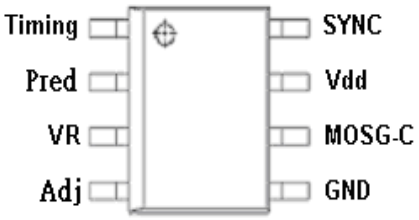
SP6051
Synchronous Rectifier Driver

DESCRIPTION
The fundamental of SP6051 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 linear 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. Specially , SP6051 is designed for Full Bridge or Forward applications, and variable switching frequency system .

APPLICATIONS
- Switching Mode Power Supply
  For Full Bridge or Forward Applications
- Storage area network power supplies
- Telecommunication converters
- Embedded systems
- Industrial & commercial systems using high current processors
- Power converters to meet Lot 6 requirement

FEATURES
- Offers efficiency improvement over Schottky Diode.
- Low Standby Power to meet DOE Lot 6 Requirement .
- Drives all level Power MOSFET.
- Prediction gate timing control.
- Minimum MOSFET body diode conduction.
- Operating frequency up to 250 KHz.
- Synchronize to transformer secondary voltage waveform.
- Self-detect DCM / CCM to enhance the performance under the variable switching frequency condition
- Prediction time for DCM is set to be 4 times longer than CCM to avoid the cross conduction during rapid load change
- Different minimum ON time for CCM and DCM
- Bi-directional rapid load protection

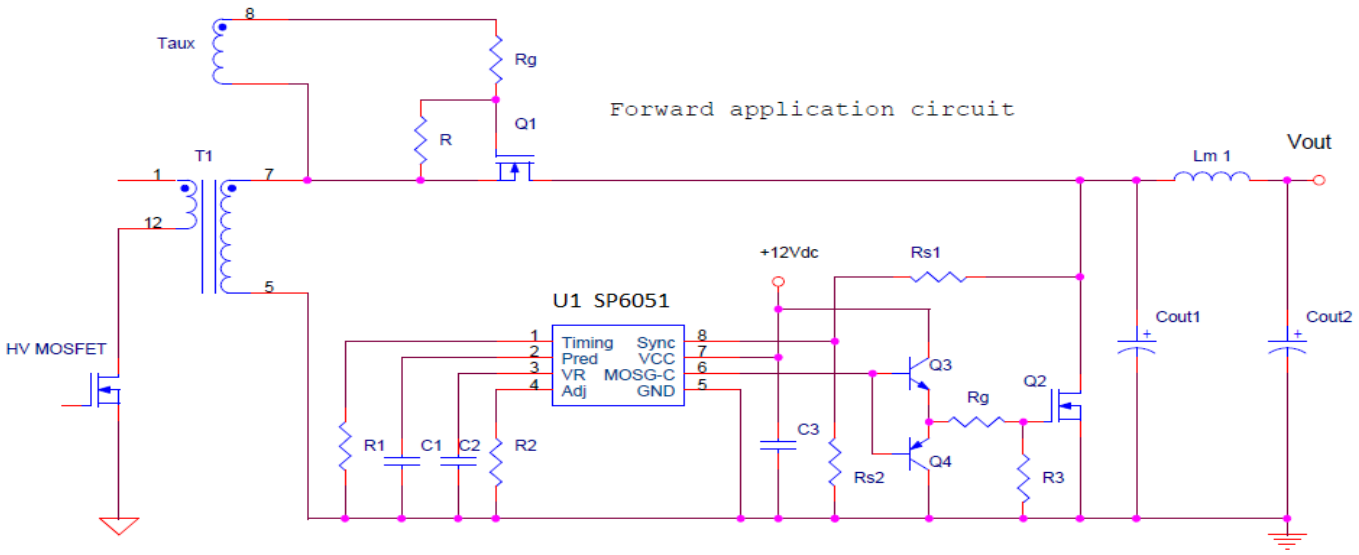
PIN CONFIGURATION (SOP-8)



