CogniPOWER
power smarter

***APEC** Conference and Expo 2010*

A new technology facilitates faster and more versatile switched-mode power converters

APEC

Fast, versatile switches for Digital Power and for tomorrow's SMPC architectures

High toggle frequencies and extreme duty cycles require clean high-side switching with accurately timed, fast transitions

The ideal high-side driver combines fast transitions, short and predictable delay, quick recovery, rejection of fast common mode transients, and easy disable, all without floating power

With bipolar-blocking FET's on the horizon, tomorrow's driver will require a common-mode range to facilitate AC applications

CogniPower
power smarter

New power switch drive technology

CogniPower is introducing patent-pending switch drive technology based on common-mode-choke level-shifting

This new technique combined with the patent-pending CogniPower bistable switch provides an unprecedented combination of timing control, simplicity and versatility

CogniPower power smarter

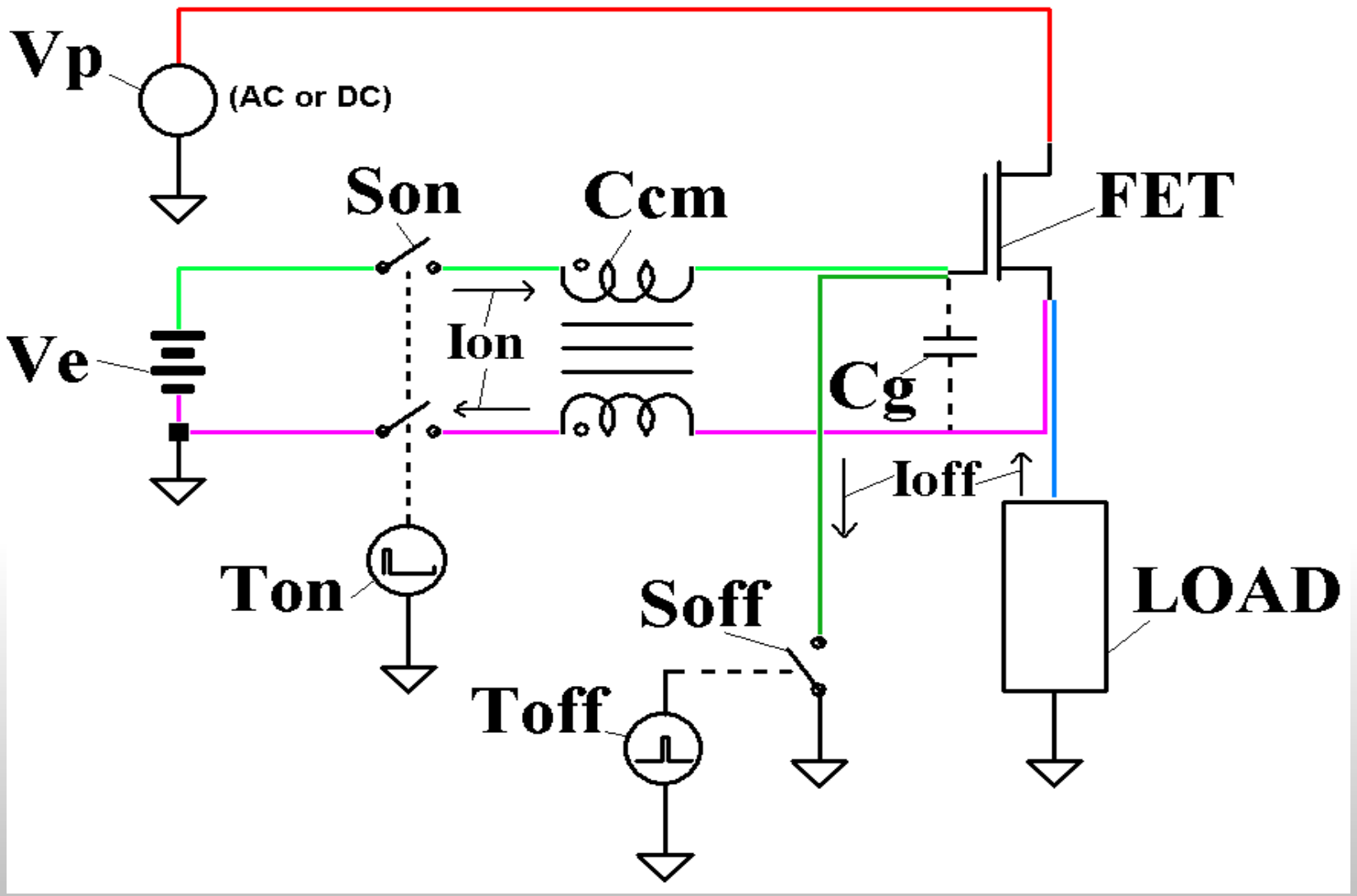
CogniPower driver technology

This new technology can drive large FET's at several MHz with well-controlled driver delays of but a few nS

With bipolar-blocking switches this driver will accommodate both positive and negative "high-side" common-mode voltages

