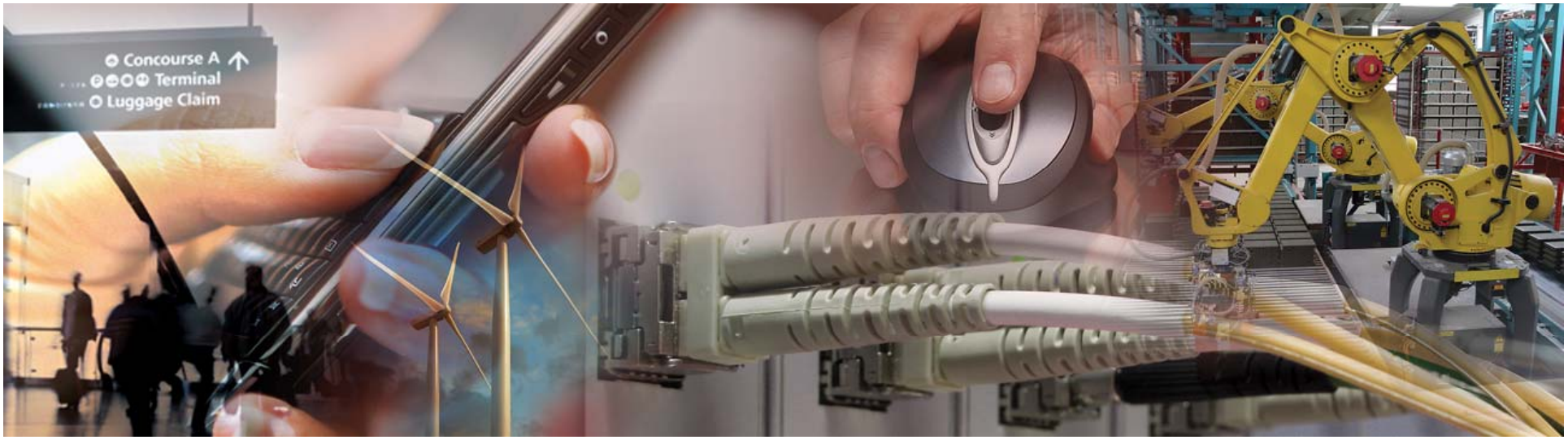
"Industry Fastest 2.5A/1A Gate Driver Optocoupler"

New Product Introduction

1 to 2.5A Power & SiC MOSFET Gate Drive Optocoupler

ACPL-P346/P345, ACPL-W346/W345



May 2013

AVAGO TECHNOLOGIES

Training Outline

- Key Features & Market
- Applications
- Upgrades and Improvements
- Competitions
- Sales Tools
- Ordering Information, Pricing and Availability

1-2.5A Output Current Power & SiC MOSFET Gate Drive Optocoupler with Rail-to-Rail Output Voltage in SSO6 Package

Part Number	I_{OUT} A Min.	I_{OUT} A Max.
ACPL-P346/W346	2.0	2.5
ACPL-P345/W345	0.8	1.0

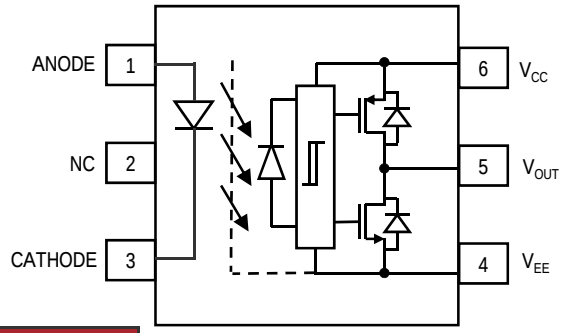
Features

- **Rail-to-Rail** Output Voltage
- 120 ns max. Short Propagation Delay
- 50 ns max. Propagation Delay Difference (PDD)
- 10 ns typ. Rise and Fall Time
- **Low LED Input** Drive with Hysteresis
- MOSFET UVLO with Hysteresis
- High CMR (min. 50 kV/µs@V_{CM}=1.5 kV)
- I_{CC} < 4 mA max. Supply Current
- Very Small Stretched SO6 Package
- Industrial Temperature Range: -40ºC to 105ºC
- **Safety Approval** UL, CSA and IEC/EN/DIN EN 60747-5-5

