SYNCHRONOUS RECTIFIER DRIVER

FEATURES

- **Offers Efficiency Improvement Over Schottky Diode (Depends on Drive Configuration of the SR).**
- **Drives all Power MOSFET.**
- **Prediction Gate Timing Control.**
- **Minimum MOSFET Body Diode Conduction.**
- **Operating Frequency up to 400 KHz**
- **Synchronize to Transformer Secondary Voltage Waveform.**

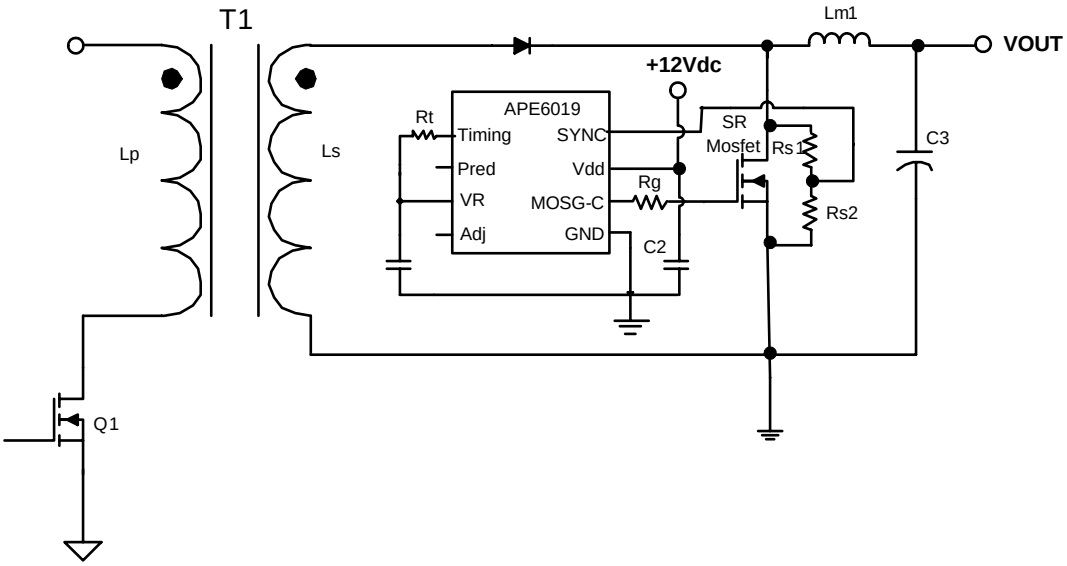
DESCRIPTION

The fundamental of APE6019 synchronous rectifier (SR) driver IC is based on our U.S. patented methods that utilize the principle of " prediction " logic circuit. The IC deliberates previous cycle timing to control the SR in present cycle by " predictive " algorithm that makes adjustments to the turn-off time, in order to achieve maximum efficiency and avoid cross-conduction at the same time. Due to this patented technology, APE6019 is suitable for either Forward or Flyback topology.

APPLICATIONS

- **Servers & Workstations**
- **Storage Area Network Power Supplies**
- **Telecommunication Converters**
- **Embedded Systems**
- **Industrial & Commercial Systems Using High Current Processors**

TYPICAL APPLICATION

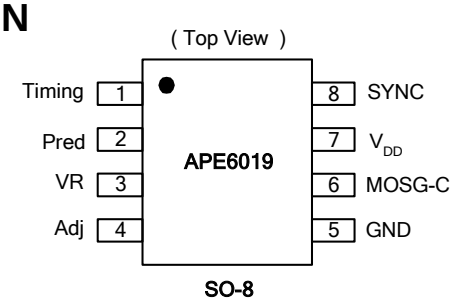


PACKAGE/ORDERING INFORMATION

APE6019X-HF

Package Type
M : SO-8

Halogen Free



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ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

DC Supply Voltage (V_{DD}) ---------- 16V
Power Dissipation@T_A=85°C (P_D) ---------- 0.25W
Storage Temperature Range (T_{ST}) ---------- -40 to 150°C
Operating Junction Temperature Range (T_J) ------- -40 to 125°C
Lead Soldering Temperature for 5 sec (T_L) --------- 260°C
Thermal Resistance Junction to Case (Rth_{jc})[Note] 45°C/W
Thermal Resistance Junction to Ambient(Rth_{ja}) 160°C/W