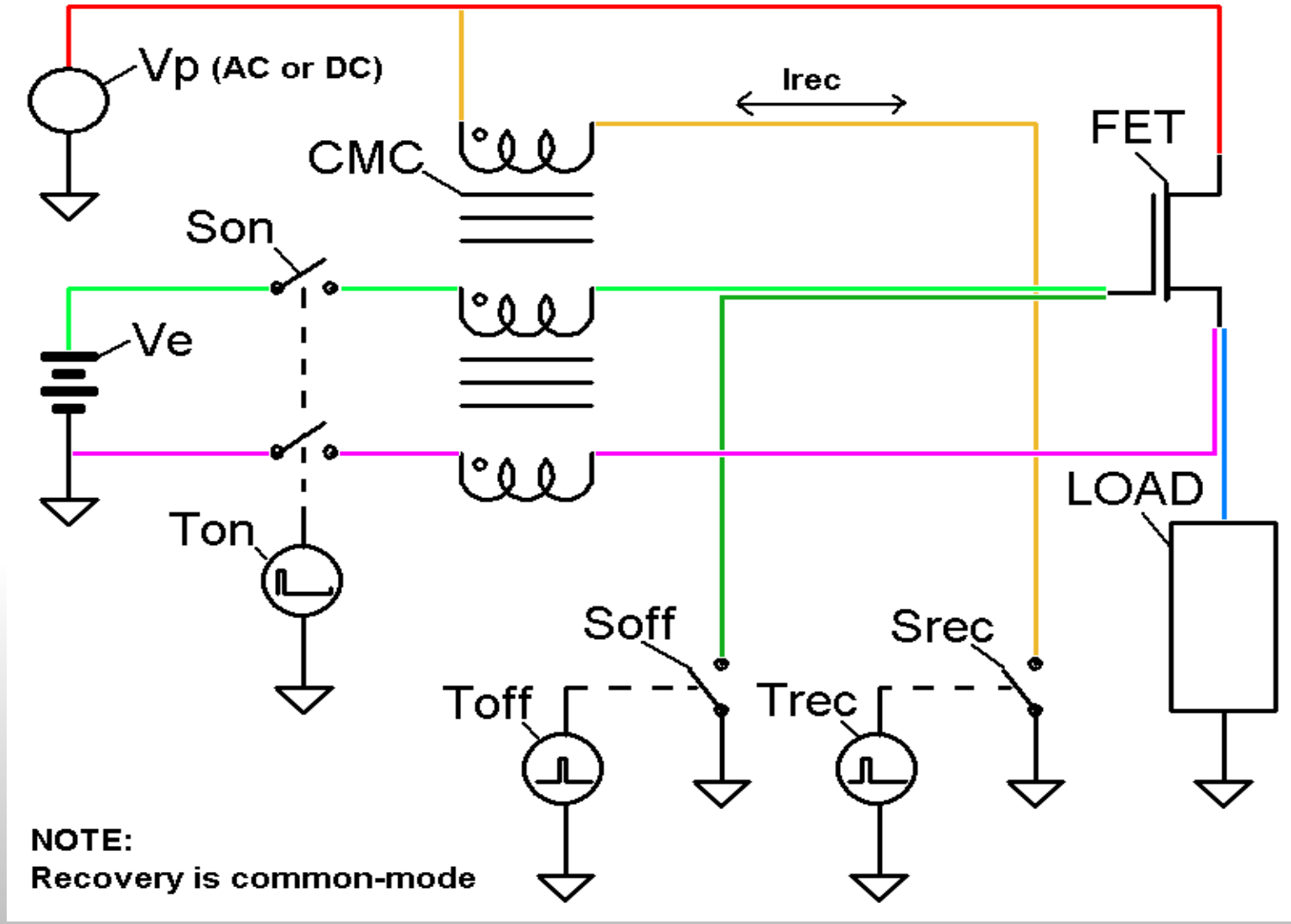
Bill Morong, principal inventor, will provide details