PART MARKING

A : Lot Code
B : Date Code

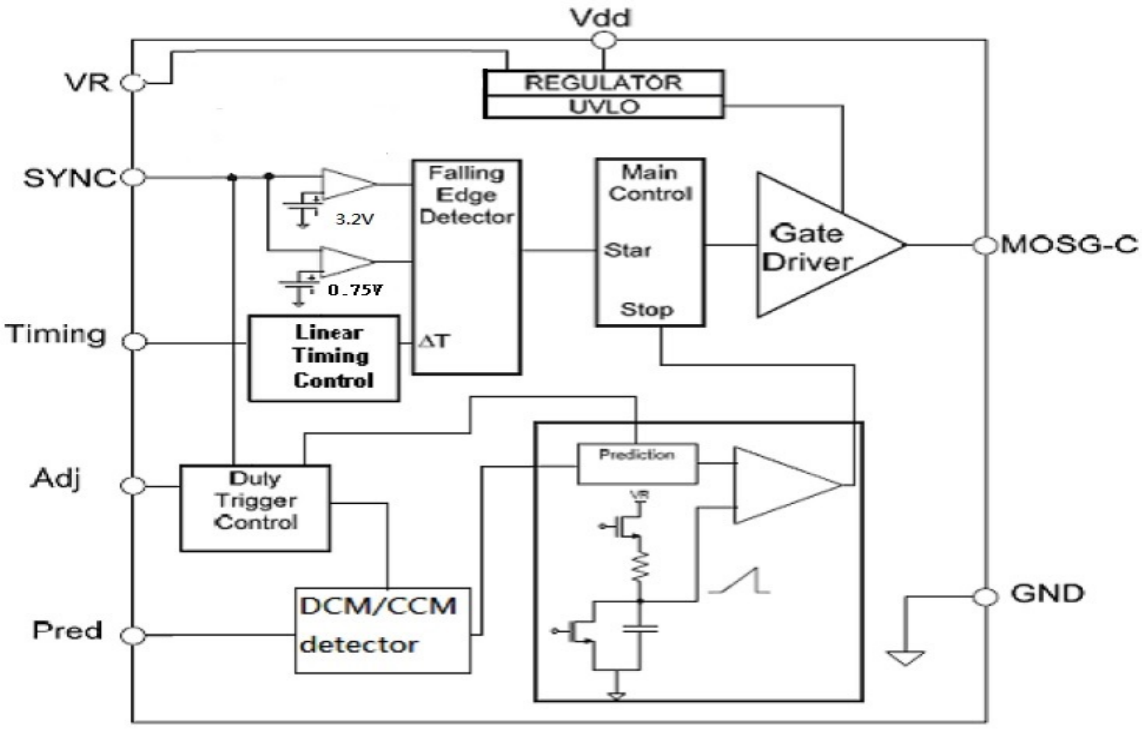
TYPICAL APPLCATION CIRCUIT



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 V_{DS} of SR MOSFET.

BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Part Marking
SP6051S8RGB	SOP-8	SP6051

※ SP6051S8RGB : Tape Reel ; Pb – Free ; Halogen - Free

ABSOULTE MAXIMUM RATINGS (TA=25℃, unless otherwise specified.)

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

Symbol	Parameter	Value	Unit
$V_{dd/MOS-G/SYNC}$	DC Supply/Output/Sync Voltage	17	V
$V_{R/Timing/pred/Adj}$	Voltage Regulator/Timing/Pred/Sync Voltage	-0.3~6	V
I_{OUT}	Peak Source Current (Pulsed)	2.0	A
	Peak Sink Current (Pulsed)	2.0	A
P_D	Power Dissipation @ T_A=85℃ (*)	0.25	W
T_J	Operating Junction Temperature Range	-40 to125	℃
T_{STG}	Storage Temperature Range	-40 to 150	℃
T_{LEAD}	Lead Soldering Temperature for 5 sec.	260	℃

THERMAL RESISTANCE

Symbol	Parameter	Value	Unit
$R_{\Theta J}$	Thermal Resistance Junction to Ambient (*)	150	℃/W

