V_{OL} (VDC)	Max. Driving Current (A)	
EN	QP12W08S-37A	12	15	-9	±8	2200

Maximum ratings

Item	Symbol	Testing Conditions	Value	Unit
Power Supply Input Voltage	V_D	DC	13	V
Input Impulse High-level Current	I_{IH}	Between PIN3 and PIN4	25	mA
Output Voltage	V_o	Output High-level Voltage	VCC	V
Driver Output Peak Current	$I_{g\,on}$	Pulse Width 2us Frequency f=20kHz	+8	A
	I_{goff}		-8	
Fault Output Current	I_{fo}		20	mA
Max. Input Voltage to Fault Detect Pin	V_{R1}	Applied PIN13	50	V

Input Specifications

Item	Symbol	Testing Conditions	Min.	Typ.	Max.	Unit
Power Supply	V_D		11.6	12	12.4	V
Maximum incoming current	I_{In}		--	180	290	mA
High-level Input Current	I_{IH}		10	16	20	mA

Output Specifications

Item		Symbol	Testing Conditions	Min.	Typ.	Max.	Unit
Isolated Power Supply Voltage		V_{CC}	V_D=12V	14.5	--	18	V
		V_{EE}	V_D=12V	-7	--	-10	
Drive Output	High-level Voltage	V_{OH}	10kΩ Connected Between PIN9-11	13.5	15.0	17.0	
	Low-level Voltage	V_{OL}	10kΩ Connected Between PIN9-11	-6	-9	-10	
	Rise Time	t_r	I_{IH}=10mA	--	0.3	1	μS
	Fall Time	t_f	I_{IH}=10mA	--	0.3	1	

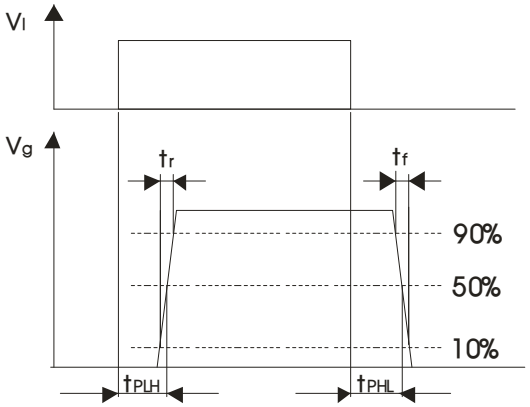
General Specifications

Item		Symbol	Testing Conditions	Min.	Typ.	Max.	Unit
Operating Frequency		f		0	--	20	kHz
Input Impulse and Drive Output	Rise Delay Time	t_{PLH}	I_{IH}=10mA	--	0.5	1	μS
	Fall Delay Time	t_{PHL}	I_{IH}=10mA	--	1	1.3	
Controlled Time of Detect Fault Circuit		t_{trip}	V_D= 12V, fault protection function	--	1.6	--	
Fault Soft Turn-off Time		t_{cf}	V_D = 12V, fault protection function	--	4.5	--	
Fault Reset Time		t_{timer}	Time from start to end of protection signal	1	1.4	2	mS
Fault Threshold Voltage		V_{ocp}	V_D=12V	--	9.5	--	V
SC Detect Voltage		V_{SC}	Collector Voltage of Module	15	--	--	
Fault Output Current		I_{FO}	PIN15 Input Current, R=4.7kΩ	--	5	--	mA
Gate Resistant		R_g		2	--	--	Ω
Insulation Test		V_{iso}	Sine Wave 50Hz/60Hz, 1min, leakage current <1mA	--	--	3750	VAC
Operating Temperature		T_{op}		-40	--	70	℃
Storage Temperature		T_{st}		-50	--	125	
Weight		W		--	6.0	--	g
Safety Standard				EN62368-1(Report)			
Safety Class				CLASS III			