UVLO Threshold

LED	V_{CC} – V_{EE} "+ve"	V_{CC} – V_{EE} "-ve"	V_O
OFF	0 - 20 V	0 - 20 V	LOW
ON	0 – 8 V	0 – 7V	LOW
ON	8 – 9 V	7 – 8 V	TRANSITION
ON	9 – 20 V	8 – 20 V	HIGH

Block Diagram



Part Number	Creepage & Clearance	IEC/EN/DIN EN 60747-5-5 V_{IORM}	UL V_{ISO}
ACPL-W346/W345	8mm/8mm	1140 V_{PEAK}	5000V_{RMS}/min
ACPL-P346/P345	8mm/7mm	891V_{PEAK}	3750V_{RMS}/min

Market – Driving Power & SiC MOSFETs

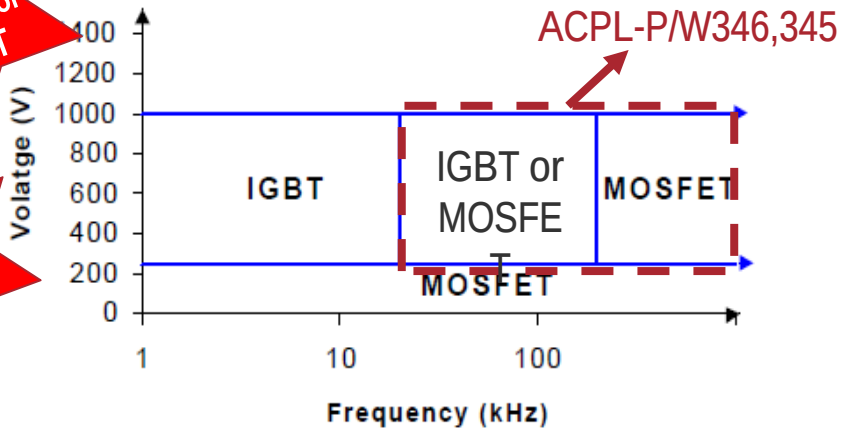
"Industry Fastest 2.5A/1A Gate Driver Optocoupler"

Specifications	HCPL-3120 (1st Gen)	ACPL-P/W343 (2nd Gen)	ACPL-P346/W346 (NEW)
UVLO Threshold	12V	12V	8V
V_{OH} Min.	V_{CC} – 4 V	V_{CC} – 0.3V (Rail-to-Rail)	V_{CC} – 0.3V (Rail-to-Rail)
t_{PLH}/t_{PHL} Max.	500 ns	200 ns	120ns
PDD Max.	350ns	100 ns	50 ns
I_{CC} Max.	5 mA	3 mA	4 mA
CMR Min.	25 kV/µs	35kV/µs	50 kV/µs
Package	300 mil DIP8	Streteched SO6	Stretched SO6