CogniPower power smarter



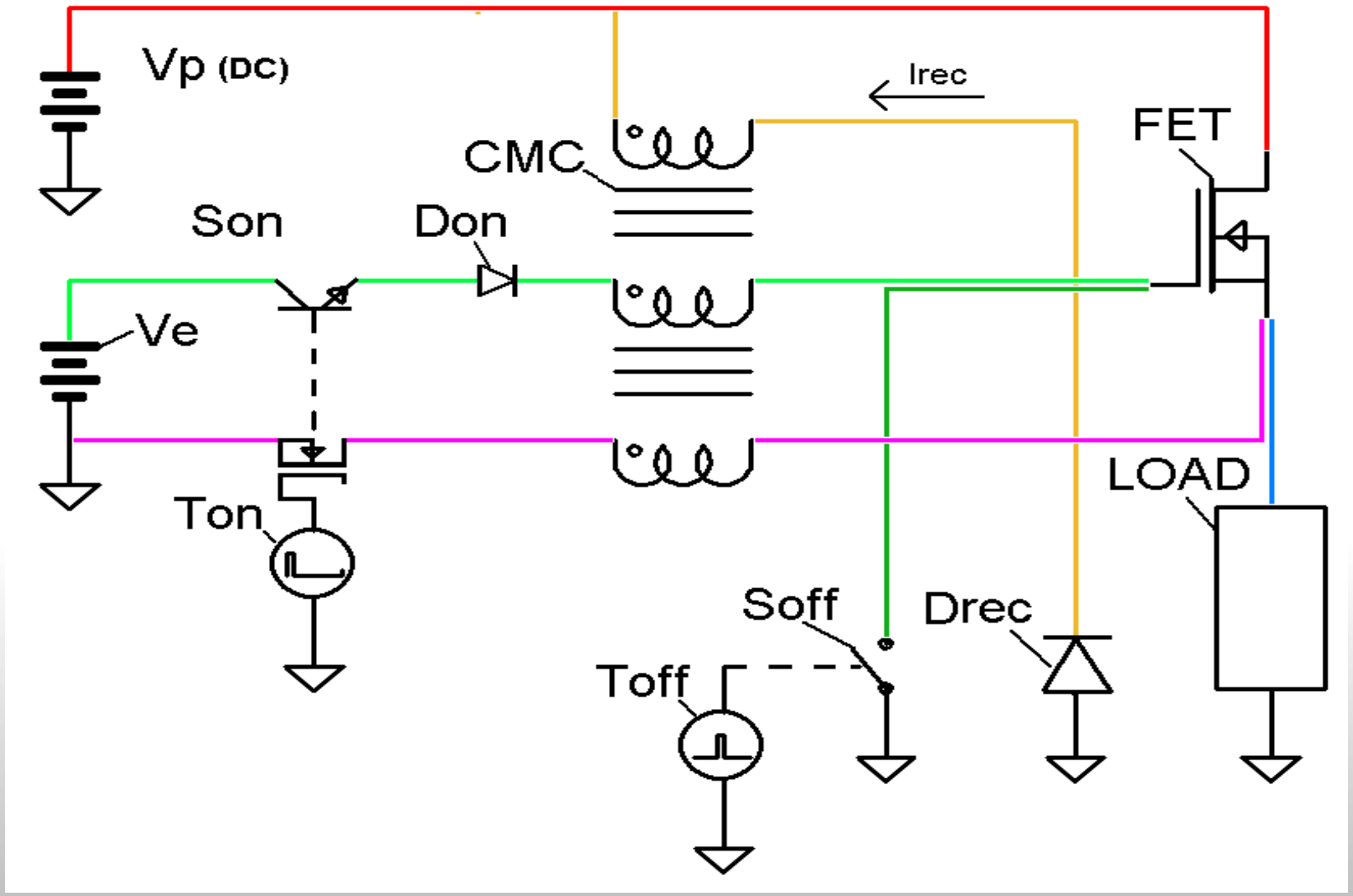
BASIC CMC-DRIVEN HIGH-SIDE SWITCH

CogniPower
power smarter



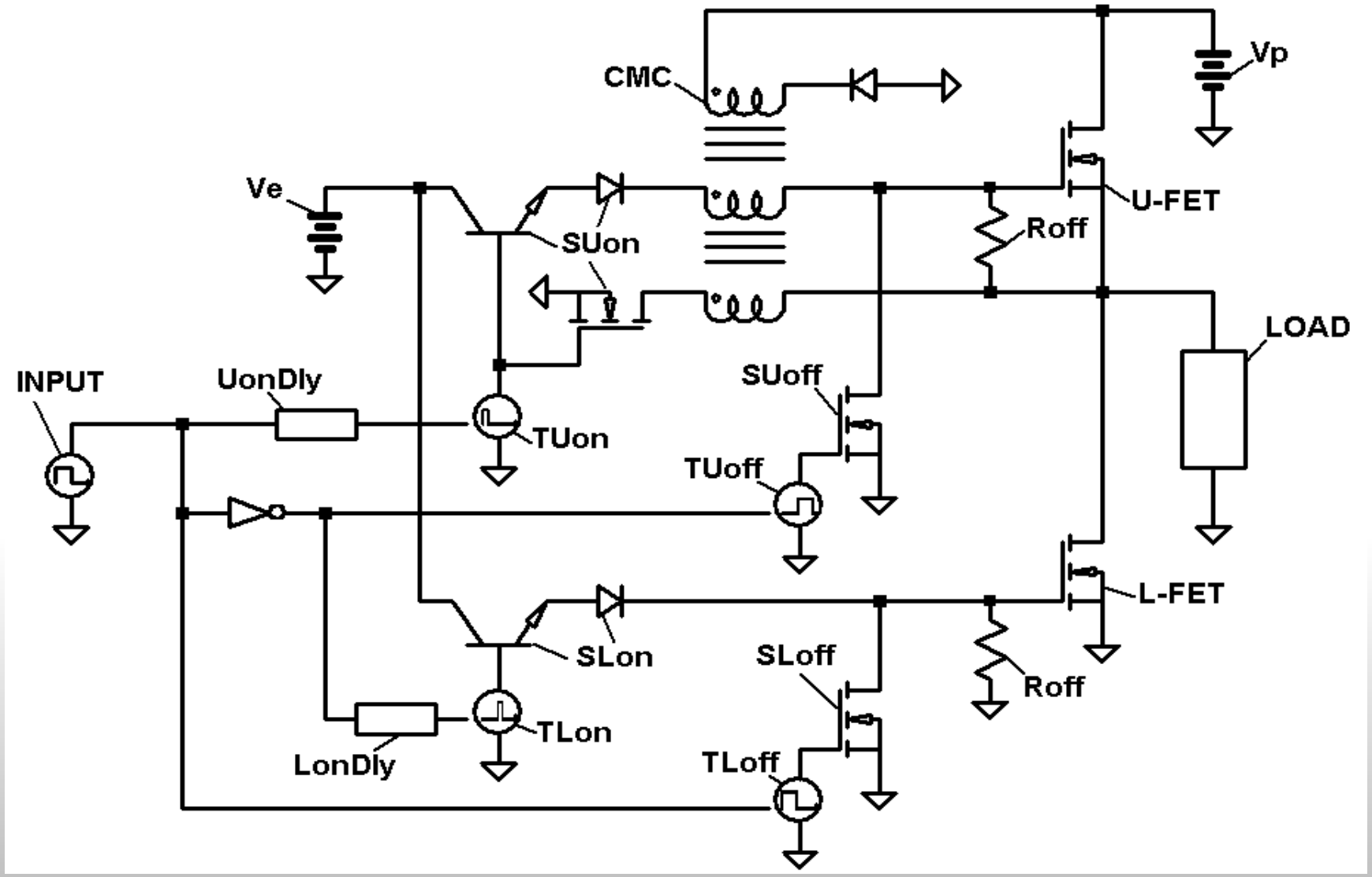
CMC-DRIVEN SWITCH WITH RECOVERY

