



# SP6053

## High Frequency Synchronous Rectifier Driver

### DESCRIPTION

The fundamental of SP6053 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. SP6053 is especially suitable for Forward and DC/DC Module.

### APPLICATIONS

- Storage area network power supplies
- Servers & workstations
- Embedded systems
- Industrial & commercial systems using high current processors
- Telecommunication converters
- DC/DC Power Module

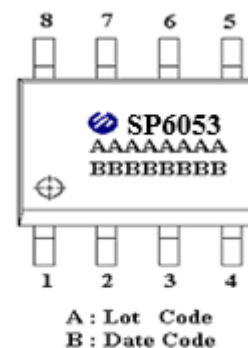
### FEATURES

- 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 at high switching frequency 500Khz.
- Synchronize to transformer secondary voltage waveform.
- Linear setting of timing function.
- Minimum VDS pulse masking function
- Bi-directional rapid load protection function.
- Self-detecting DCM / CCM to enhance the performance under the variable switching frequency condition.
- SOP-8 Package

### PIN CONFIGURATION (SOP-8)



### PART MARKING

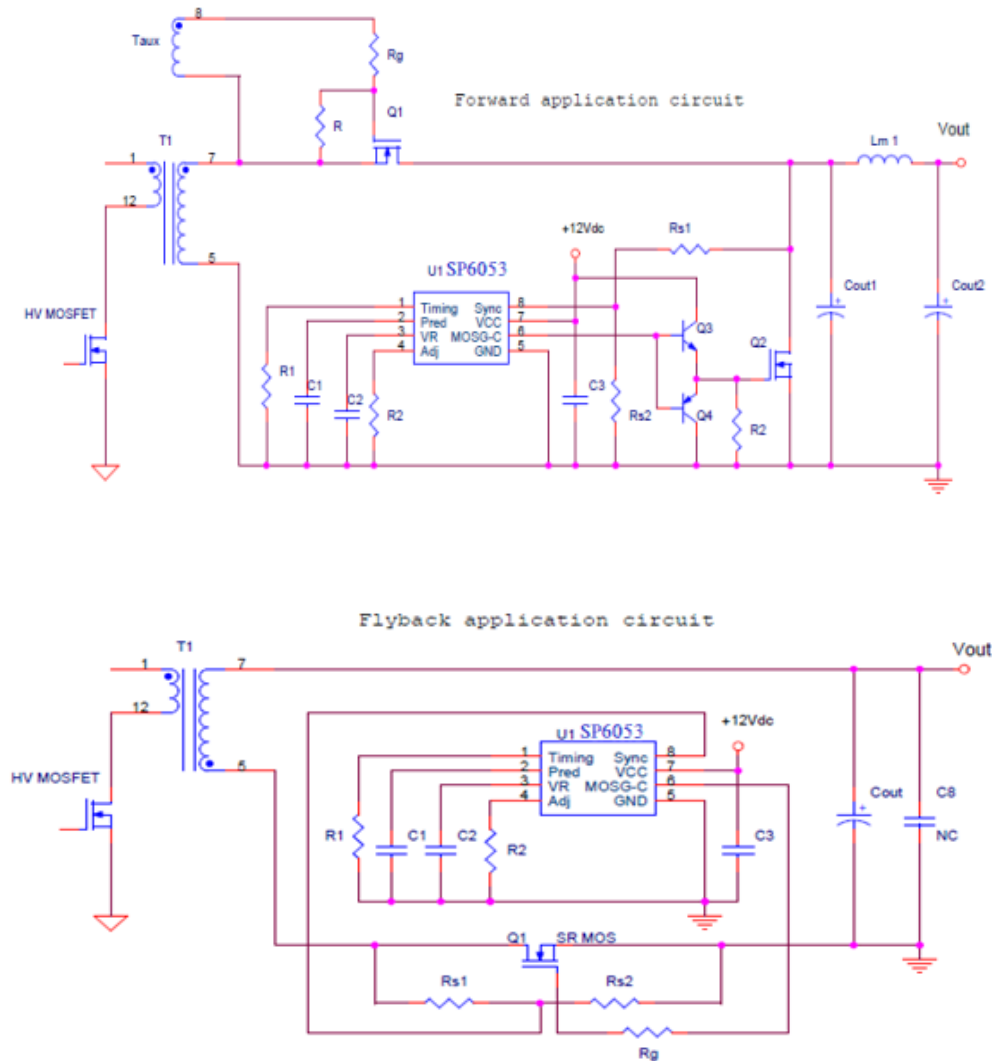




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### TYPICAL APPLICATION CIRCUIT



