LAMPIRAN

LEM

Current Transducer HX 03 .. 50-P/SP2 I_{PN} = 3 .. 50 A

For the electronic measurement of currents: DC, AC, pulsed, mixed, with a galvanic isolation between the primary circuit (high power) and the secondary circuit (electronic circuit).

Electrical data

Primary nominal r.m.s. current I_{PN} (A)	Primary current measuring range I_P (A)[1]	Primary Conductor Diameter x Turns (mm)	Type
3	± 9	0.6d x 20T	HX 03-P/SP2
5	± 15	0.8d x 12T	HX 05-P/SP2
10	± 30	1.1d x 6T	HX 10-P/SP2
15	± 45	1.4d x 4T	HX 15-P/SP2
20	± 60	1.6d x 3T	HX 20-P/SP2
25	± 75	1.6d x 2T	HX 25-P/SP2
50	± 150	1.2 x 6.3 x 1T	HX 50-P/SP2

V_{OUT}	Output voltage @ ± I_{PN}, R_L = 2 kΩ, T_A = 25°C	V_{OE} ±0.625	V
R_{OUT}	Output impedance	< 50	Ω
R_L	Load resistance	≥ 2	kΩ
V_C	Supply voltage (± 5 %)	+12 .. +15	V
I_C	Current consumption	< 15	mA
V_d	R.m.s. voltage for AC isolation test, 50/60Hz, 1 mn	> 3	kV
V_e	R.m.s. voltage for partial discharge extinction at 10pC	≥ 1	kV
	Impulse withstand voltage, 1.2/50µs	≥ 6	kV

Accuracy-Dynamic performance data

X	Accuracy @ I_{PN}, T_A = 25°C (without offset)	< ± 1	% of I_{PN}
ε_L	Linearity (0 .. ± I_{PN})	< ± 1	% of I_{PN}
V_{OE}	Electrical offset voltage, T_A = 25°C	+2.5V±50	mV
V_{OH}	Hysteresis offset voltage @ I_P = 0; after an excursion of 3 x I_{PN}	< ± 10	mV
V_{OT}	Thermal drift of V_{OE} max.	± 1.5	mV/K
$TC\varepsilon_G$	Thermal drift of the gain (% of reading)	± 0.1	%/K
t_r	Response time @ 90% of I_P	≤ 3	µs
f	Frequency bandwidth (-3 dB) [2]	50	kHz

General data

T_A	Ambient operating temperature	- 25 .. + 85	°C
T_S	Ambient storage temperature	- 25 .. + 85	°C
m	Mass	8	g
	Min. internal creepage distance/clearance	≥ 5.5	mm
	Isolation material group	I	
	Standards	EN50178	

Notes : [1] With R_L = 2kΩ
[2] Small signal only to avoid excessive heating of the magnetic core

Features

- Galvanic isolation between primary and secondary circuit
- Hall effect measuring principle
- Isolation voltage 3000V
- Low power consumption
- Extended measuring range (3x I_{PN})
- Single supply from +12V to +15V
- Material according to UL94-V0

Advantages

- Low insertion losses
- Easy to mount with automatic handling system
- Small size and space saving
- Only one design for wide current ratings range
- High immunity to external interference.

Applications

- Switched Mode Power Supplies (SMPS)
- AC variable speed drives
- Uninterruptible Power Supplies (UPS)
- Electrical appliances
- Battery supplied applications
- DC motor drives

030806/3

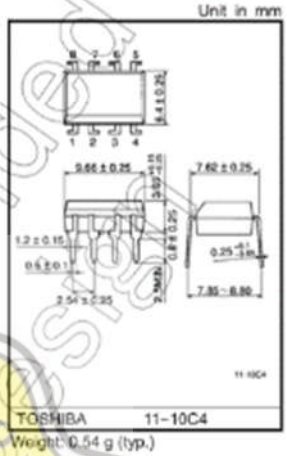
LEM Components www.lem.com

TOSHIBA Photocoupler GaAlAs Ired & Photo-IC

TLP250

Transistor Inverter
Inverter For Air Conditioner
IGBT Gate Drive
Power MOS FET Gate Drive

Unit in mm

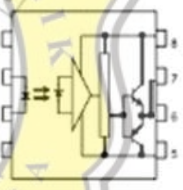


Weight: 0.54 g (typ.)