CogniPower
power smarter



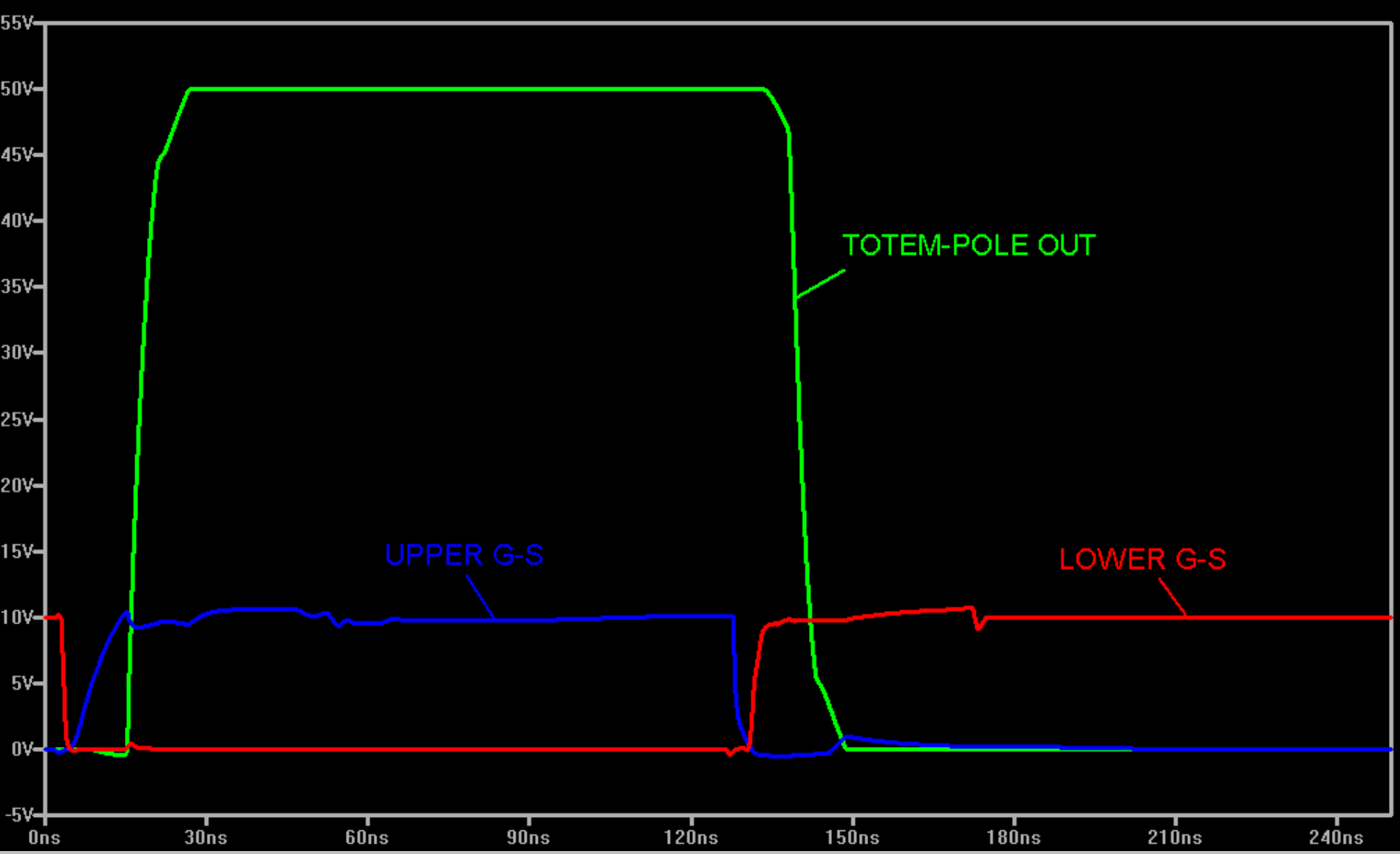
UNIPOLAR CMC-DRIVEN SWITCH

CogniPower
power smarter



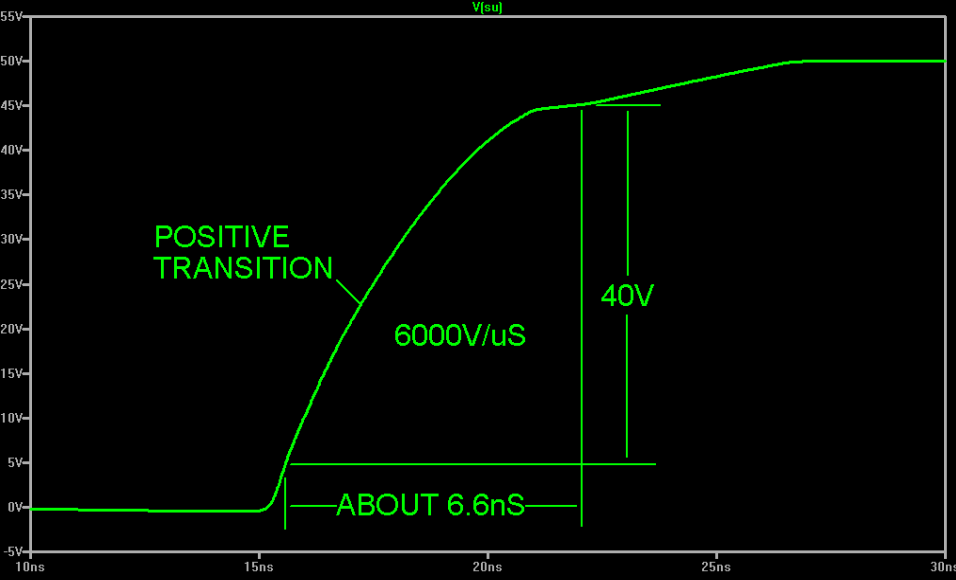
UNIPOLAR TOTEM-POLE with CMC-DRIVEN UPPER SWITCH