### PIN DESCRIPTION

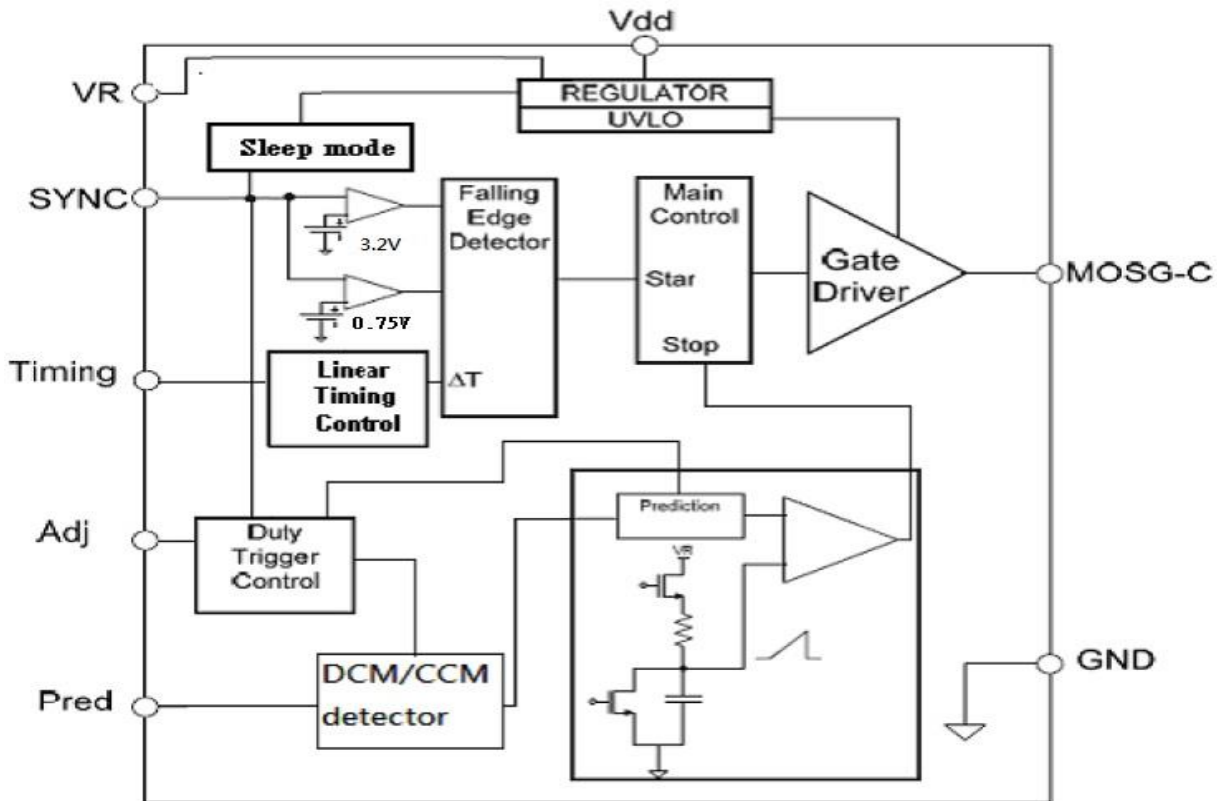
Pin	Symbol	Description
1	Timing	Discontinuous current filter timing adjustment resistor connection.
2	Pred	Capacitor to store previous cycle timing for SR MOSFET.
3	VR	Voltage Regulator.
4	Adj	Trigger point adjustment for Dynamic state.
5	GND	Ground connection.
6	MOSG-C	Catch MOSFET gate drive.
7	Vdd	DC supply voltage.
8	SYNC	Synchronized signal from the VDS of SR MOSFET.



