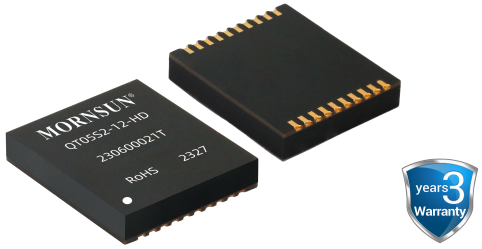
Dual integrated MOSFET driver



Patent protection

FEATURES

- Integrated high efficiency isolated power supply
- Two independent driver output channels
- 4A peak pulling current and 8A peak filling current
- Separate output, open and close speed can be adjusted separately
- Integrated FET switch status detection function
- Integrated UVLO protection
- Isolation voltage: 600Vrms
- Ultra-small, ultra-thin, chip-scale DFN package
- Operating temperature range: -55℃ to 125℃

Scope of application

- Switching power supply
- Motor control
- EV/HEV inverters and DC/DC converters
- Rectifiers for servers and communication devices
- PV boost and inverter
- Used to drive new wide-band gap power devices

QT05S2-12 is a high-speed gate driver that integrates 4A peak pull current and 8A peak fill current of an isolated power supply to efficiently and safely drive MOSFETs as well as emerging wide-gap power devices for any application requiring gate amplification drive. The product provides the necessary electrical isolation for the drive signal through capacitive isolation, and integrates the MOSFET switch status detection function to output the detection signal.

Selection Guide

Part No.	Input Voltage(VDC)	Drive output			Number of channels
		Output high level voltage(VDC)	Output low level voltage(VDC)	Drive output current(A)	
QT05S2-12	5	12	0	+4/-8	2

Note: This product features dual output channels. The two channels operate independently of each other (without isolation). Unless otherwise specified, the following specifications specifically refer to the single channel, and the performance of the two channels is consistent.

Maximum allowed value

Item	Symbol	Conditions	Numerical value	Unit
Power supply input voltage	V_{CC}	DC	5.5	V
Working current	I_{CC}	DC	150	mA
Peak drive output current	$I_{g\,on}$	Frequency f=1kHZ	+4	A
	I_{goff}		-8	
Signal input voltage	V_{IN}	3, 9 pin voltage	5.5	V
Test end withstand voltage	V_{JC}	15, 19 pin voltage	5.5	V

Input Specifications

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply	Input voltage	V_{CC}		4.5	5.0	5.5	V
	No-load current	I_{in}	V_{CC}=5V	--	24	35	mA
	Working current		Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	25	40	mA
			Vcc=5V, f=10kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	35	50	mA
			Vcc=5V, f=50kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	60	75	mA
			Vcc=5V, f=100kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	95	120	mA
	Single channel operating power		Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	0.125	0.25	W
Input signal	High level voltage	V_H		2	--	5.5	V
	Low level voltage	V_L		0	--	0.8	V
Detection signal input	High level voltage	V_{JCH}		2	--	5.5	V
	Low level voltage	V_{JCL}		0	--	0.8	V

Note: ①The duty cycle of the input signal under the working current test condition is 50%;
②When the detection signal (JC) pin is suspended, the internal default pull-up resistance is 10kΩ.

Output Specifications

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Drive output	High level voltage	V_{OH}	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	10	12	14	V
	Low level voltage	V_{OL}	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	0	--	1	
	Output rise time	t_r	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	0.4	1	uS
	Output drop time	t_f	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	0.4	1	
	Output rise delay	t_{PLH}	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	0.2	1	
	Output drop delay	t_{PHL}	Vcc=5V, f=1kHz, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF		0.2	1	
Feedback output	High level voltage	V_{FKH}	I_{FKH}=4mA	Vcc-0.4	Vcc-0.1	--	V
	Low level voltage	V_{FKL}	I_{FKL}=-4mA	--	--	0.4	
	High level output current	I_{FKH}		--	4	--	mA
	Low level output current	I_{FKL}		--	-4	--	
	Output rise time	t_{FKr}		--	--	0.15	uS
	Output drop time	t_{FKf}		--	--	0.15	
	Output rise delay	t_{FKLH}		--	--	0.2	
	Output drop delay	t_{FKHL}		--	--	0.2	

Note: ①When the signal input (IN) pin is suspended, the internal default pull-up resistance is 51kΩ.

General Specifications

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating frequency	f	Vcc=5V, R_{gon}=R_{goff}=10Ω, C_{LOAD}=20nF	--	--	100	kHz
Primary/secondary side isolation voltage	V_{iso}	Sine 50Hz/60Hz, 1 minute, leakage current < 1mA	--	--	3000	Vrms
Electrostatic immunity (ESD)	V_{ESD}	Human Body Model (HBM), ANSI/ESDA/JEDEC JS-001	-2000		+2000	V
		Charged Device Model (CDM), JEDEC specification JESD22-C101	-1500		1500	
Operating temperature	T_{op}		-55	--	+125	℃
Storage temperature	T_{st}		-65	--	+150	
weight	W		--	1.9	--	g
Reflow temperature		Peak temperature Tc≤250℃, the maximum time above 217℃ is 60 s, the actual application refer to IPC/JEDEC J-STD-020D.3 standard.			250	℃
Tide sensitive class			MSL 3			
Safety level			CLASS III			