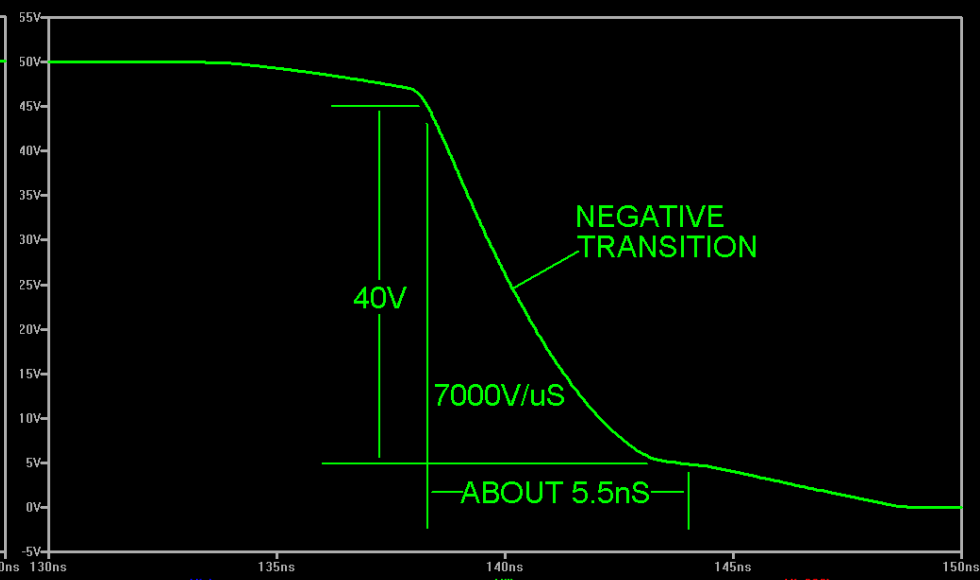
CogniPower
power smarter

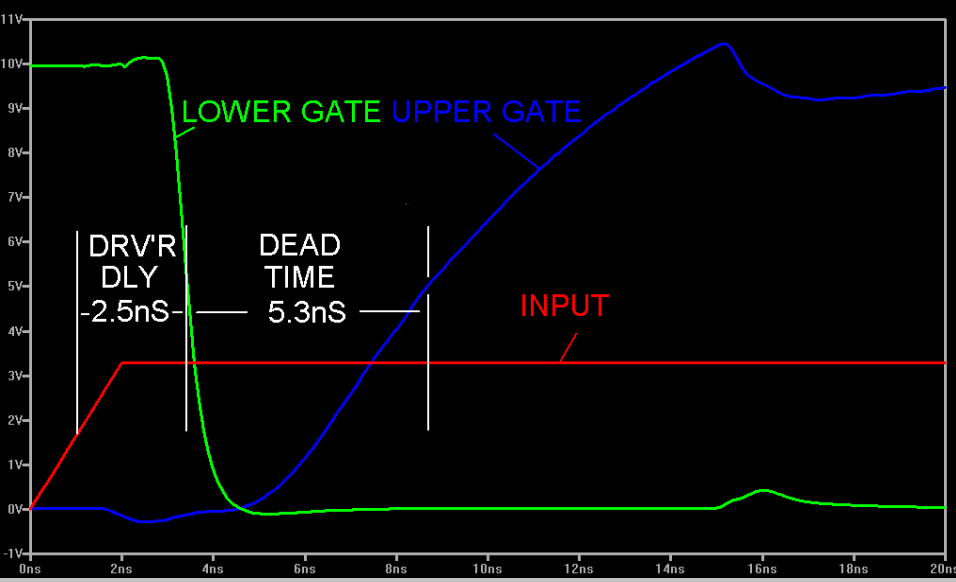


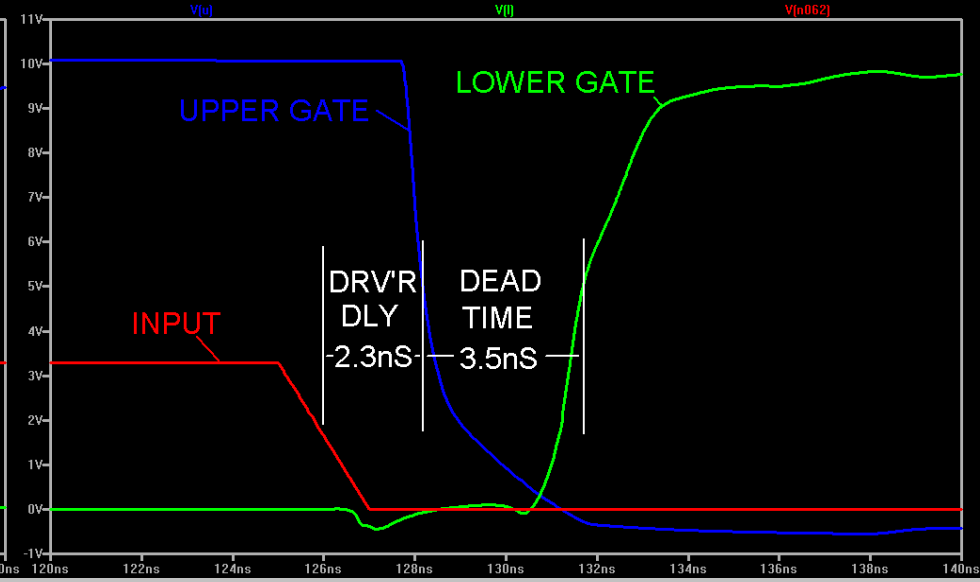
