



# SP6033

## High Performance Synchronous Rectifying Converter

### DESCRIPTION

SP6033 is a high performance and tightly integrated secondary side synchronous rectifying converter for switching mode power supply system. It combines a low  $R_{dson}$  N-channel MOSFET to emulate the traditional diode rectifier at the secondary side of Flyback converter, The fundamental of SP6033 synchronous rectifying (SR) converter 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. The SP6033 is capable to adapt in almost all existing Resonance converters with no adjustment required.

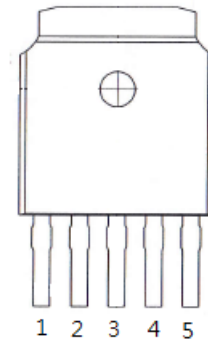
### FEATURES

- Offers efficiency improvement over Schottky Diode.
- Low Standby Power to meet DOE Lot 6 requirement.
- Secondary-side synchronous rectifier optimized for switching power system.
- Build-in 100V SR MOSFET with low  $R_{dson}$
- Operating frequency up to 300 KHz.
- Synchronize to transformer primary voltage waveform.
- Internal over voltage protection

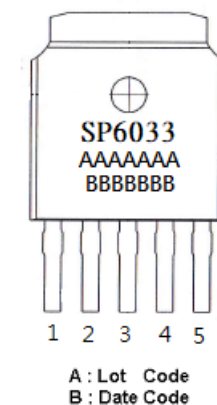
### APPLICATIONS

- Switching Mode Power Supply (CCM&DCM&QR)
- Storage area network power supplies
- Telecommunication converters
- Embedded systems
- Industrial & commercial systems using high current processors
- Power converters to meet Lot 6 requirement

### PIN CONFIGURATION (TO-252-5L)



### PART MARKING



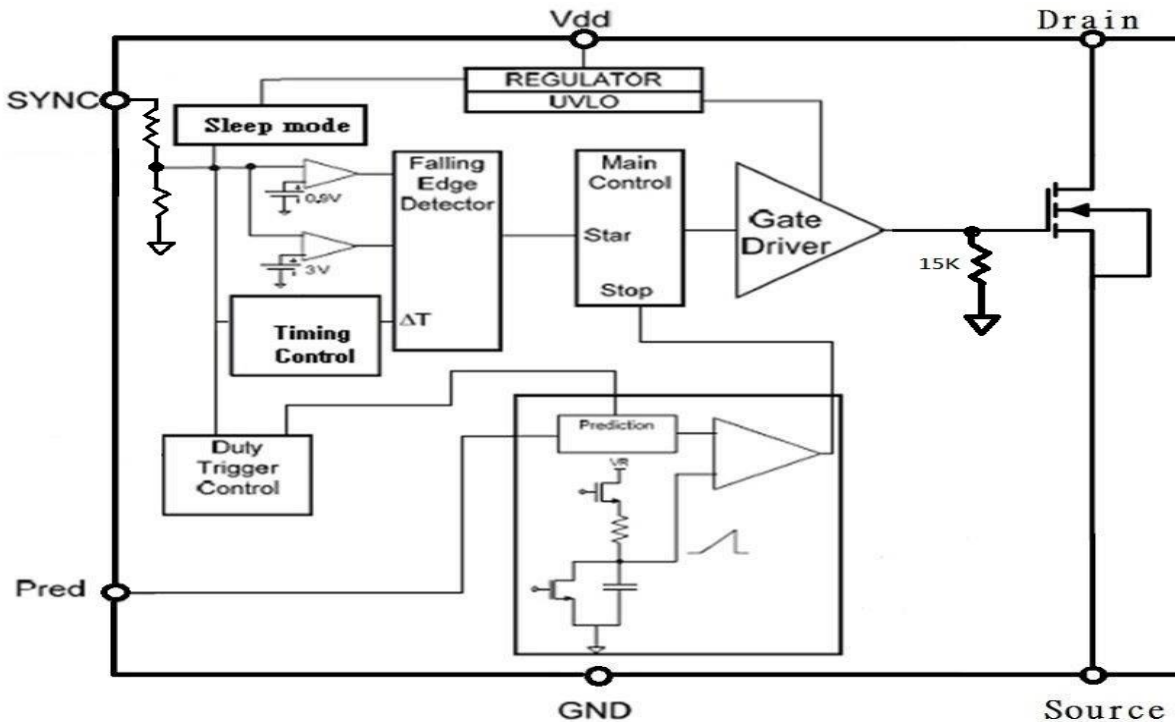




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### BLOCK DIAGRAM



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

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

Symbol	Parameter	Value	Unit
V <sub>dd</sub>	DC Supply Voltage	16	V
V <sub>d</sub> to V <sub>s</sub>	Drain to Source	100	V
P <sub>D</sub>	Power Dissipation @ T <sub>C</sub> =25°C (*)	1.33	W
T <sub>J</sub>	Operating Junction Temperature Range	-40 to 125	°C
T <sub>STG</sub>	Storage Temperature Range	-40 to 150	°C
T <sub>LEAD</sub>	Lead Soldering Temperature for 5 sec.	260	°C

### THERMAL RESISTANCE

Symbol	Parameter	Value	Unit
R <sub>θJA</sub>	Thermal Resistance-Junction to Ambient (*)	75	°C/W

(\*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.