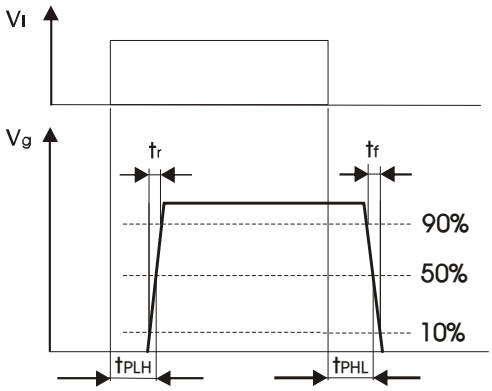
Pin Description

Pin	Mark	Description
1	NC	Empty
2	FK1	Channel 1 status feedback terminal (low level connected, high level disconnected)
3	IN1	Logic Channel 1 drive signal input terminal (high level effective)
4	VCC1	Channel 1 is the positive terminal of the working voltage.
5	GND1	Channel 1 is the negative terminal of the working voltage.
6	VCC2	Channel 2 is the positive terminal of the working voltage.
7	GND2	Channel 2 is the negative terminal of the working voltage.
8	FK2	Channel 2 status feedback terminal (low level connected, high level disconnected)
9	IN2	Channel 2 drive signal input terminal (high level effective)
10	NC	Empty
11	NC	Empty

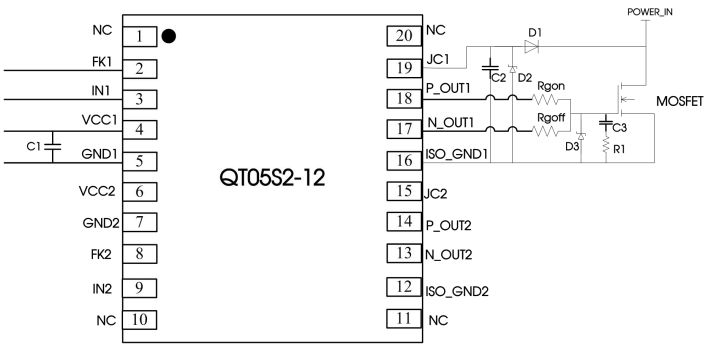
12	ISO_GND2	Channel 2 isolates the negative terminal of the power output.
13	N_OUT2	Channel 2 drives down the output terminal.
14	P_OUT2	Channel 2 drives the pull-up output terminal.
15	JC2	Channel 2 feedback signal input terminal.
16	ISO_GND1	Channel 1 isolates the negative terminal of the power output.
17	N_OUT1	Channel 1 drives down the output terminal.
18	P_OUT1	Channel 1 drives the pull-up output terminal.
19	JC1	Channel 1 feedback signal input terminal.
20	NC	Empty

Design Reference

1. Define input and output features



2. Typical application circuit



Recommended parameters:

C1	100nF
C2	10nF
C3	10nF
R1	10kΩ
D1	Fast recovery diode(trr≤0.2μs)
D2	TVS tube(6.5V)
D3	TVS tube(18V)
Rgon	10Ω
Rgoff	7.5Ω

Note:

1. Select different withstand voltage values on D1 according to the bus voltage, which is generally greater than or equal to twice the bus voltage, and consider D1 voltage drop when selecting, so that D1 positive pilot voltage drop plus MOSFET on-voltage drop is less than 1.1V, otherwise the MOSFET switch detection function may not be available.

2. C2, D2 are JC pin protection devices, recommended. If the bus interference is large, the C2 capacity value is increased as appropriate, and the actual selection needs to be combined with the customer application environment.

3.Rgon and Rgoff selection should be combined with customer system debugging.

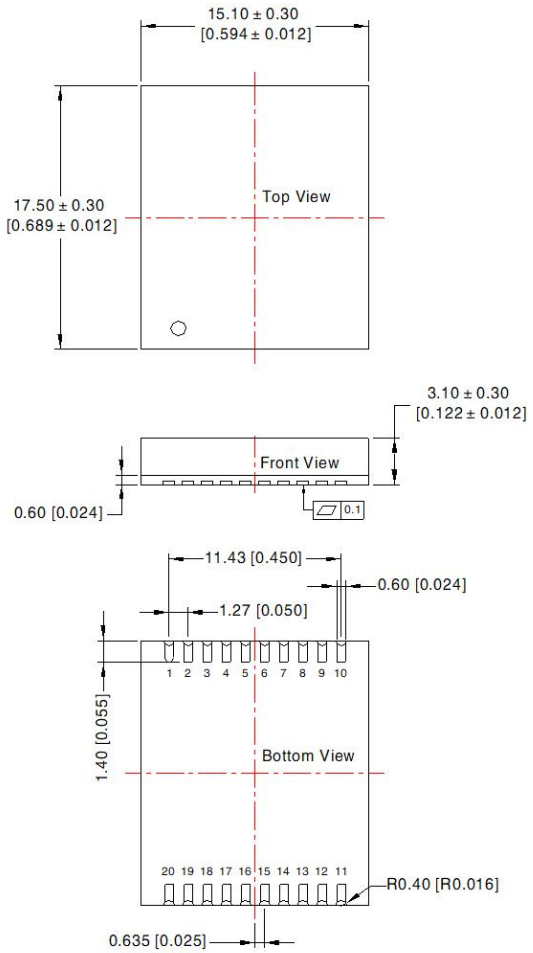
3. For additional information please refer to application notes on www.mornsun-power.com