TOTEM POLE at 4 MHz

CogniPower
power smarter

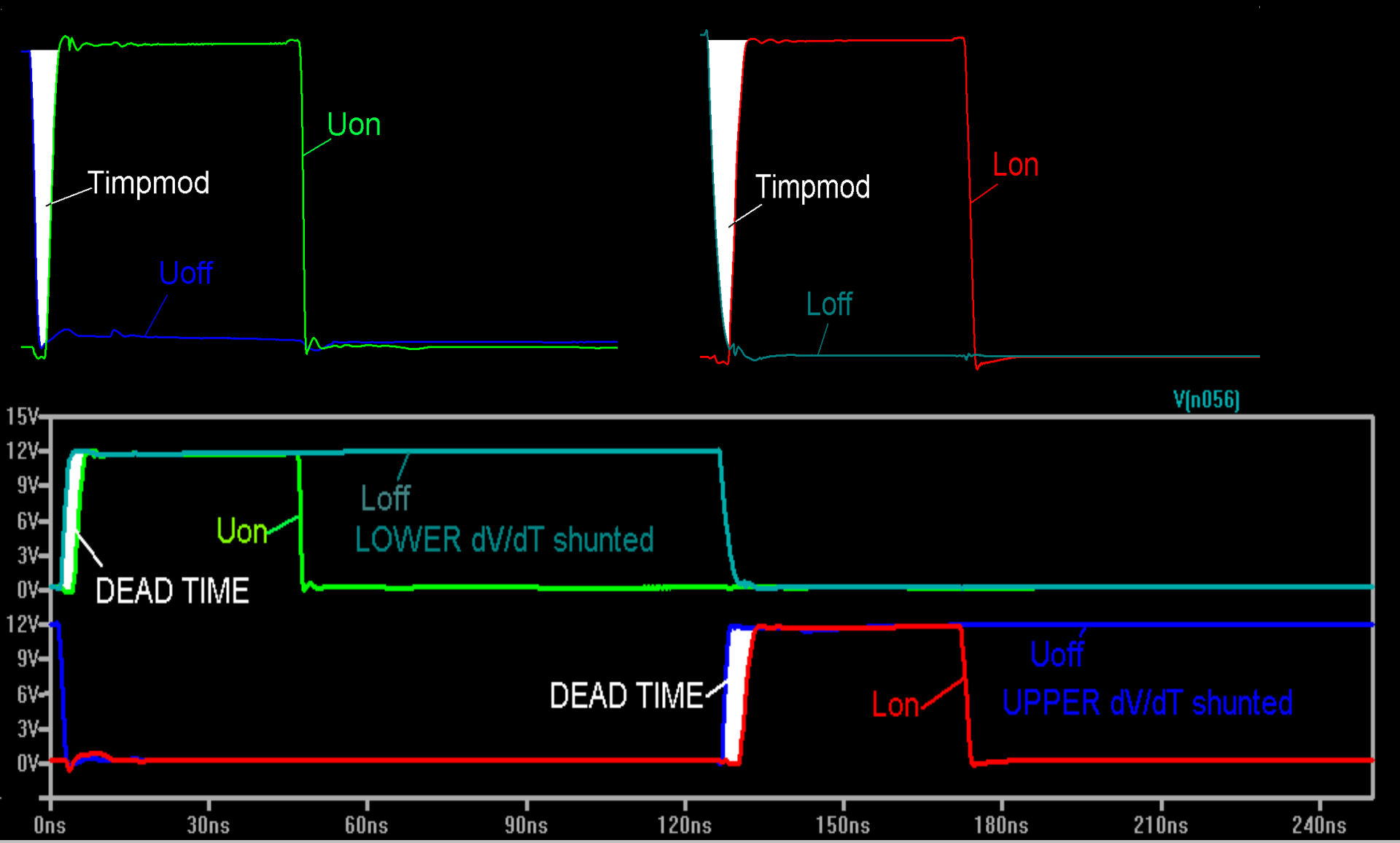






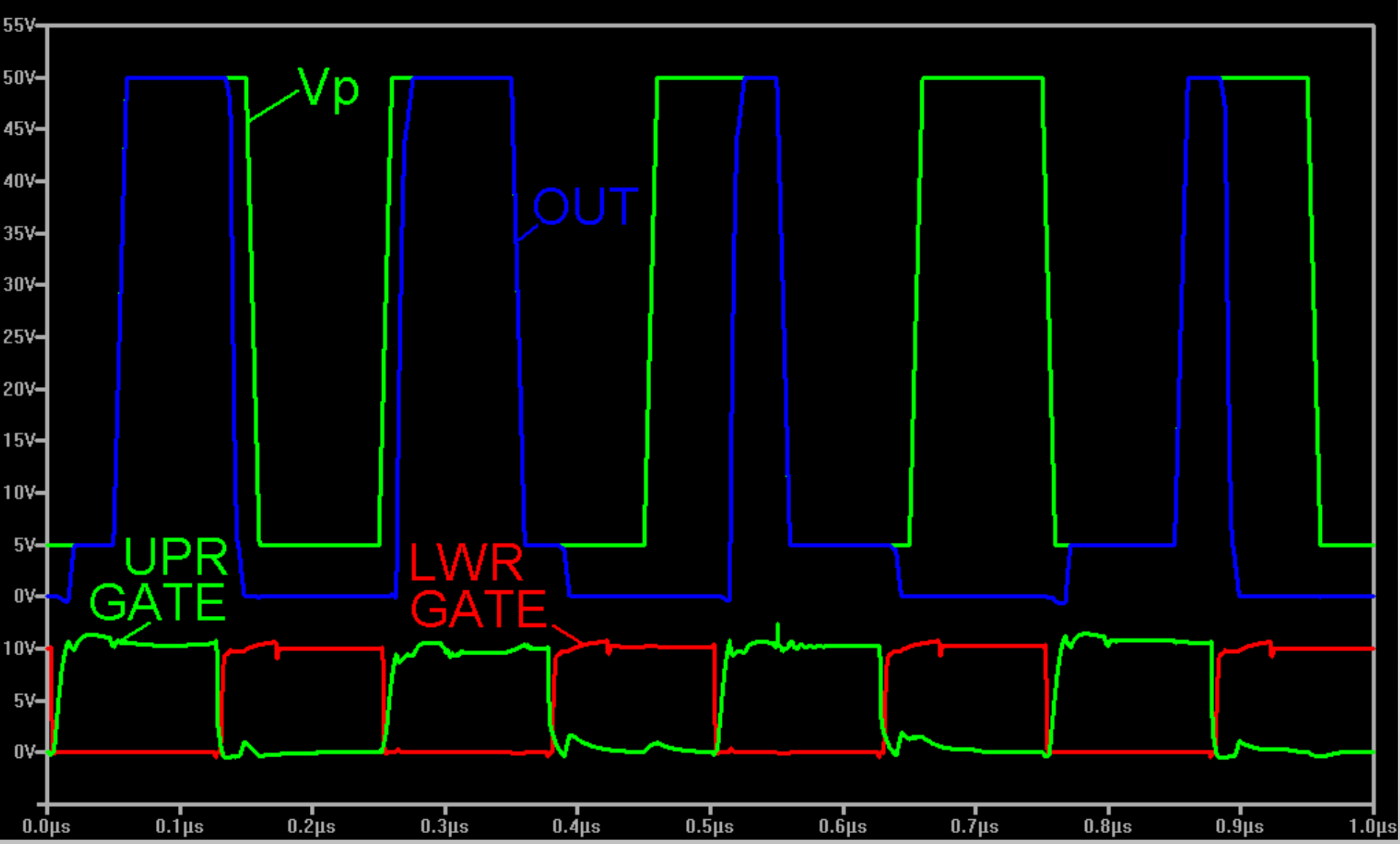