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

ELECTRICAL CHARACTERISTICS

(T_A=25℃, V_{dd}=12V, Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
SUPPLY INPUT						
IDD	Supply current	V_{SYNC}=0 , Vdd on,	1.5	2.6	3.5	mA
Vdd	Supply voltage	Idd peak < 2A			15	V
Vdd on	Enable voltage		7.6	8.0	8.4	V
Vdd hysteresis	Enable voltage			0.25	0.5	V
Vovp	Over voltage protection		16	16.5	17	V
Vovp hystersis				0.35	0.6	V
SYNC REFERENCE (SYNC)						
Vshth	SYNC high threshold			3.2		V
Vslth	SYNC low threshold			0.75		V
Isync	SYNC input current				3	mA
Vswake	SYNC wake-up voltage	Vsync minimum pulse >1.5us	4.5	5.4	6	V
Voltage Regulator REFERENCE (VR)						
VR	voltage		5.2		5.4	V
IVR	VR Output Current				50	mA
ON TIME DUTY SETUP (PIN 6)						
Ton-time		Frequency= 10KHz-20KHz, Duty=20%~50%		26	32	uS
MOSFET GATE DRIVER (MOSG-C)						
Voh	Output high voltage	Io =-200mA	10.5	11.0		V
Vol	Output low voltage	Io =200mA		0.5	0.8	V
Td	Propagation delay	No load	25	50	155	nS
Tpred_CCM	Prediction time in CCM	The pred pin is open		200		nS
Tpred_DCM	Prediction time in DCM	The pred pin is open		800		ns
Tr	Rise time	Load = 1nF (*)		10	25	nS
Tf	Fall time	Load = 1nF (*)		10	25	nS
Dynamic Protect						
Dt-CCM	Dynamic variable	Pin 4 , 25KΩ to GND (CCM)		500		nS
Ton-min	MOSG-C on time	PWM adjusts time > Dt (CCM)		2.4		uS
Dt-DCM	Dynamic variable	Pin 4 , 25KΩ to GND (DCM)		1000		nS
Ton-min	MOSG-C on time	PWM adjusts time > Dt (DCM)		0.45		uS