UVLO Optimized for MOSFET

SPEED Critical for MOSFET

Application : High Voltage, High Frequency



High Freq Drives

PV/Micro Inverter

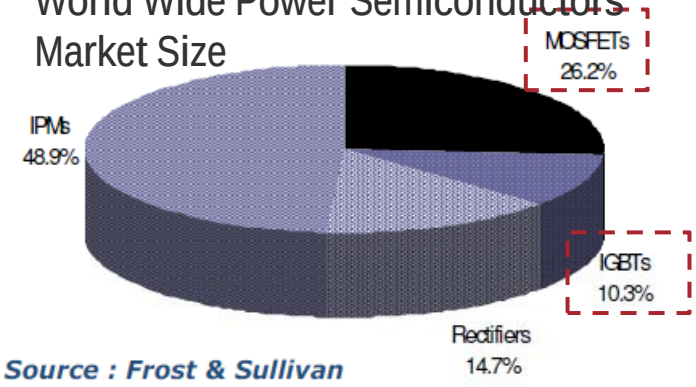
Battery Vehicle

Charger

Power Supply

Induction Heater

World Wide Power Semiconductors Market Size



Source : Frost & Sullivan

Applications - Power Supply, DC/AC, DC/DC Converter

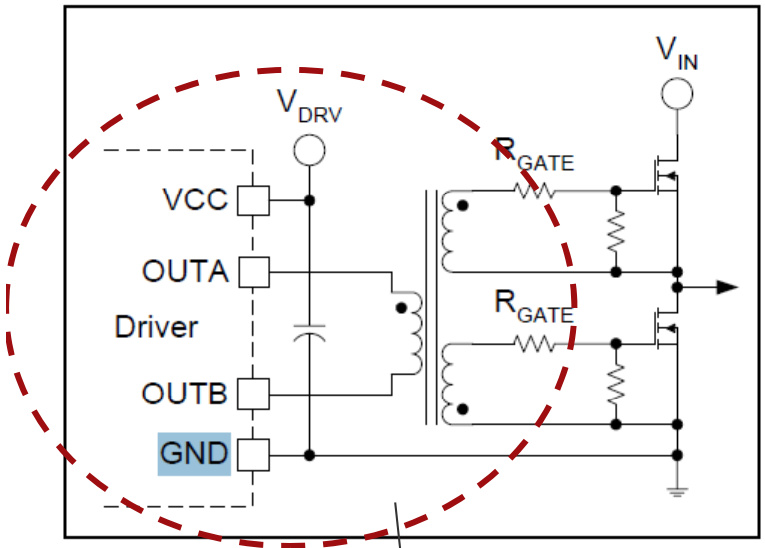
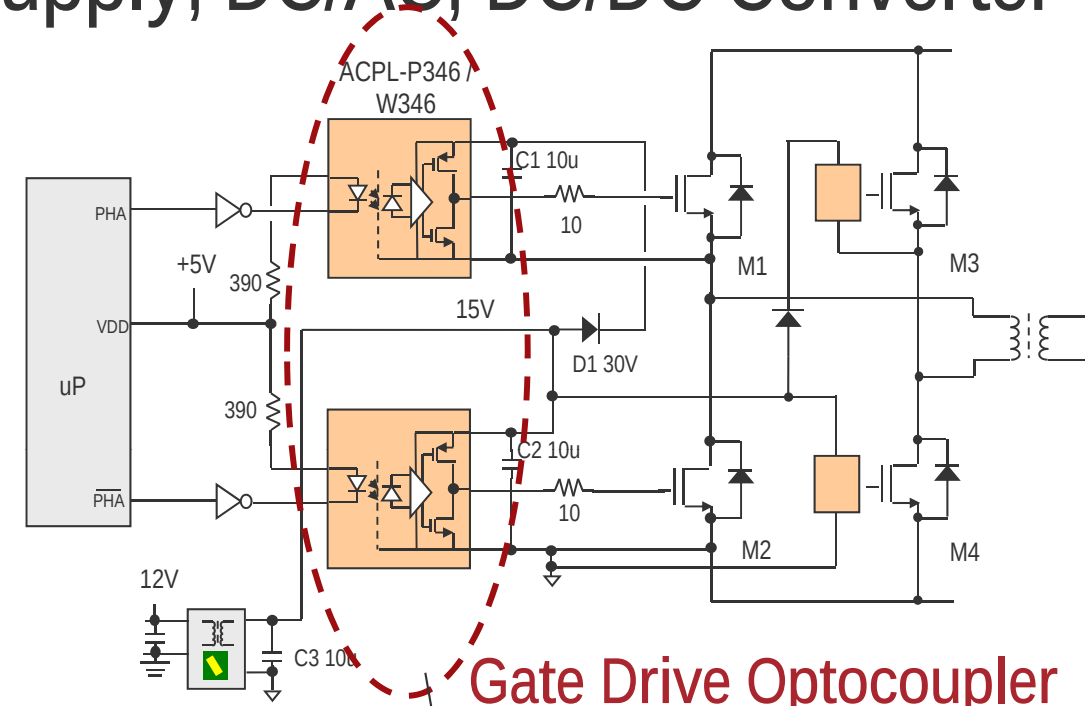
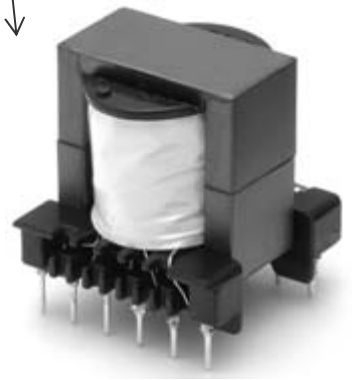