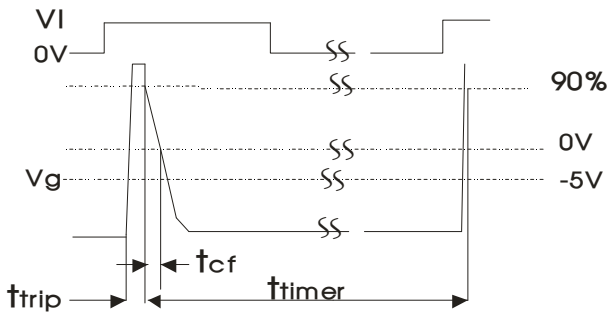
Design Reference

1. Description of Characteristic

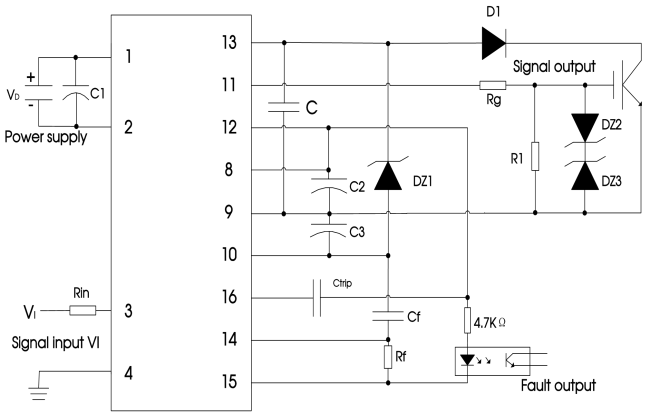
1) Definition of Fault-free Characteristic



2) Definition of Fault Characteristic



2. Typical application



V_D	12V
V_I	5V±5%
C1	100μF/35V(Low impedance)
C2	100μF/35V(Low impedance)
C3	100μF/35V(Low impedance)
Ctrip	set as required (optional)
Cf	set as required (optional)
Rf	set as required (optional)
Rg	5Ω
R1	10kΩ 0.25W
DZ1	TVS(30V , 0.5W)
DZ2, DZ3	TVS(18V , 1W)
D1	fast recovery diode (trr≤0.2μs)

Note:

1. For further ripple & noise reduction, connect an additional capacitor each with a value between 1uF and 10uF in parallel with capacitors C2 and C3.
2. If the input impulse voltage is too high, the current-limiting resistance can be adjusted to meet the requirements of the input impulse current. A high-speed opto-coupler LED with a 150Ω series resistance is connected in between the signal input terminals and the current-limiting resistance can be calculated according to the following formula:

$$R_{in} = \frac{V_I - 1.7V}{I_{IH}} - 150\Omega$$

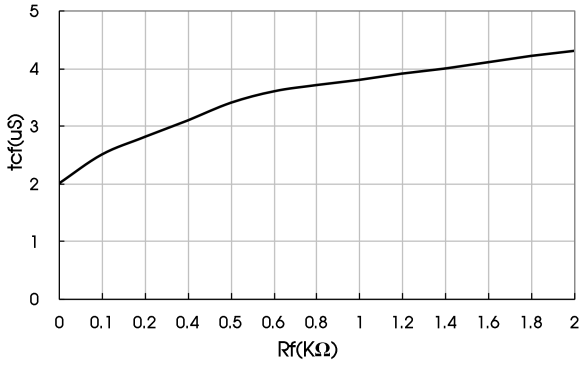
3. If the application environment is poor, a ceramic capacitor C can be added between pin 9 and pin 13, the recommended capacity value is 0.1uF. In fact, the selection needs to be combined with the customer's application environment.
4. D1 should be selected according to the voltage of the bus. Generally, it should be greater than or equal to twice the voltage of the bus. In practice, selection should be based on the customer's application environment.

(1) Fault soft turn-off time adjustment:

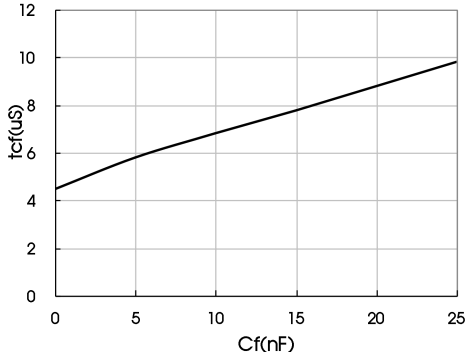
When a short-circuit or an over-current condition occurs, the driver protection circuit activates and slowly turns off the IGBT. The default turn-off time is 4.5μS, and this turn-off time can be adjusted by connecting an external resistor Rf to reduce the time, or capacitor Cf to increase the time. The adjustment range is 2.5μS to 10μS. The values for protective turn-off time adjustment in the table below are for reference only and must be verified to suite the actual application.