The TOSHIBA TLP250 consists of a GaAlAs light emitting diode and a integrated photodetector.
This unit is 8-lead DIP package.
TLP250 is suitable for gate driving circuit of IGBT or power MOS FET.

- Input threshold current: I_F=5mA(max.)
- Supply current (I_{CC}): 11mA(max.)
- Supply voltage (V_{CC}): 10~35V
- Output current (I_O): ±1.5A (max.)
- Switching time (t_{pLH}/t_{pHL}): 0.5μs(max.)
- Isolation voltage: 2500V_{rms}(min.)
- UL recognized: UL1577, file No.E67349
- Option(D4)
  VDE Approved : DIN EN60747-5-2
  Maximum Operating Insulation Voltage : 560V_{PK}
  Highest Permissible Over Voltage : 4000V_{PK}
  (Note): When a EN60747-5-2 approved type is needed, Please designate "Option(D4)"

Pin Configuration (top view)

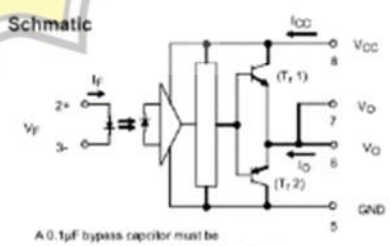


1 : N.C.
2 : Anode
3 : Cathode
4 : N.C.
5 : GND
6 : V_O (Output)
7 : V_O
8 : V_{CC}

Truth Table

		Tr1	Tr2
Input LED	On	On	Off
	Off	Off	On

Schmatic



A 0.1μF bypass capcitor must be connected between pin 8 and 5 (See Note 5).

MICROCHIP

dsPIC30F4011/4012

dsPIC30F4011/4012 Enhanced Flash 16-bit Digital Signal Controller

Note: This data sheet summarizes features of this group of dsPIC30F devices and is not intended to be a complete reference source. For more information on the CPU, peripherals, register descriptions and general device functionality, refer to the *dsPIC30F Family Reference Manual* (DS70046). For more information on the device instruction set and programming, refer to the *dsPIC30F Programmer's Reference Manual* (DS70030).

High Performance Modified RISC CPU:

- Modified Harvard architecture
- C compiler optimized instruction set architecture with flexible addressing modes
- 84 base instructions
- 24-bit wide instructions, 16-bit wide data path
- 48 Kbytes on-chip Flash program space (16K Instruction words)
- 2 Kbytes of on-chip data RAM
- 1 Kbytes of non-volatile data EEPROM
- Up to 30 MIPs operation:
  - DC to 40 MHz external clock input
  - 4 MHz-10 MHz oscillator input with PLL active (4x, 8x, 16x)
- 30 interrupt sources
  - 3 external interrupt sources
  - 8 user selectable priority levels for each interrupt source
  - 4 processor trap sources
- 16 x 16-bit working register array

DSP Engine Features:

- Dual data fetch
- Accumulator write back for DSP operations
- Modulo and Bit-Reversed Addressing modes
- Two, 40-bit wide accumulators with optional saturation logic
- 17-bit x 17-bit single cycle hardware fractional/integer multiplier
- All DSP instructions single cycle
- ± 16-bit single cycle shift

Peripheral Features:

- High current sink/source I/O pins: 25 mA/25 mA
- Timer module with programmable prescaler:
  - Five 16-bit timers/counters; optionally pair 16-bit timers into 32-bit timer modules
- 16-bit Capture input functions
- 16-bit Compare/PWM output functions
- 3-wire SPI™ modules (supports 4 Frame modes)
- I^2C™ module supports Multi-Master/Slave mode and 7-bit/10-bit addressing
- 2 UART modules with FIFO Buffers
- 1 CAN modules, 2.0B compliant

Motor Control PWM Module Features:

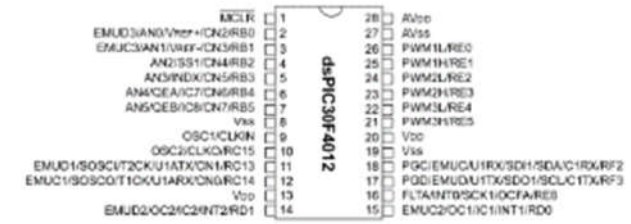
- 6 PWM output channels
  - Complementary or Independent Output modes
  - Edge and Center Aligned modes
- 3 duty cycle generators
- Dedicated time base
- Programmable output polarity
- Dead-time control for Complementary mode
- Manual output control
- Trigger for A/D conversions