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### BLOCK DIAGRAM



### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6053S8RGB	SOP-8	SP6053

※ SP6053S8RGB : Tape Reel ; Pb – Free ; Halogen - Free

### 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/MOS-G/SYNC</sub>	DC Supply/Output/Sync Voltage	17	V
V <sub>R/Timing/pred/Adj</sub>	Voltage Regulator/Timing/Pred/Sync Voltage	-0.3~6	V
I <sub>OUT</sub>	Peak Source Current (Pulsed)	2.0	A
	Peak Sink Current (Pulsed)	2.0	A
P <sub>D</sub>	Power Dissipation @ T <sub>A</sub> =85°C(*)	0.25	W
T <sub>J</sub>	Operating Junction Temperature Range	-40 to 150	°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>θJ</sub>	Thermal Resistance Junction to Ambient (*)	150	°C/W

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



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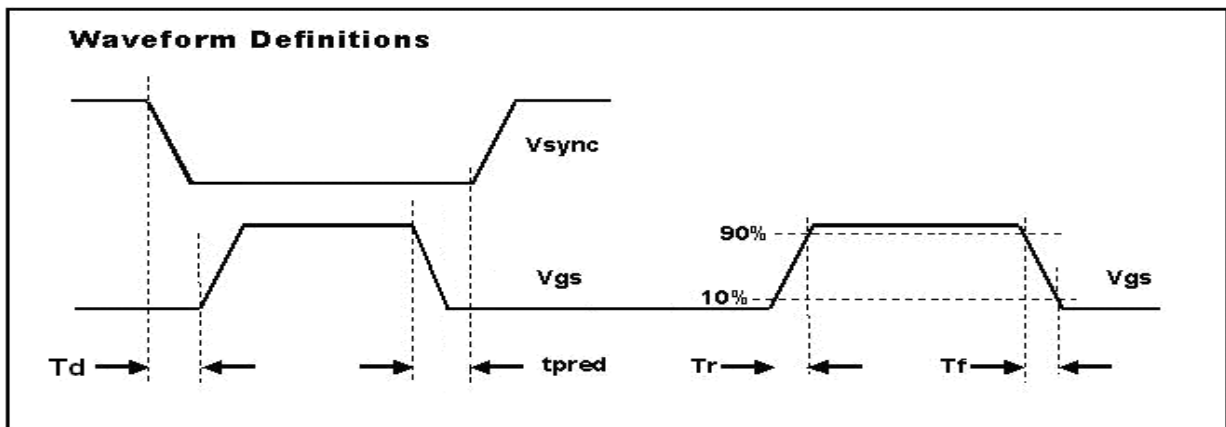
## High Frequency Synchronous Rectifier Driver

### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ ,  $V_{DD}=12\text{V}$ , Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY INPUT</b>						
$I_{DD}$	Supply current	Sleep mode		0.23		mA
$V_{DD}$	Supply voltage	$V_{SYNC}=0\text{V}$ , $V_{DD}$ on, No load $I_{DD\text{ peak}} < 2\text{A}$	1.7	2.3	3.1	
$V_{DD\text{ on}}$	Enable voltage		7.6	8.0	8.4	V
$V_{DD\text{ hysteresis}}$	Enable voltage			0.25	0.5	V
$V_{ovp}$	Over voltage protection		16	16.5	17	V
$V_{ovp\text{ hysteresis}}$				0.35		V
<b>SYNC REFERENCE (SYNC)</b>						
$V_{shth}$	SYNC high threshold			3.2		V
$V_{slth}$	SYNC low threshold			0.75		V
$V_{sync}$	SYNC wake-up voltage	$I_{syn} < 4\text{mA}$ , pulse width $> 0.6\text{ us}$	5	5.5	6	V
$I_{sync}$	SYNC input current				3	mA
<b>Voltage Regulator REFERENCE (VR)</b>						
$V_R$	voltage		5.2		5.4	V
$I_{VR}$	VR Output Current				50	mA
<b>ON TIME DUTY SETUP ( PIN 6 )</b>						
$T_{on\text{-time}}$				40		uS
<b>MOSFET GATE DRIVER (MOSG-C)</b>						
$V_{oh}$	Output high voltage	$I_o = -200\text{mA}$	10.3	11.0		V
$V_{ol}$	Output low voltage	$I_o = 200\text{mA}$		0.5	0.8	V
$T_d$	Propagation delay	No load	25	50	155	nS
$T_{pred}$		No load		150		nS
$T_r$	Rise time	Load = 1nF (*)		11	25	nS
$T_f$	Fall time	Load = 1nF (*)		13	25	nS
<b>Dynamic Protect</b>						
$Dt_{CCM}$	Dynamic variable	Pin 4 , 25K $\Omega$ to GND		500		nS
$Dt_{DCM}$	Dynamic variable	Pin 4 , 25K $\Omega$ to GND		1500		nS
$T_{on\text{-min}}$	MOSG-C on time	PWM adjusts time $> Dt$	0.2	0.3	0.45	uS

(\*)  $T_r$  &  $T_f$  are measured among 10% and 90% of starting and final voltage.