TRANSITIONS, DELAYS, DEAD TIMES



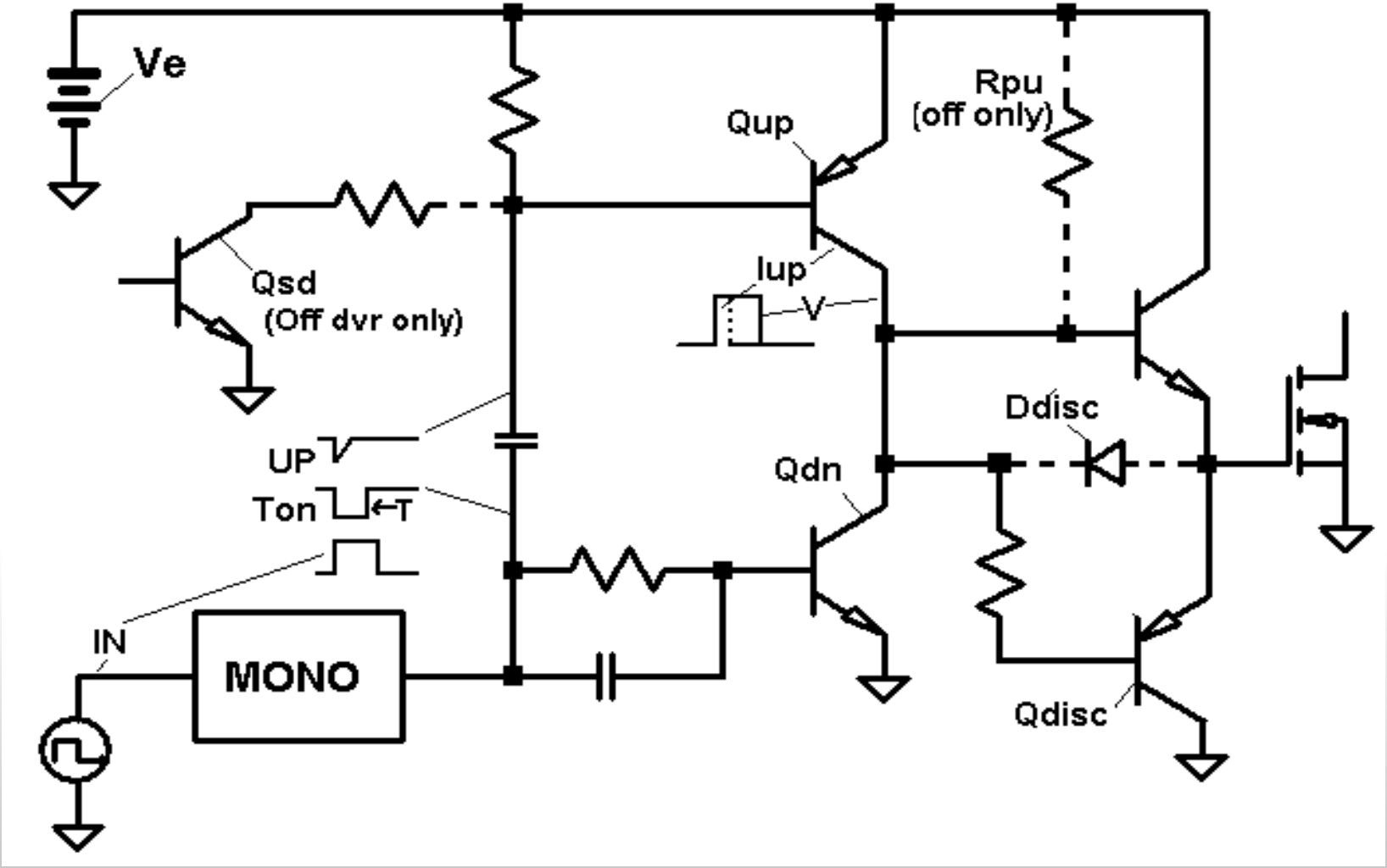
PULSE TIMING, DEAD TIME, IMPEDANCE MODULATION