Quadrature Encoder Interface Module Features:

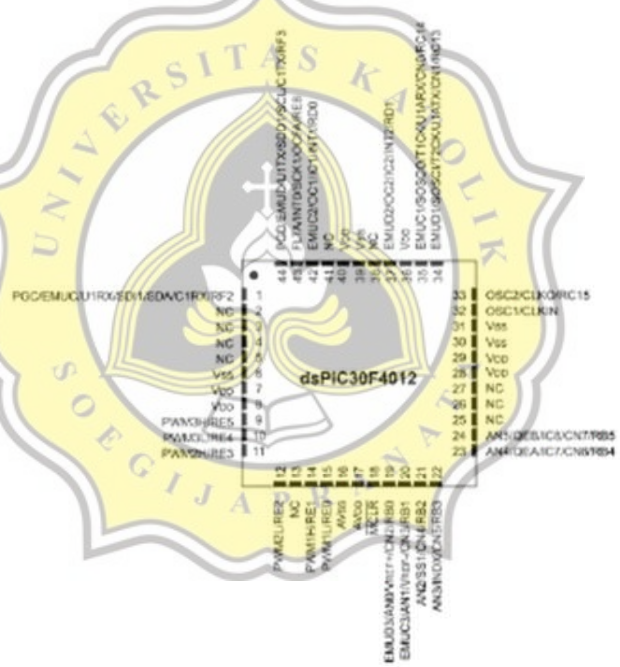
- Phase A, Phase B and Index Pulse input
- 16-bit up/down position counter
- Count direction status
- Position Measurement (x2 and x4) mode
- Programmable digital noise filters on inputs
- Alternate 16-bit Timer/Counter mode
- Interrupt on position counter rollover/underflow

Pin Diagrams (Continued)

28-Pin SPDIP
28-Pin SOIC



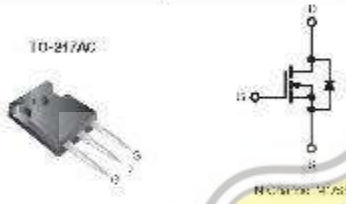
44-Pin QFN



Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	200	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.085
Q_g (Max.) (nC)	110	
Q_{gs} (nC)	26	
Q_{gd} (nC)	74	
Configuration	Single	

TO-247AC



N-Channel MOSFET

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC

RoHS*

DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-220AB package is universally preferred for commercial-industrial applications where higher power levels preclude the use of TO-220AB devices. The TO-247AC is similar but superior to the earlier TO-218 package because of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.

ORDERING INFORMATION	
Package	TO-247AC
Lead (Pb)-free	IRFP250PbF
	SiHFP250-E3
SnPb	IRFP250
	SiHFP250

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	200	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	T_C = 25 °C	I_D	33	A
		T_C = 100 °C		13	
Pulsed Drain Current[a]			I_{DM}	120	
Linear Derating Factor				1.5	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	410	mJ
Repetitive Avalanche Current[a]			I_{AR}	33	A
Repetitive Avalanche Energy[a]			E_{AR}	19	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	190	W
Peak Diode Recovery dV/dt[c]			dV/dt	5.0	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	− 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			300[d]	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. V_{DD} = 50 V, starting T_J = 25 °C, L = 683 μH, R_G = 25 Ω, I_{AS} = 33 A (see fig. 12).

c. I_{SD} ≤ 33 A, dI/dt ≤ 160 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.

d. 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

DC/DC Converter

B_S-1WR2 & B_D-1WR2 series

MORNSUN®

1W, fixed input voltage, isolated & unregulated single output

Continuous Short Circuit Protection

c UL us CE Patent Protection RoHS

FEATURES

- Continuous short-circuit protection
- Operating temperature range: -40℃ to +105℃
- Conversion efficiency high up to 80%
- Miniature SIP/DIP package, international standard pin-out
- Isolation voltage: 1.5K VDC
- EN60950,UL60950 Approval

B_S-1WR2 & B_D-1WR2 series are specially designed for applications where an isolated voltage is required in a distributed power supply system. They are suitable for:

1. *Where the voltage of the input power supply is stable (voltage variation: ±10%-1%);*
2. *Where isolation between input and output is necessary (isolation voltage ≤1500VDC);*
3. *Where the output voltage regulation and the ripple & noise of the output voltage is not strictly required;*
4. *Typical application: digit circuit condition; normal low-frequency artificial circuit condition; relay drive circuit and data switching circuit condition, etc.*