Note. The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

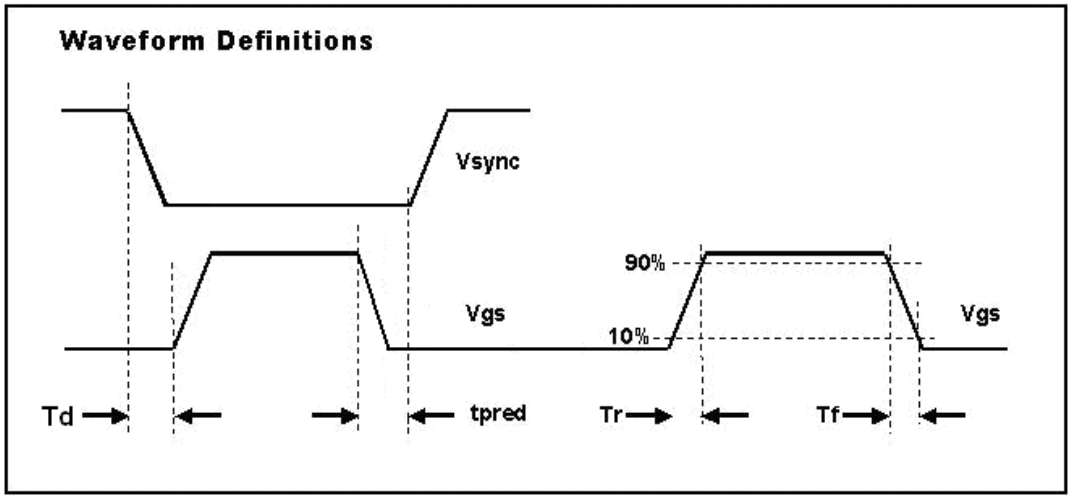
ELECTRICAL SPECIFICATIONS

(T_A=25°C, V_{DD}=12V, Freq. =300 KHz, Duty Cycle=50%, unless otherwise specified.)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
SUPPLY INPUT						
Supply Current	I_{DD}	No load	-	4	7	mA
		V_{SYNC}=0V, No load	-	5	8	mA
Supply Voltage	V_{DD}	I_{DD} peak < 2A	-	-	16	V
Enable Voltage	V_{ddon}		9	10	11	V
SYNC REFERENCE (SYNC)						
SYNC High Threshold	V_{shth}		-	3.9	-	V
SYNC Low Threshold	V_{slth}		-	0.9	-	V
SYNC Clamp Voltage	Vsync	Isync=3mA	-	5	-	V
SYNC Input Current	I_{SYNC}		-	-	3	mA
Voltage Regulator REFERENCE (VR)						
VR Output Current	I_{VR}		-	-	20	mA
ON TIME DUTY SETUP (PIN 6)						
Ton-Time			-	20	-	us
MOSFET GATE DRIVER (MOSG-C)						
Output High Voltage	V_{oh}	V_{CC}=12V、I_O = 200mA	10.5	-	V_{CC}	V
Output Low Voltage	V_{ol}	V_{CC}=12V、I_O = -200mA	-	0.5	0.8	V
Source Current	I_{oh}	C_{LOAD} = 10nF		1	1.2	A
Sink Current	I_{ol}	C_{LOAD} = 10nF		-1	-1.2	A
Propagation Delay	T_d	No load	50	80	-	ns
Pred Time	T_{Pred}	No load	-	120	-	ns
Rise Time	T_r	No load (Note1)	-	10	25	ns
Fall Time	T_f	No load (Note1)	-	10	25	ns
Dynamic Protect						
Dynamic Variable	D_t	Pin 4 open	-	600	-	ns
MOSG-C on Time	T_{on-min}	PWM adjusts time > Dt	-	1	-	us

Note 1: Tr & Tf are measured among 10% and 90% of starting and final voltage.

