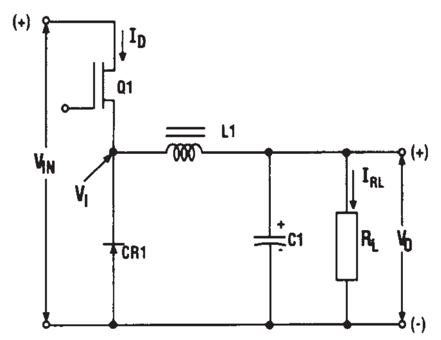
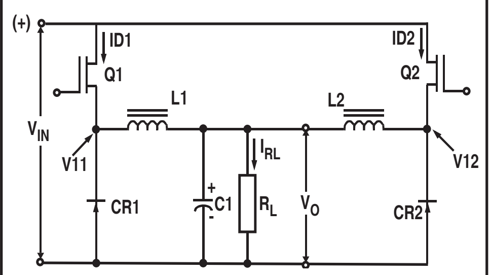
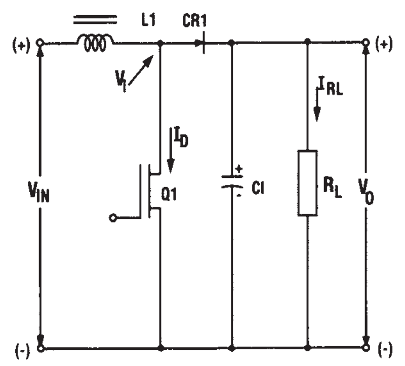
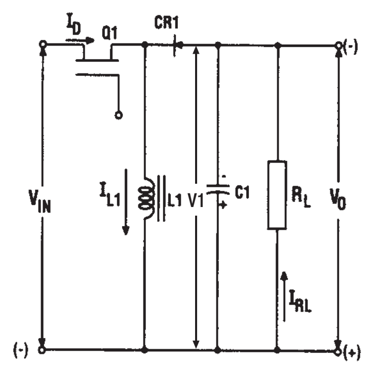
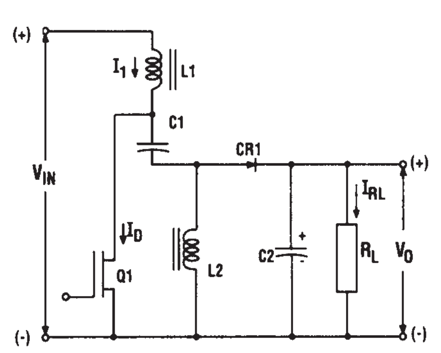
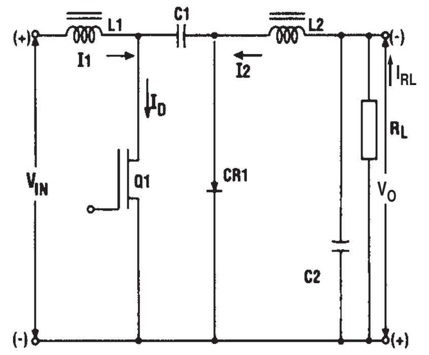
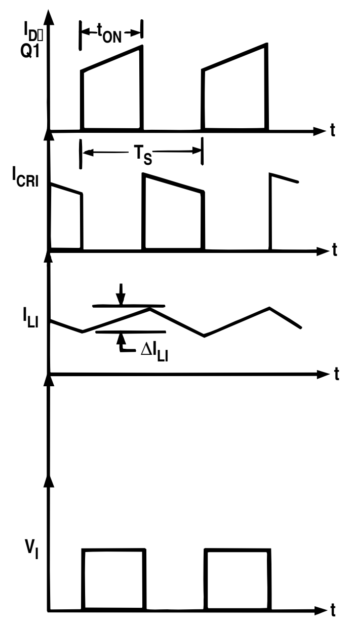