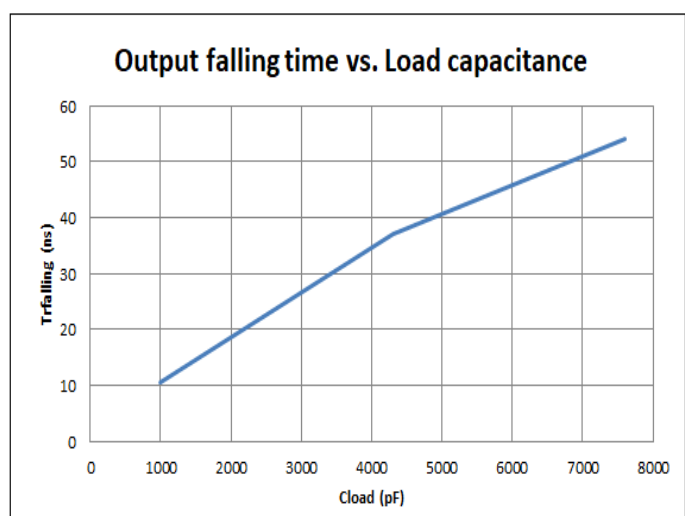
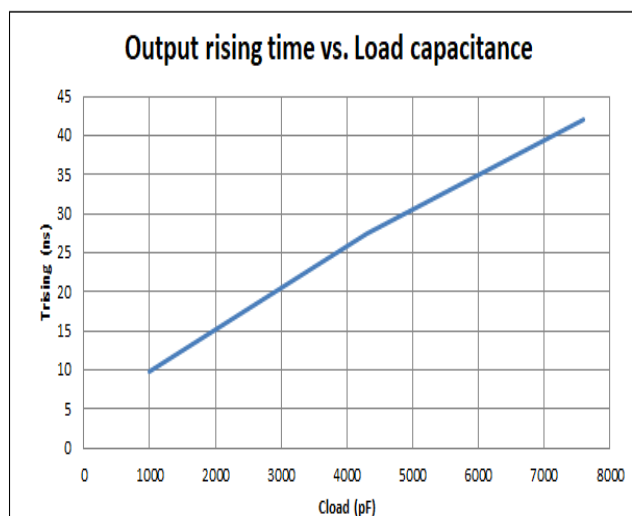
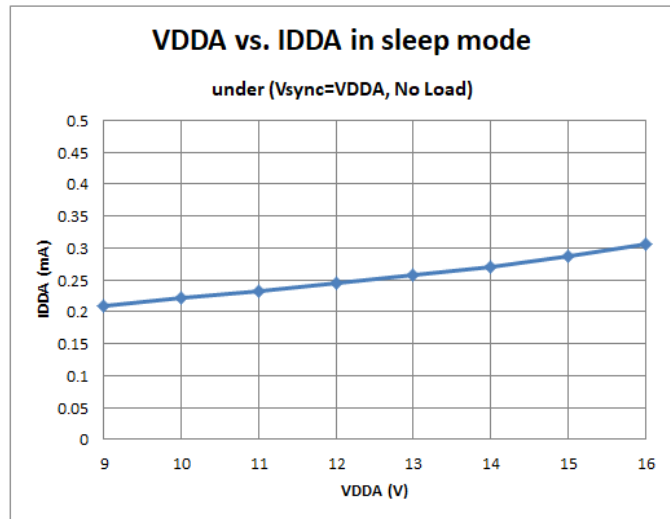