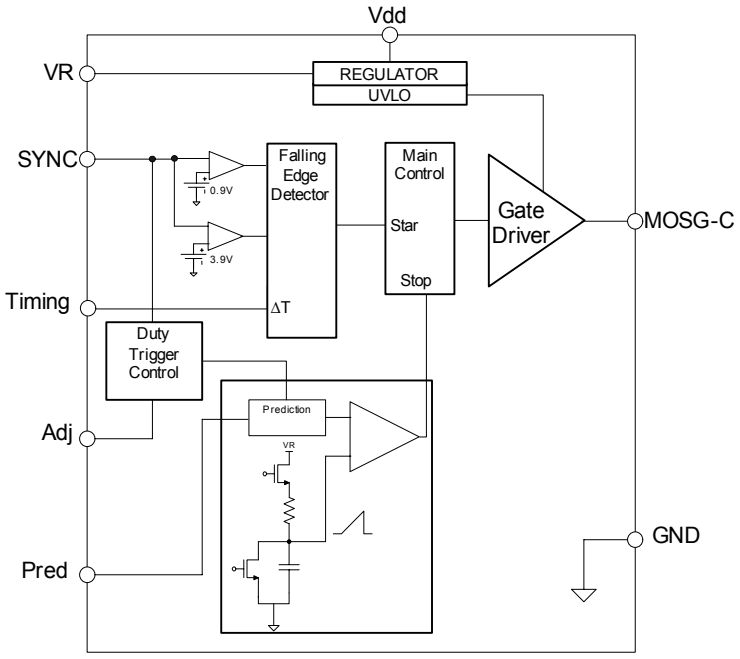
WAVEFORM DEFINITIONS



PIN DESCRIPTIONS

PIN SYMBOL	PIN DESCRIPTION
Timing	Discontinuous current filter timing adjustment resistor connection.
Pred	Capacitor to store previous cycle timing for SR MOSFET
VR	Voltage Regulator
Adj	Trigger point adjustment for Dynamic state.
GND	Ground connection.
MOSG-C	Catch MOSFET gate drive.
V_{DD}	DC supply voltage.
SYNC	Synchronized signal from the VDS of SR MOSFET

BLOCK DIAGRAM



TYPICAL PERFORMANCE CHARACTERISTICS

Figure 1 : Supply Current vs Supply Voltage

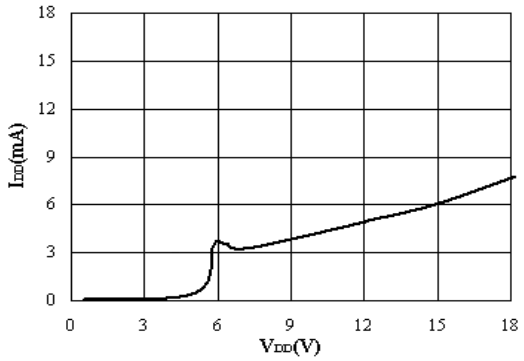


Figure 2 : Supply Current vs Freq. @ No Load

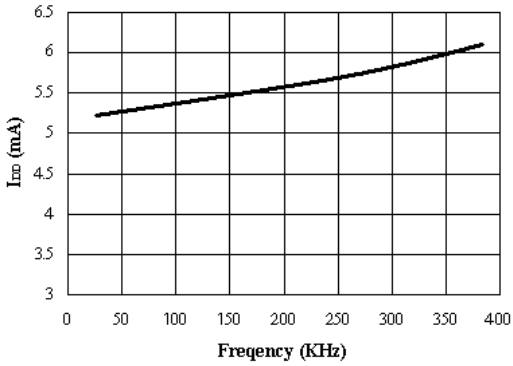
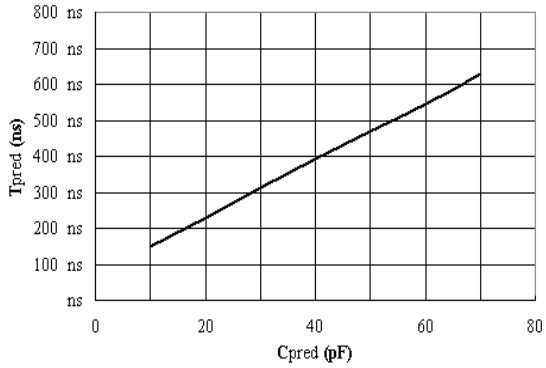
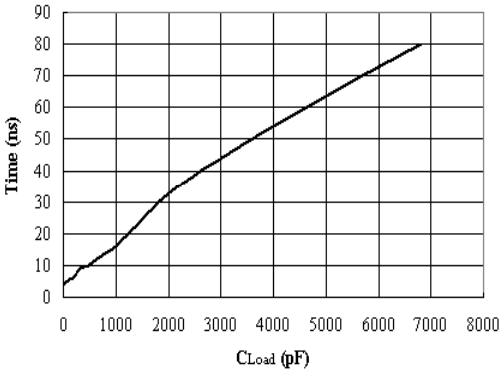