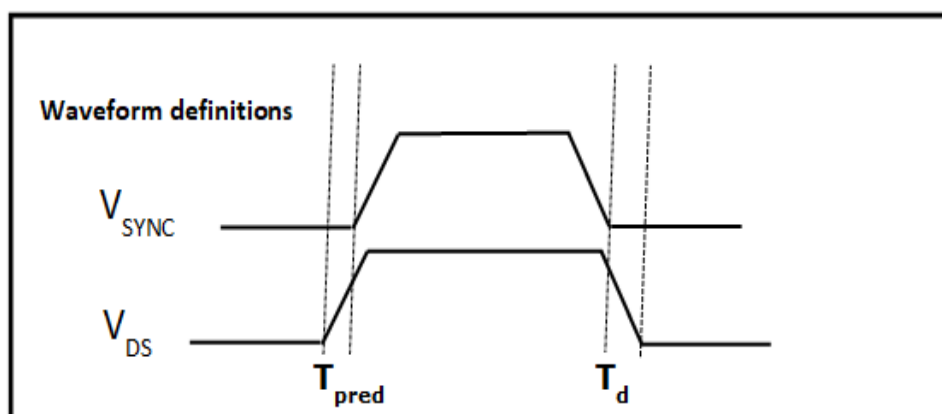
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### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ ,  $V_{dd}=5\text{V}$ , Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY INPUT</b>						
I <sub>dd</sub>	Supply current	No load & Sleep mode	0.05	0.11	0.2	mA
		$V_{\text{SYNC}}=\text{DC } 12\text{V}$	2.3	2.65	3.0	mA
V <sub>dd</sub>	Supply voltage	I <sub>dd peak</sub> < 1A	4.3		16	V
V <sub>dd on</sub>	Enable voltage		3.3	3.5	4.3	V
V <sub>dd hysteresis</sub>	Enable voltage			0.2		V
<b>SYNC REFERENCE (SYNC)</b>						
V <sub>shth</sub>	SYNC high threshold			3.0		V
V <sub>slth</sub>	SYNC low threshold			0.97		V
V <sub>sync WK</sub>	SYNC wake-up voltage		12			V
I <sub>sync</sub>	SYNC input current				3	mA
<b>PREDICTION SECTION</b>						
T <sub>d</sub>	Propagation delay			150		nS
T <sub>pred</sub>	Dead time			1		uS
<b>SR MOSFET SECTION</b>						
BV <sub>dss</sub>	MOSFET Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=250\mu\text{A}$	100			V
R <sub>ds(on)</sub>	On Resistance	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=20\text{A}$		9.5	12	mΩ
C <sub>iss</sub>	Input Capacitance	$V_{\text{DS}}=50\text{V}, V_{\text{GS}}=0\text{V}$ $f=1\text{MHz}$		2275		
C <sub>oss</sub>	Output Capacitance			162		
C <sub>rss</sub>	Reverse Transfer Capacitance			7.9		
T <sub>d(on)</sub>	Turn On Time			8		
T <sub>d(off)</sub>	Turn Off Time	$V_{\text{DD}}=50\text{V}, I_{\text{D}}=14\text{A}$		26		
T <sub>f</sub>	Fall time	$V_{\text{GEN}}=10\text{V}, R_{\text{G}}=10\Omega$		4		nS

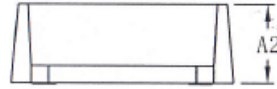
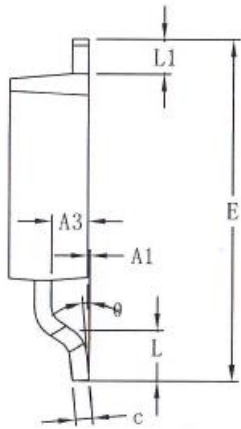
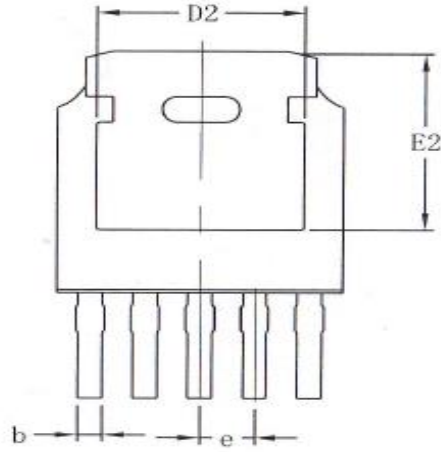
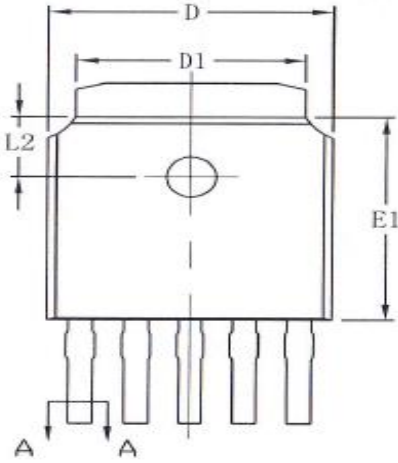




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### TO-252-5L PACKAGE OUTLINE



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A1	0.00	—	0.10
A2	2.20	2.30	2.40
A3	1.02	1.07	1.12
b	0.54	—	0.62
b1	0.53	0.56	0.59
c	0.51	—	0.55
c1	0.50	0.51	0.52
D	6.50	6.60	6.70
D1	5.33 REF.		
D2	4.83 REF.		
E	9.90	10.10	10.30
E1	6.00	6.10	6.20
E2	5.30REF		
e	1.27BSC		
L	1.40	1.50	1.60
L1	1.02REF.		
L2	1.70	1.80	1.90
$\theta$	0	—	8°



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