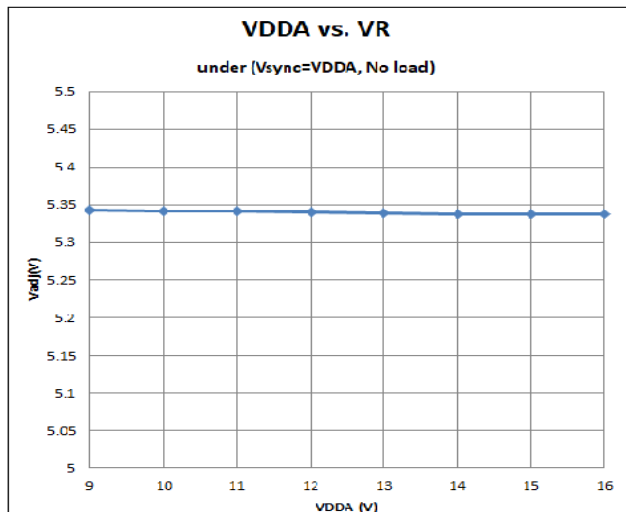
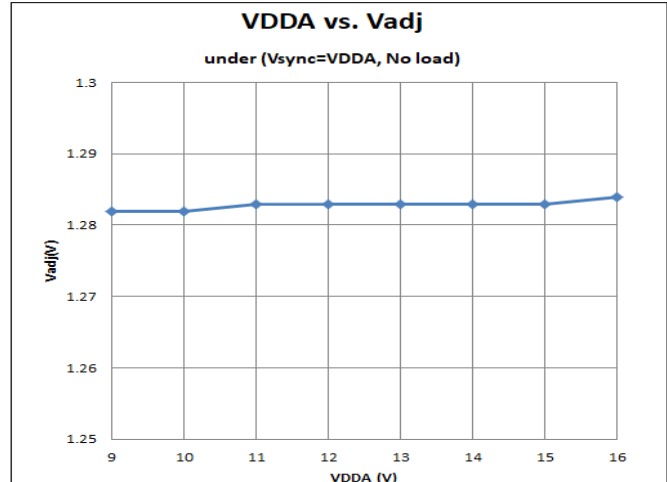
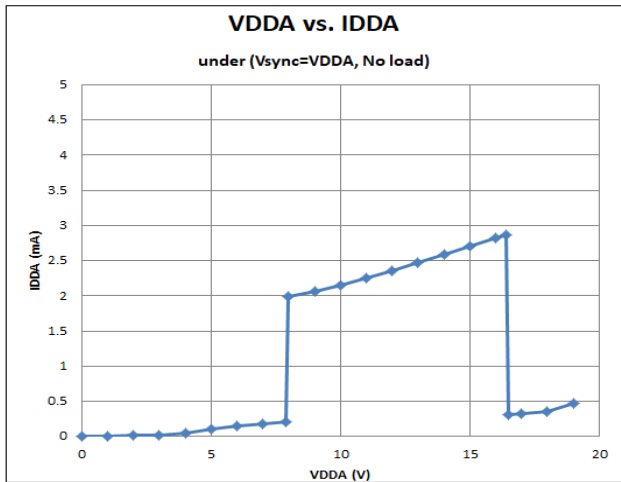