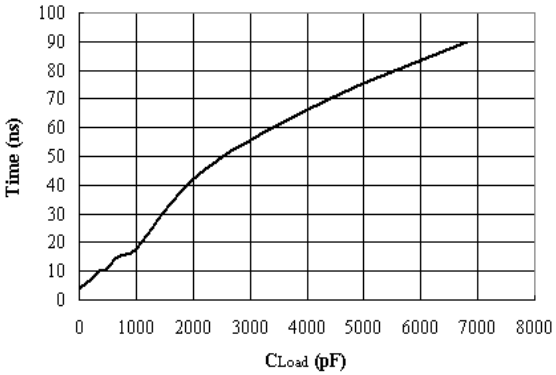
Figure 3 : Tpred vs Cpred @ Freq =100 KHz ; VDD =10V



Fihure 4 : Output Rise Time vs Load Capacitor



Fihure 5 : Output Fall Time vs Load Capacitor



Fihure 6 : Dynamic time vs Load Capacitor

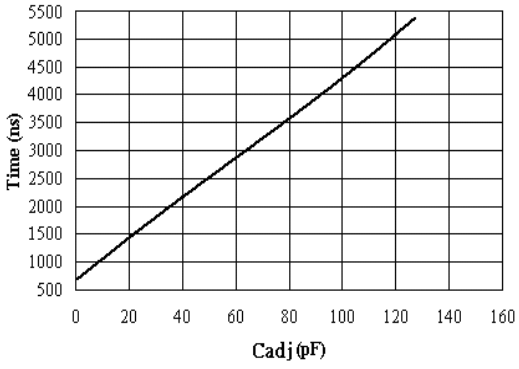


*Fig. 1 : No Load ; No SYNC

*Fig. 4~5 : Frequency = 100 kHz.

MARKING INFORMATION

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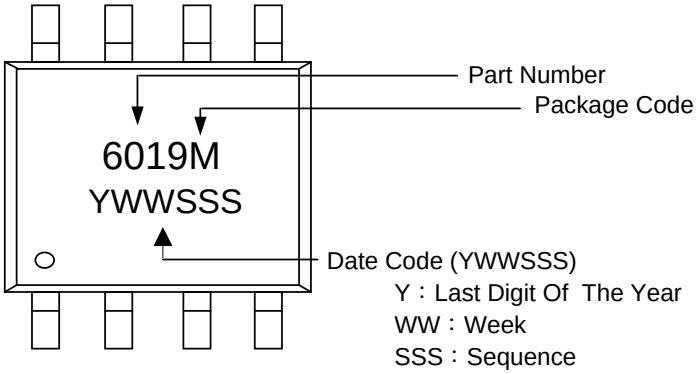

PACKAGE OUTLINE

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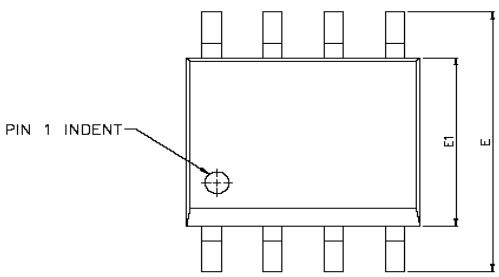

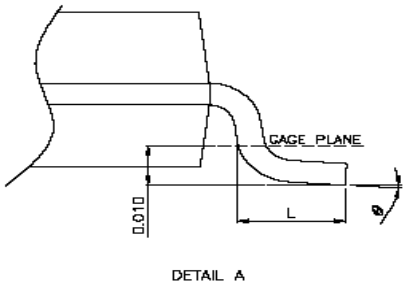

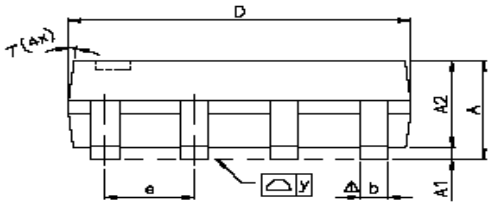

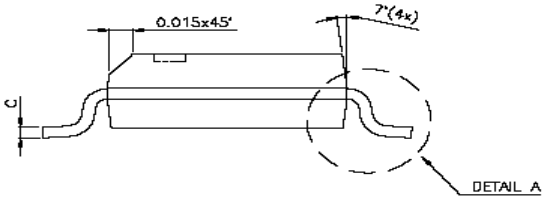

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.47	1.60	1.73	0.058	0.063	0.068
A1	0.10	——	0.25	0.004	——	0.010
A2	——	1.45	——	——	0.057	——
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.0098
D	4.80	4.85	4.95	0.189	0.191	0.195
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	——	1.27	——	——	0.050	——
L	0.38	0.71	1.27	0.015	0.028	0.050
2 y	——	——	0.076	——	——	0.003
θ	0°	——	8°	0°	——	8°