CogniPower
power smarter

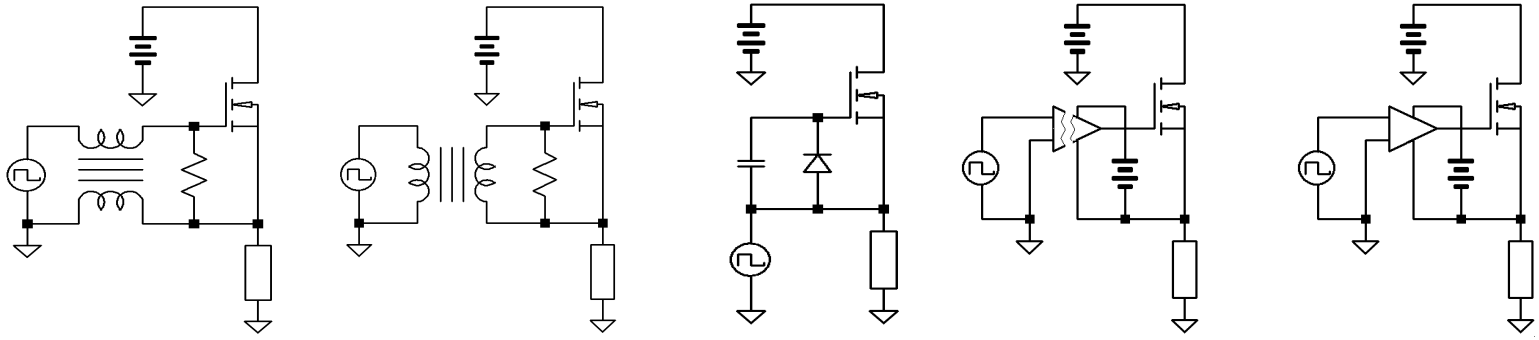


COMMON-MODE RESPONSE

CogniPower
power smarter



ON and OFF DRIVER STRUCTURE

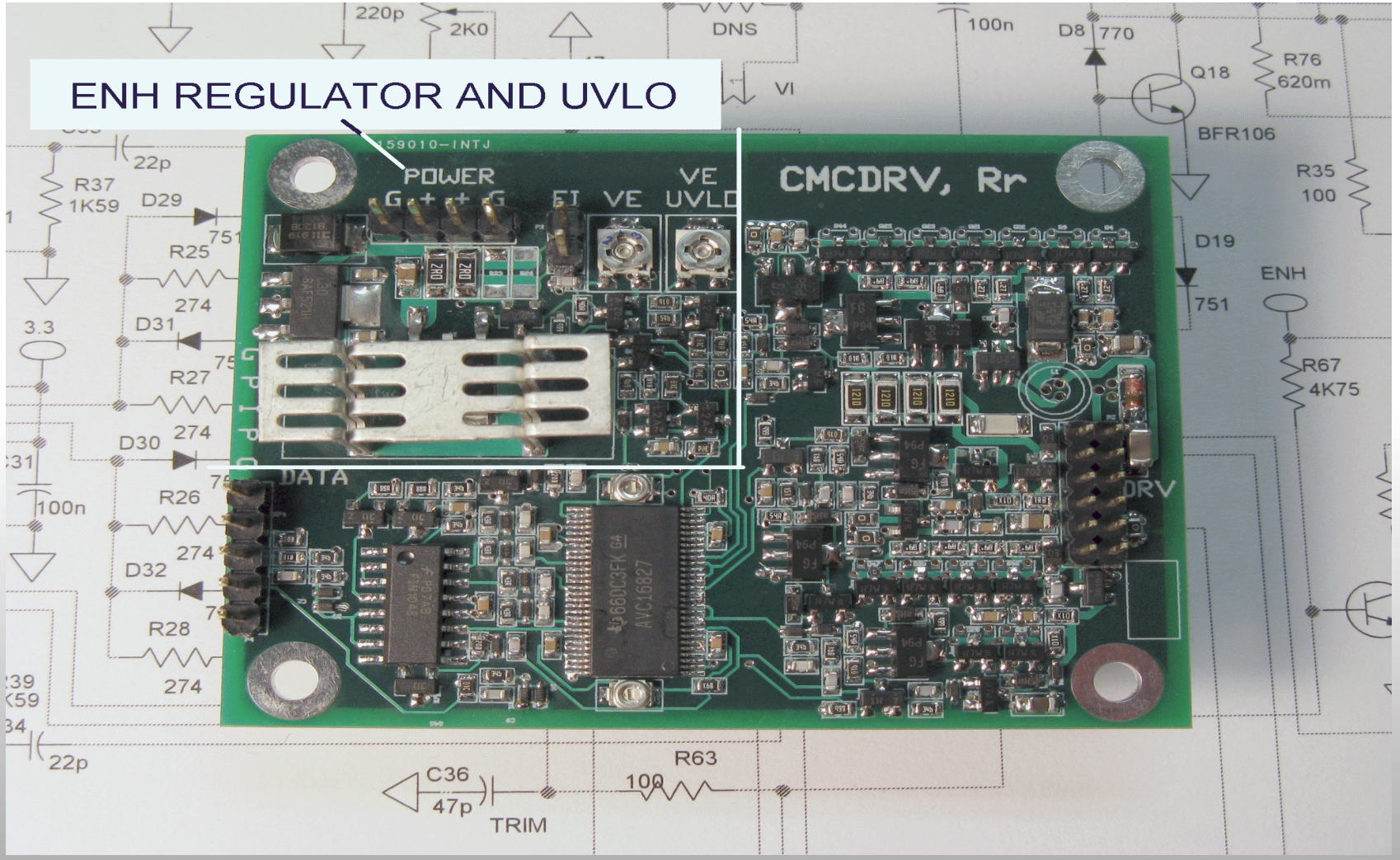


SPEED	FAST	FAST	FAST	SLOW	MEDIUM
FAST-SLEW CMR	EXCELLENT	EXCELLENT	POOR	CAN BE GOOD	POOR
RECOVERY	EXCELLENT	≈ ON TIME	≈ ON TIME	SLOW	VARIES
PROP. DELAY	<5nS	<10nS*	DRIVERS 15-30nS	≈ 100nS	DRIVERS 15-30nS
DISABLE UPPER	YES	NO	NO	POSSIBLE	POSSIBLE
FLOATING POWER	NONE NEEDED	NONE NEEDED	NONE NEEDED	NEEDED	NEEDED
GALVANIC ISOLATION	NO	YES	NO	YES	NO

COMPARISON OF SWITCH DRIVE METHODS

CogniPower
power smarter

CMC Drive Evaluation Board



CogniPower
power smarter

CogniPower CMC Drive Efficiency

Totem-pole of 2ea. AP1002BMX FET's , Cg 3.3nF, 6V, 2MHz

Qg = 3.3e-9 x 6 = 2e-8 Coulombs per cycle per FET

2e-8 Coulombs x 2 FET's = 4e-8 Coulombs per cycle

4e-8 Coulombs x 2e+6Hz = 0.08 amperes

It being impossible to charge a capacitor from a voltage source with greater than 50% efficiency, minimum theoretical 6V enhancement current = 0.160 amperes

As tested, CogniPower CMC driven totem-poles draw 0.150 amperes at 2MHz with AP1002BMX FET's

CONCLUSIONS:

The AP1002BMX FETs tested use less than the typical gate charge

The CMC FET driver delivers gate charge very efficiently

CMC-Driven Switch Advantages

Fast

Short, predictable propagation delay

Excellent high-speed CMR

Quick recovery enables extreme duty-cycles

Totem-pole dead-time can approach 1 nS

Efficient delivery of gate-enhancement charge

Level-shift and gate power with one magnetic device

Quick and secure high-side switch disable

Architecture supports bipolar CMV

CogniPower power smarter

CONCLUSION

The CogniPower CMC-driven switch opens a path to faster, more agile switched-mode power converters

To see a live demonstration of these switch drivers, and to learn about other CogniPower new technology, please visit us at booth #233

CogniPower power smarter