Figure 39. Push-pull type half-bridge gate drive

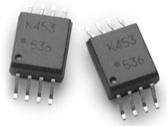


Gate Drive Transformer



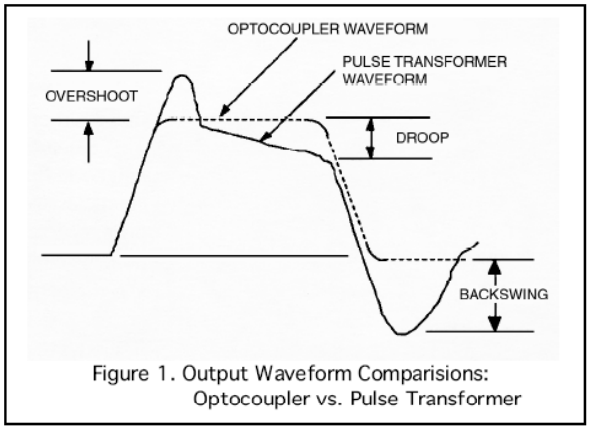
- Large Size,
- Core Saturation
- Lower Operating Temperature

Gate Drive Optocoupler

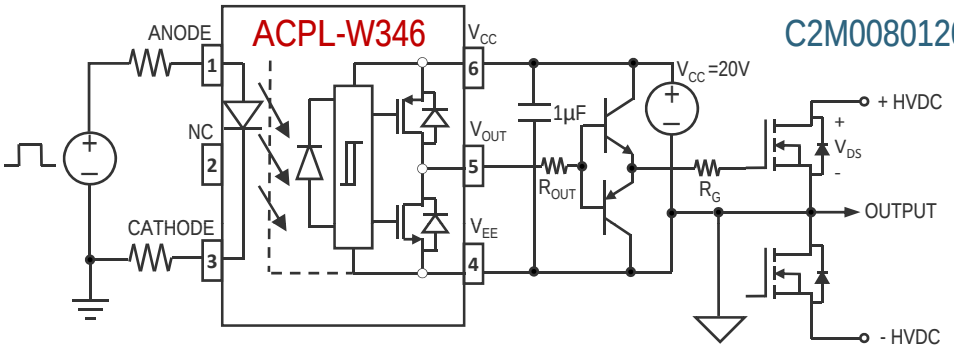


- Small Size,
- High Operating Temperature
- Surface Mount

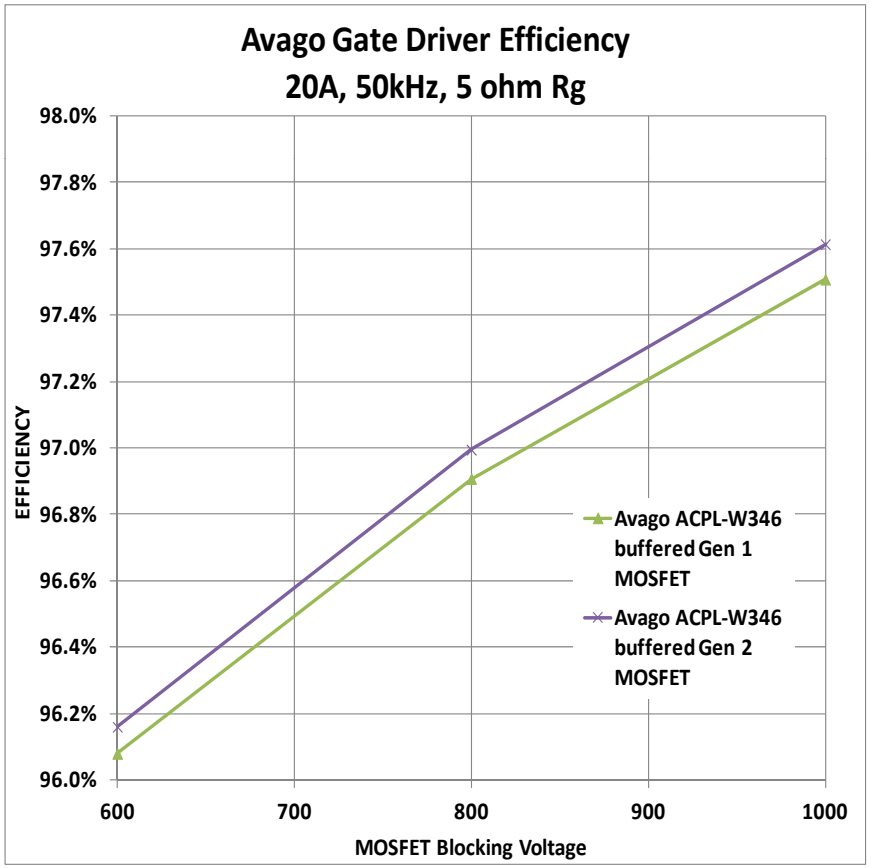
Gate Drive Optocoupler vs Gate Drive Transformer

	Gate Drive Transformer	Gate Drive Optocoupler
Duty Cycle	**35 - 65%**	0 - 100%
Propagation Delay	Very short	**Short**
UVLO	**External circuitry**	Can be built-in
Size	**Bulky**	Standard semiconductor package
Core Saturation	**Possible**	Not applicable
 Figure 1. Output Waveform Comparisions: Optocoupler vs. Pulse Transformer	**Overshoot/Backswing damages sensitive circuit. Droop causes under voltage**	Good
Gate Drive Impedance	**Affected by leakage inductance**	No
Need Isolated Power Supply	No	**Yes**
Additional Gate Drive Circuit	**May be**	No
Cost	Low	**Medium**

Applications – Driving Cree's SiC MOSFET



C2M0080120D (Gen2)



Ideally Matched for SiC MOSFETS

- 2.5 A Peak Output Current