Reference values for Fault soft turn-off time adjustment			
R_f (kΩ)	t_{cf} (μS)	C_f (nF)	t_{cf} (μS)
—	4.5	—	4.5
1.5	4.0	1	4.9
0.5	3.5	3.3	5.3
0.3	3.0	10	6.5
0.11	2.5	22	9.3

Reference curve of relation between fault soft turn-off time and Rf

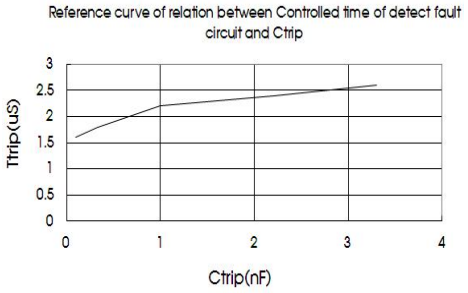


Reference curve of relation between fault soft turn-off time and Cf



(2) Controlled fault detection time adjustment:
When a short circuit or an over current condition occurs, the time from the moment the driver detects a short circuit or an over current condition to when the gate potential drops to 90% of the normal amplitude is called "Controlled Time of Fault Detection". The driver sets the default minimum controlled time for the fault detection circuit and the user can increase this time, by connecting an external Ctrip capacitance. The maximum time that can be adjusted is 3.5μS. The values for adjustment controlled short circuit time detection in the table below are for reference only and must be verified to suite the actual application

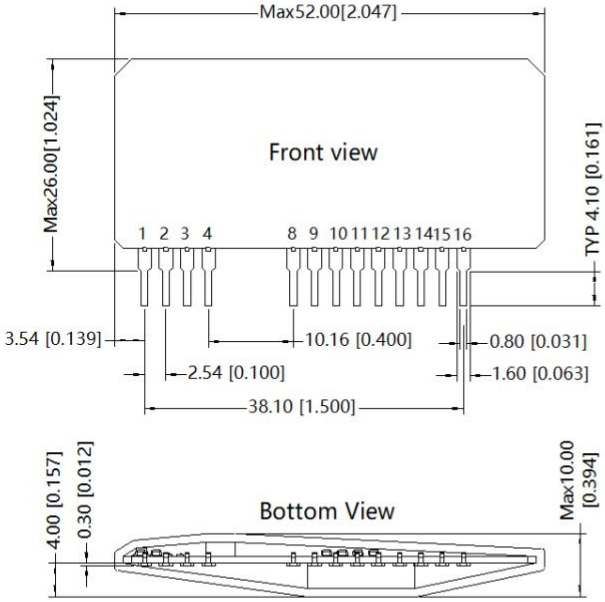
Reference values for Controlled fault detection time adjustment	
C_{trip} (nF)	t_{trip}(μS)
--	1.6
0.10	1.8
0.33	2.0
2.20	2.4
3.30	2.8

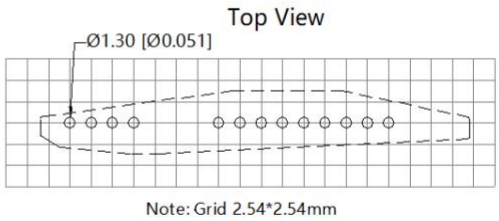


3. For additional information please refer to IGBT Driver application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





Note: Grid 2.54*2.54mm

Pin-Out			
Pin	Function	Pin	Function
1	Power supply (+)	11	Drive output
2	Power supply (-)	12	Collector of internal power tube
3	Drive signal input(+)	13	Detect of short circuit
4	Drive signal input(-)	14	Adjustment of Soft turn-off time
8	DC/DC converter output (+)	15	Fault signal output
9	DC/DC converter output (COM)	16	Adjustment of short-circuit detection time delay
10	DC/DC converter output (-)		

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number: 58230001;
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. The built-in isolated DC-DC power supply is for internal driver use only and cannot be used for external connections.
4. The driver must be wired as short as possible to the IGBT module's gate and emitter terminals (1m max.);
5. Twisted pair is recommended for the connection of the driver to the gate and emitter of the IGBT;
6. In order to reduce the high peak voltage generated at the collector of the IGBT turn-off, it is recommended to increase the gate resistance appropriately;
7. The additional capacitor or resistor should be placed as close as possible to the driver terminals. Do not exceed the recommended maximum values;
8. Select electrolytic capacitors for C2 and C3 with a low ESR and placed them as close as possible to the driver terminals;
9. Select a fast recovery diode D1 (connected to pin13) with a peak reverse voltage that is higher than the peak value of the IGBT collector voltage;
10. The 30V Zener diode DZ1 is connected between pin13 and pin10, protecting the driver from the reverse recovery characteristic of the diode D1 which could generate an excessive voltage on pin13;
11. 4.7kΩ resistance can be connected between pin13 and pin 9 if fault detection no required.(D1 and DZ1 is not required in this circuit).
12. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load, and measured when Rg=5Ω;
13. All index testing methods in this datasheet are based on company corporate standards;
14. The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
15. We can provide product customization service, please contact our technicians directly for specific information ;
16. Products are related to laws and regulations: see "Features" ;
17. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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