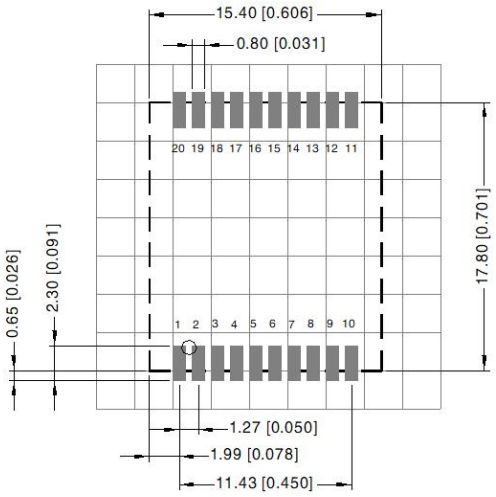
Ordering Information

Part number	Package	Number of pins	Product marking	Tape & Reel
QT05S2-12	DFN	20	QT05S2-12	670/disk

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



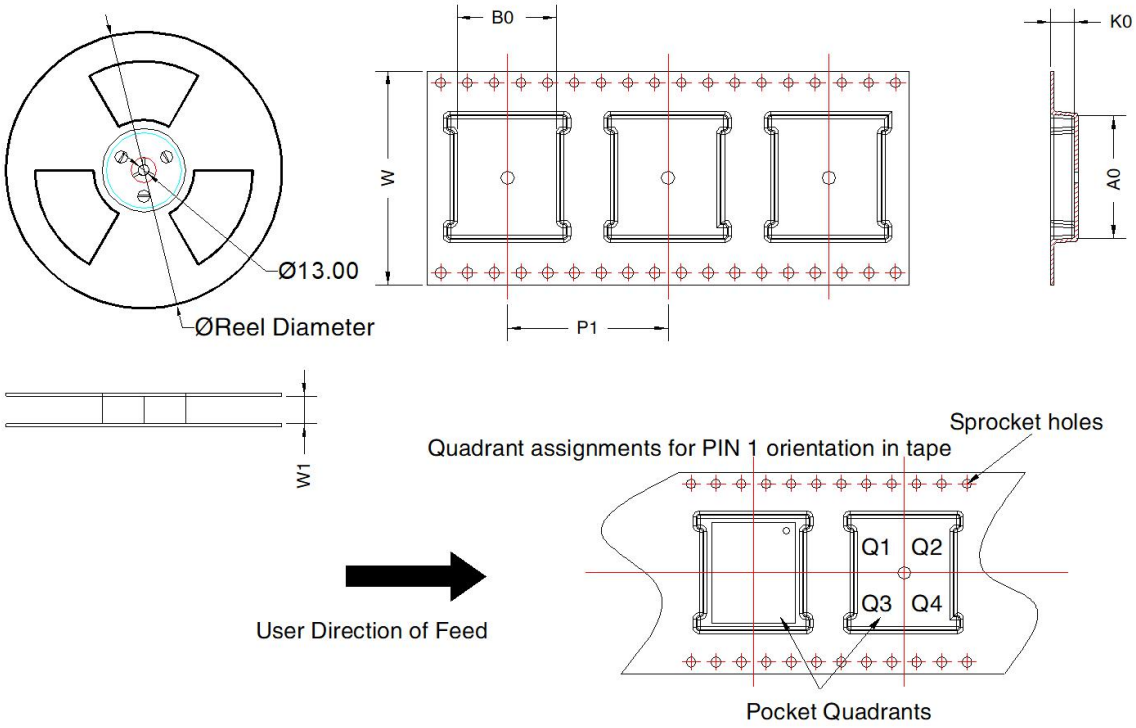


Note: Grid 2.54*2.54mm

Pin-Out			
Pin	Mark	Pin	Mark
1	NC	11	NC
2	FK1	12	ISO_GND2
3	IN1	13	N_OUT2
4	VCC1	14	P_OUT2
5	GND1	15	JC2
6	VCC2	16	ISO_GND1
7	GND2	17	N_OUT1
8	FK2	18	P_OUT1
9	IN2	19	JC1
10	NC	20	NC

Note:
Unit: mm[inch]
General tolerances: ± 0.10[± 0.004]

Tape & Reel Information



Device	Package Type	Pin	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
QT05S2-12	DFN	20	670	330.0	32.4	18.30	15.80	3.60	24	32	Q2

Notes:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210354;
2. 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;
3. All index testing methods in this datasheet are based on company corporate standards;
4. The above are the performance indicators of the product models listed in this manual, some indicators of non-standard models of products will exceed the above requirements, the specific situation can directly contact our technical personnel;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" ;
7. 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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