(*) Tr & Tf are measured among 10% and 90% of starting and final voltage

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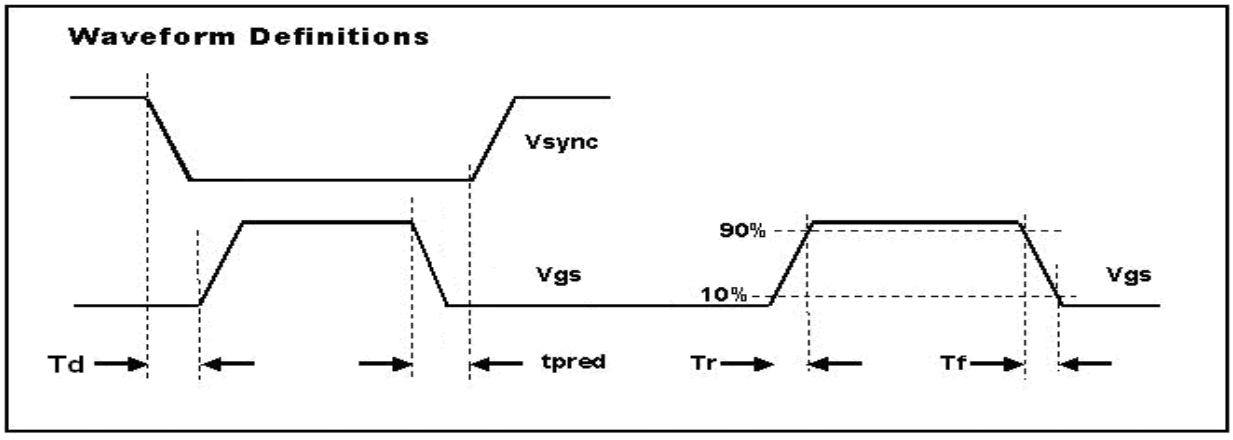
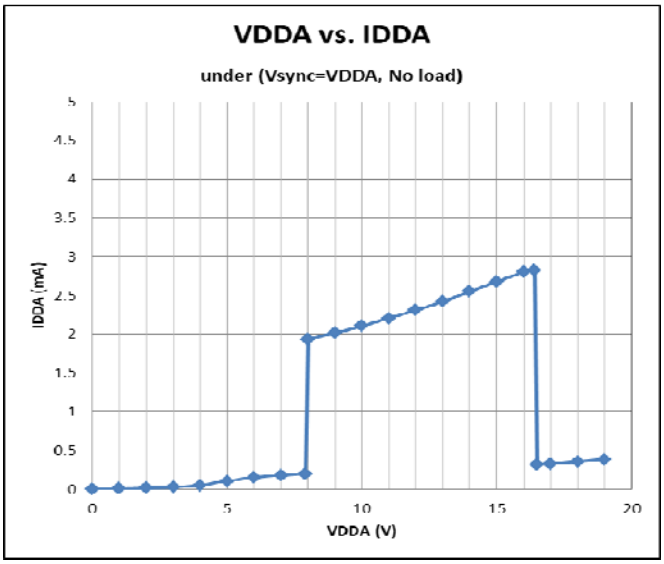
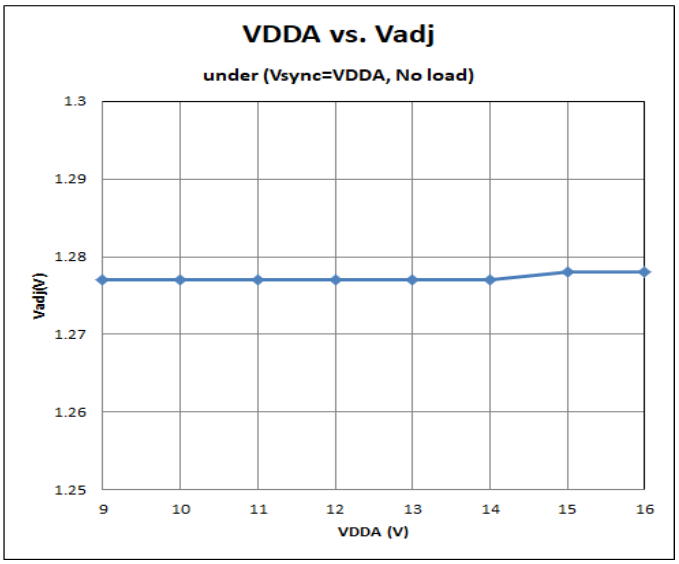
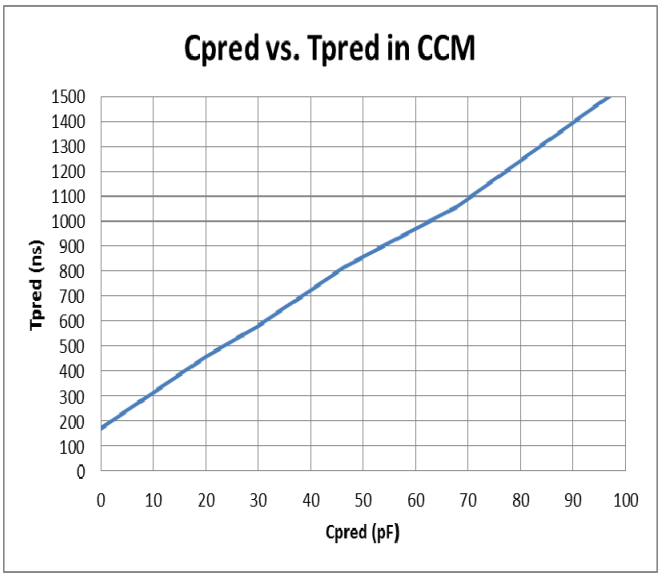
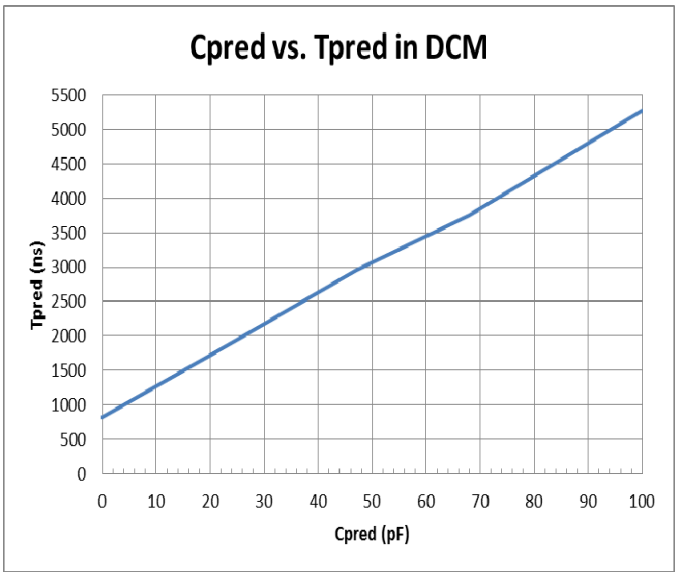