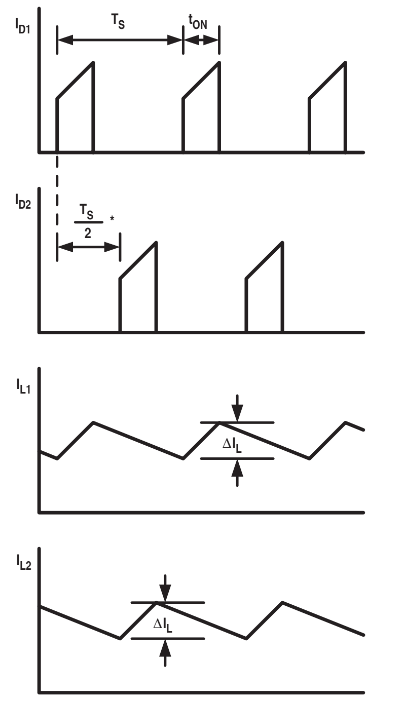
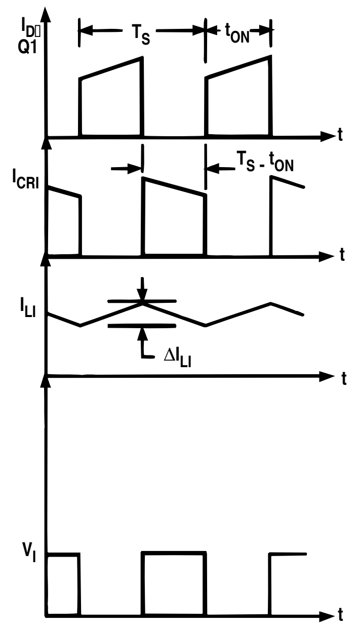
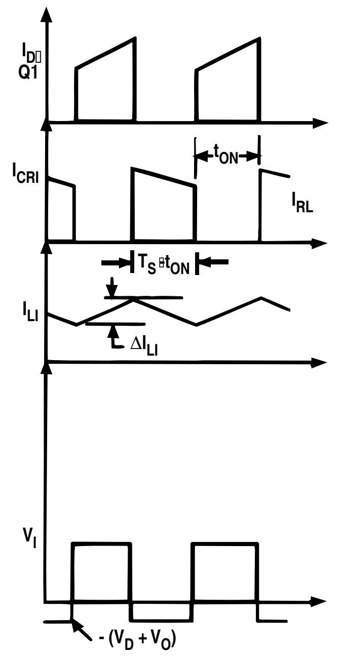
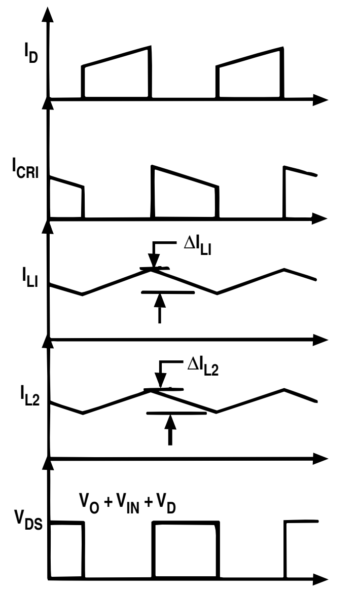
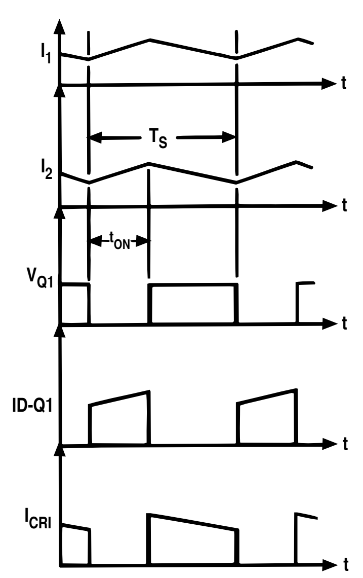
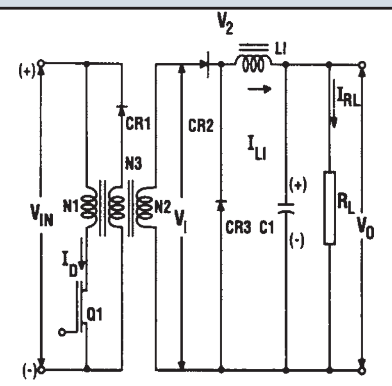
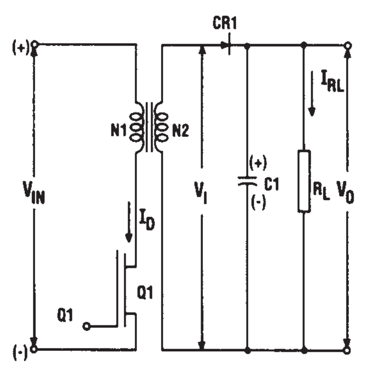
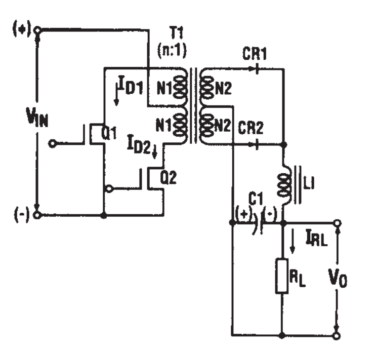