- Rail-to-Rail Output Voltage
- 120 ns max. Short Propagation Delay
- 10 ns typ. Rise and Fall Time
- 50 kV/µs min. Common Mode Rejection (CMR)
- Safety Approval UL, CSA and IEC/EN/DIN EN 60747-5-5 up to V_{IORM}=1140V_{PEAK}

Upgrades and Improvements

Specifications	ACPL-P314/W314(FY'06)	ACPL-P340/W340 (FY'11)	ACPL-P/W345 (FY'13)
I_{OUT} Min./Max.	0.4 A / 0.6 A	0.8 A / 1.0 A	0.8 A / 1.0 A
V_{OH} Min. (Rail-to-Rail)	V_{CC} – 4 V	V_{CC} – 0.3V	V_{CC} – 0.3V
UVLO	NA	12V	8V
t_{PLH}/t_{PHL} Max.	700 ns	200 ns	120 ns
PDD Max.	500 ns	100 ns	50 ns
t_R/t_F Typ.	50 ns	40 ns	10 ns
I_{CC} Max.	3.0 mA	3.0 mA	4.0 mA
I_F	8-12 mA	7-16 mA	7-11 mA
CMR Min.	25 kV/µs	35 kV/µs	50 kV/µs
Package	Stretched SO6	Stretched SO6	Stretched SO6

Specifications	HCPL-3120 (FY'93)	HCPL-3180 (FY'03)	ACPL-P/W346 (FY'13)
I_{OUT} Min.	2.0A / 2.5 A	2.0A / 2.5 A	2.0A / 2.5 A
V_{OH} Min. (Rail-to-Rail)	V_{CC} – 4 V	V_{CC} – 4 V	V_{CC} – 0.3V
UVLO	12V	8V	8V
t_{PLH}/t_{PHL} Max.	500 ns	200 ns	120 ns
PDD Max.	350ns	90ns	50 ns
t_R/t_F Typ.	100ns	25ns	10 ns
I_{CC} Max.	5 mA	6 mA	4.0 mA
I_F	7-16mA	10-16mA	7-11 mA
CMR Min.	25 kV/µs	10 kV/µs	50 kV/µs
Package	300 mil DIP8	300 mil DIP8	Stretched SO6