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### TYPICAL CHARACTERISTICS

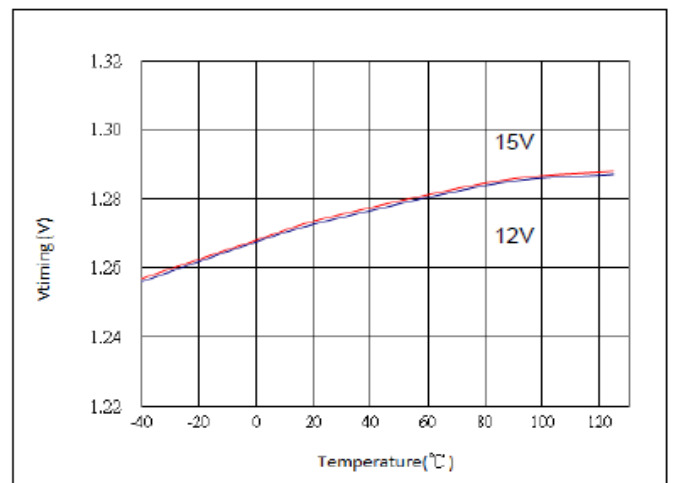
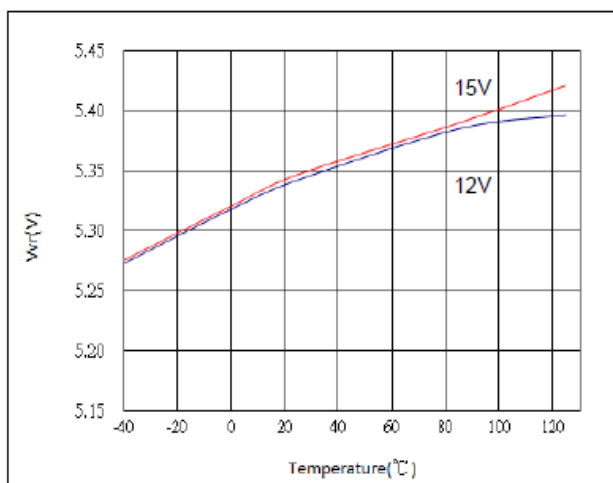
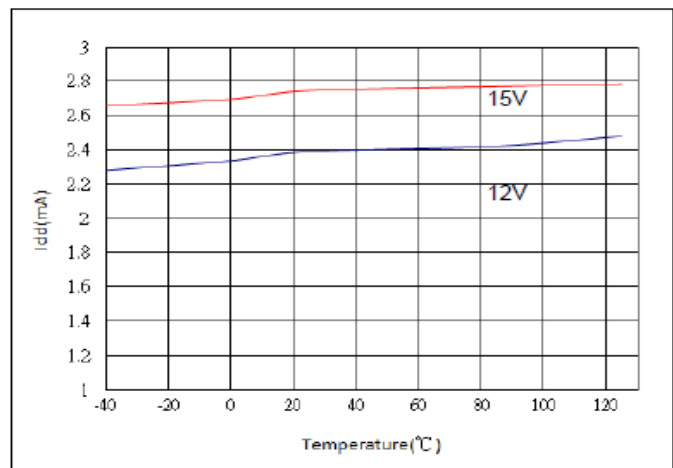
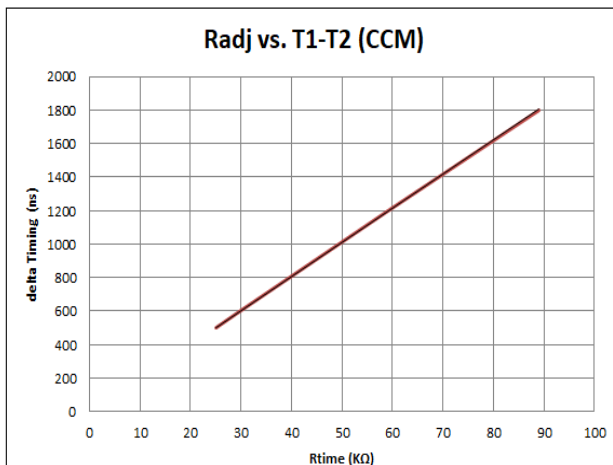
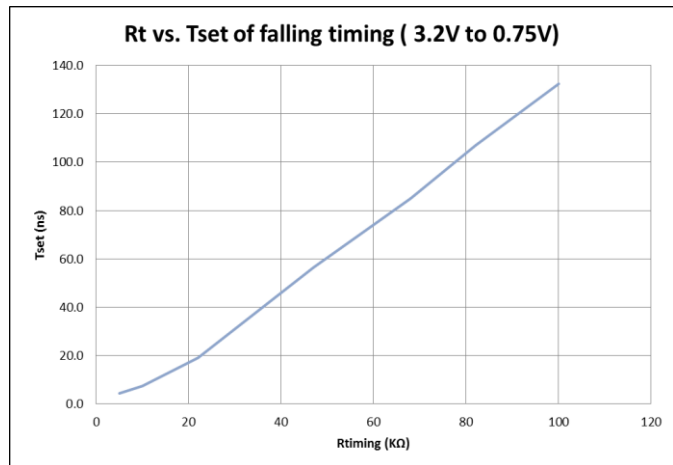
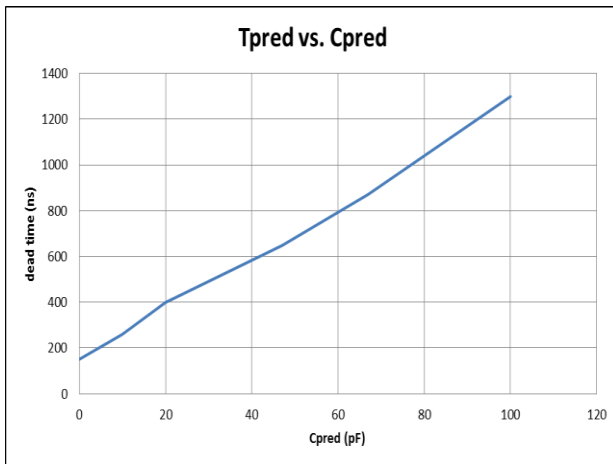




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### TYPICAL CHARACTERISTICS





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