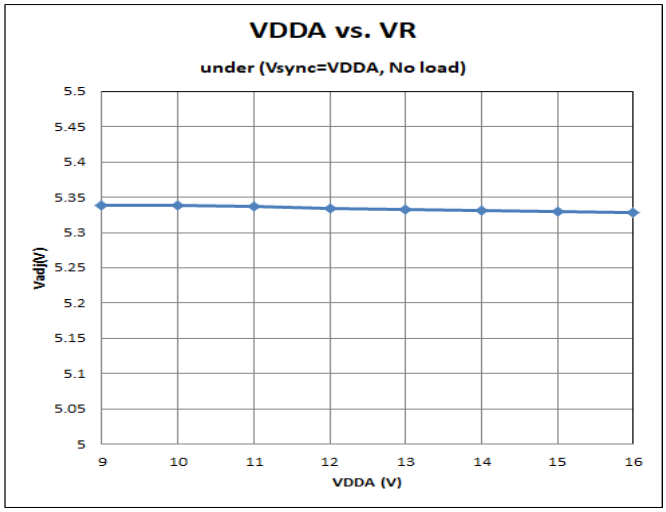
PERFORMANCE CHARACTERISTICS











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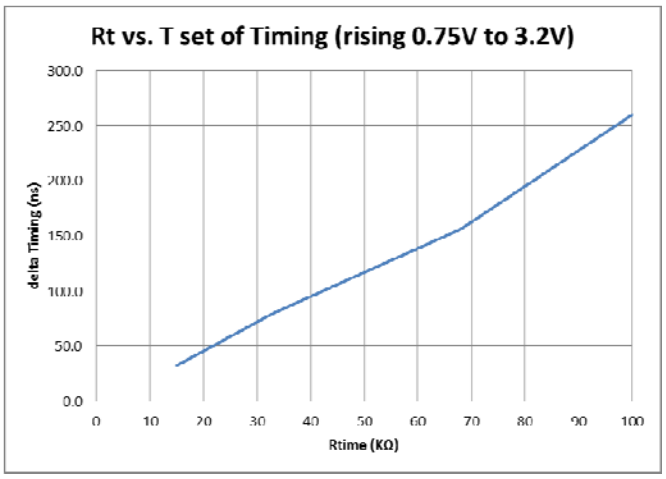