Selection Guide

Certification	Part No.	Input Voltage (VDC) Nominal (Range)	Output Voltage (VDC)	Output Current (mA)(Max./Min.)	Efficiency (%,Min./Typ.) @ Full Load	Max. Capacitive Load(μF)
–	B0303S-1WR2	3.3 (2.97-3.63)	3.3	303/30	68/72	220
UL/CE	B0305S-1WR2		5	200/20	72/76	
	B0312S-1WR2		12	84/9	76/80	
–	B0303D-1WR2		3.3	303/30	68/72	
	B0305D-1WR2		5	200/20	72/76	
UL/CE	B0505S-1WR2	5 (4.5-5.5)	3.3	303/30	68/72	
	B0505S-1WR2		5	200/20	76/80	
	B0509S-1WR2		9	111/12	76/80	
	B0512S-1WR2		12	84/9	76/80	
	B0515S-1WR2		15	67/7	76/80	
	B0524S-1WR2		24	42/4	76/80	
–	B0503D-1WR2		3.3	303/30	68/72	
UL/CE	B0505D-1WR2		5	200/20	76/80	
	B0509D-1WR2		9	111/12	76/80	
	B0512D-1WR2		12	84/9	76/80	
	B0515D-1WR2		15	67/7	76/80	
	B0524D-1WR2		24	42/4	76/80	
–	B1203S-1WR2	12 (10.8-13.2)	3.3	303/30	68/72	
UL/CE	B1205S-1WR2		5	200/20	76/80	
	B1209S-1WR2		9	111/12	76/80	
	B1212S-1WR2		12	84/9	76/80	
	B1215S-1WR2		15	67/7	76/80	
	B1224S-1WR2		24	42/4	76/80	
–	B1203D-1WR2		3.3	303/30	68/72	
UL/CE	B1205D-1WR2		5	200/20	76/80	
	B1209D-1WR2		9	111/12	76/80	
	B1212D-1WR2		12	84/9	76/80	
	B1215D-1WR2		15	67/7	76/80	

CENCON 2019

4th IEEE CONFERENCE ON ENERGY CONVERSION

CERTIFICATE OF APPRECIATION

is awarded to

Vincent Wijaya

In recognition and appreciation of your contribution as

Presenter

for paper entitled

Implementation of Input Capture Method on Switched Reluctance Motor to Obtain Precise Commutation Signals

Organizers: IEEE

Co-organizers:

Technical co-sponsors: THE KOREAN INSTITUTE OF POWER ELECTRONICS

Sponsor: genetron

Tole Sutikno
Director of LPPI UAD/General Chair

Tan Chee Wei
General Chair

Nik Rumzi Nik Idris
General Chair

Report #10474312

BAB IPENDAHULUAN Latar BelakangDewasa ini, kendaraan listrik menjadi salah satu solusi dalam mengurangi pemanasan global. Kendaraan ini menggunakan energi listrik sebagai sumber dayanya. Tanpa adanya penggunaan bahan bakar fosil, kendaraan listrik tidak memiliki polusi udara maupun polusi suara ADDIN [1], [2] . Kendaraan listrik memiliki penggerak berupa motor listrik. Berdasarkan sumber daya yang digunakan, motor listrik dapat dibedakan menjadi motor AC dan motor DC. Motor AC memiliki beberapa keunggulan, seperti usia pemakaian yang lebih panjang dan biaya perawatan yang lebih murah dibanding motor DC. Namun, torsi yang dihasilkan oleh motor AC lebih rendah dibanding motor DC. Motor Brushless DC (BLDC) dikembangkan untuk mengatasi kelemahan motor DC. Motor BLDC memiliki torsi yang tinggi, efisiensi yang tinggi serta usia pemakaian yang lama ADDIN [3]. Akan tetapi, penggunaan magnet permanen pada motor BLDC meningkatkan harga dan membatasi kecepatan motor tersebut. Sebagai solusi permasalahan tersebut, dikembangkanlah motor switched reluctance (SRM) ADDIN [4]. SRM merupakan salah satu motor listrik modern. Motor ini terdiri dari stator yang berupa lilitan dan rotor yang berupa inti besi dengan kutub yang menonjol. SRM memiliki beberapa keunggulan, seperti kecepatan tinggi dan harga yang lebih murah dibanding motor BLDC.