Competitions

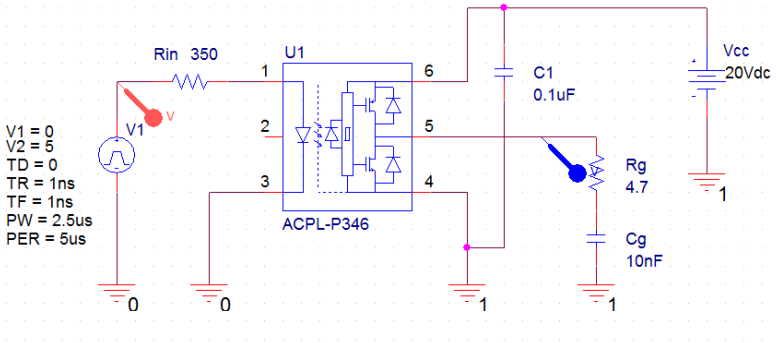
Competitions	Avago	Replacement Level	Avago Value Propositions
Fairchild FOD3182	ACPL-P346/W346	2	▪High output current ▪True Rail-to-Rail ▪MOSFET UVLO vs. competitors' IGBT or no UVLO ▪Fast propagation delay, tP 120ns (max) ▪Fast propagation delay difference, PDD 50ns (max) ▪High CMR 50kV/µs (min)
Toshiba TLP700A		1	
NEC PS9331(Prelim)		2	
Fairchild FOD3181	ACPL-P345/W345	2	
Toshiba TLP705/705F		1	
NEC PS9307AL(Prelim)		1	

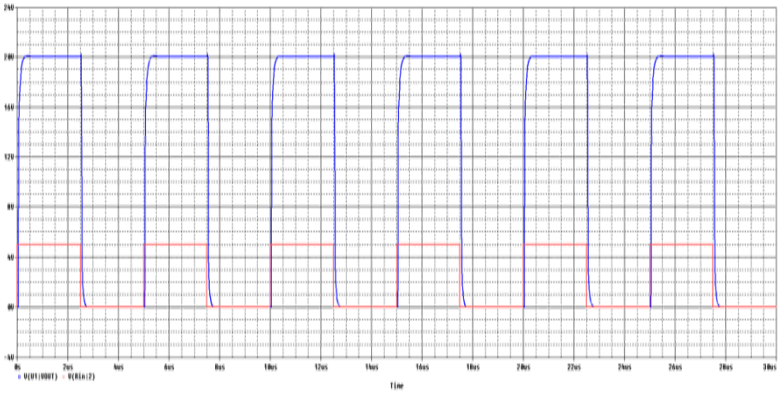
Sales Tools

- Samples and Evaluation Boards are available in ESAMPLES

EVBD-ACPL-W346 evaluation board user's guide is available at ww.avagotech.com/docs/AV02-4051EN

- Spice Model





Ordering Information, Pricing and Availability

Ordering Information

Part Number	Option (RoHS Compliant)	Package	Surface Mount	Tape & Reel	UL 5000 V_{RMS}/min	IEC/EN/DIN EN 60747-5-5	Quantity
ACPL-P346/P345 ACPL-W346/W345	-000E	Stretched SO-6	X				100 per tube
	-500E		X	X			1000 per reel
	-060E		X			X	100 per tube
	-560E		X	X		X	1000 per reel

Price

Part Number	Recommended Resale Price	Quantity
ACPL-P346-000E	$1.75	10,000
ACPL-W346-000E	$1.90	10,000
ACPL-P345-000E	$1.45	10,000
ACPL-W345-000E	$1.60	10,000

Availability

- 13 May 2013
- 8 weeks lead-time

Thank You