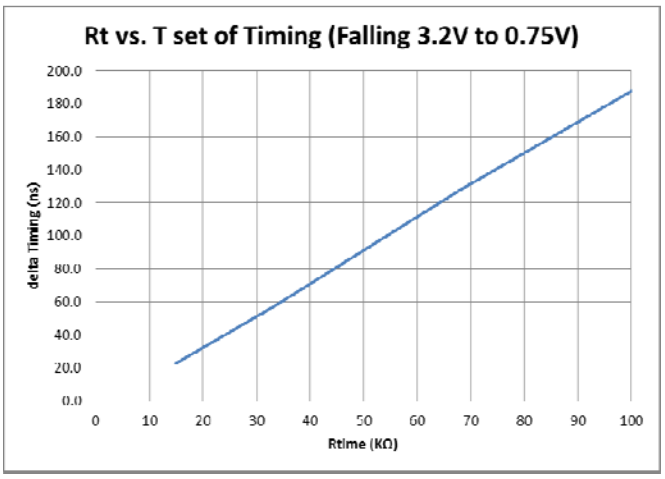

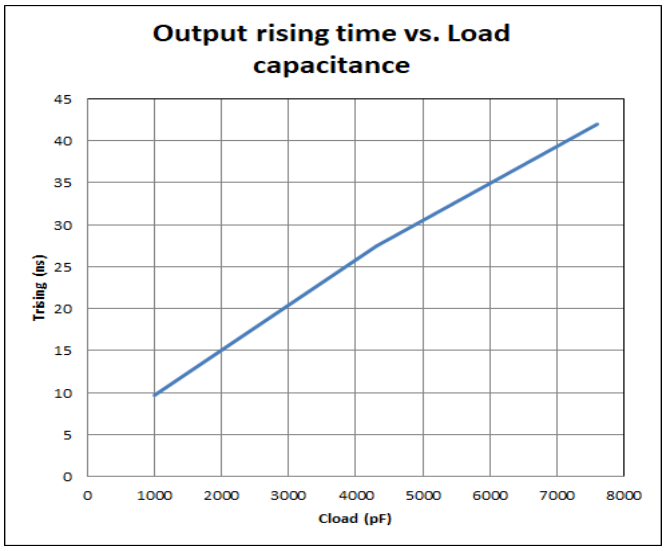

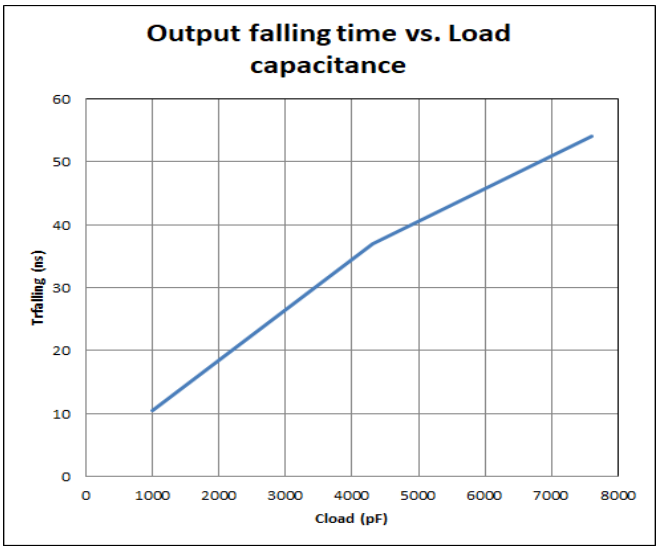

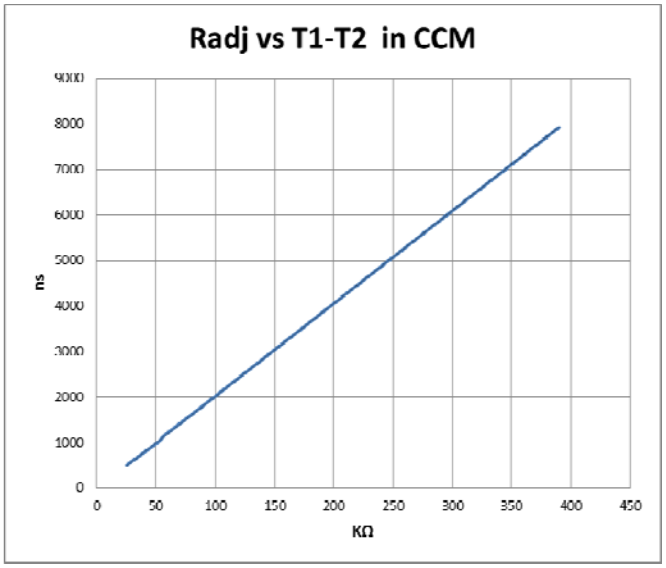

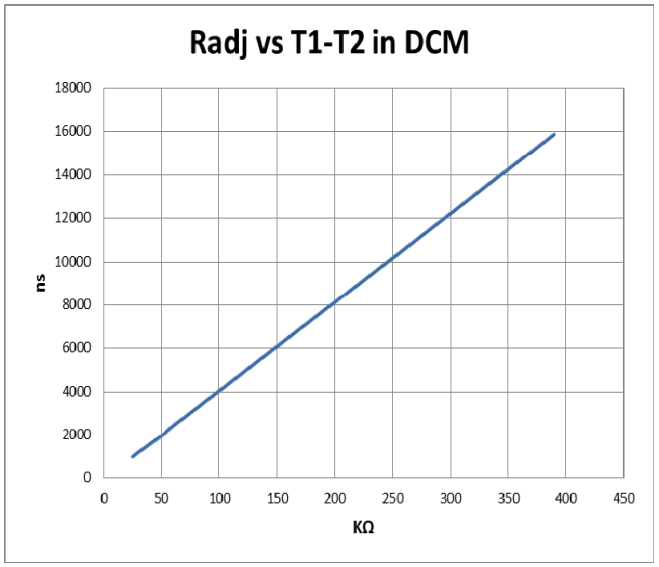

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