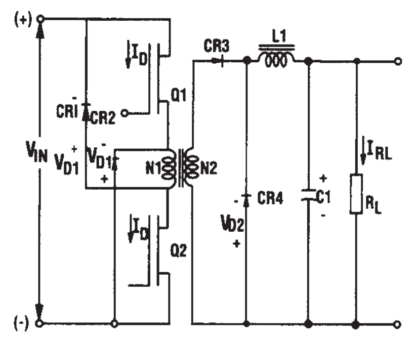
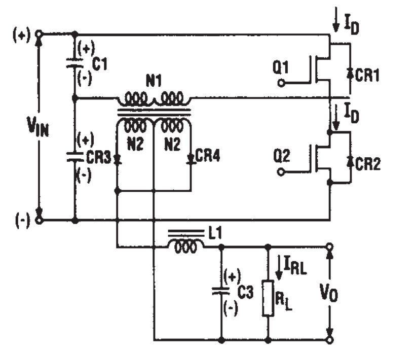
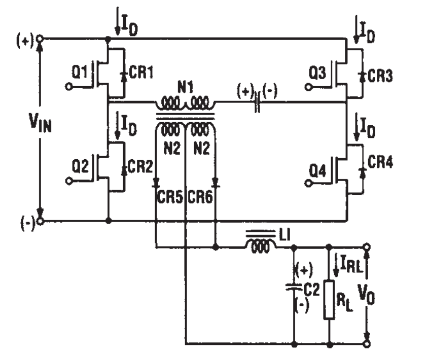
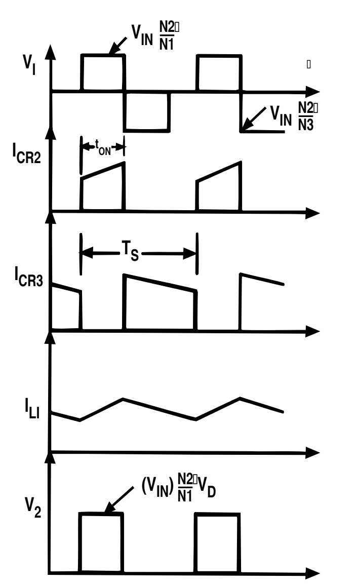
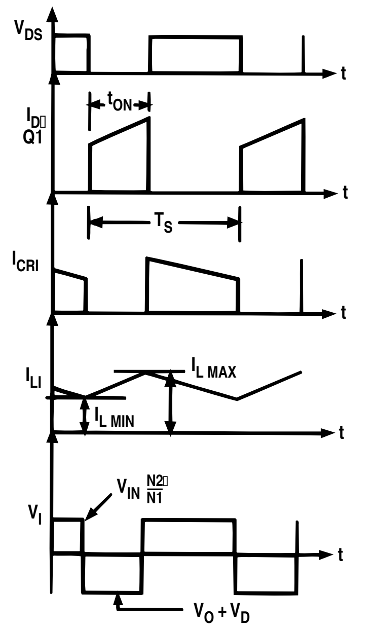
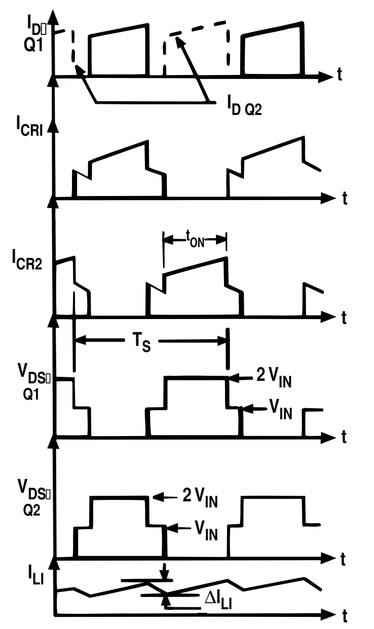
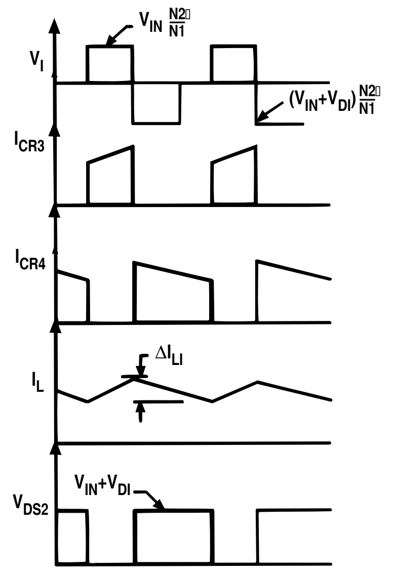
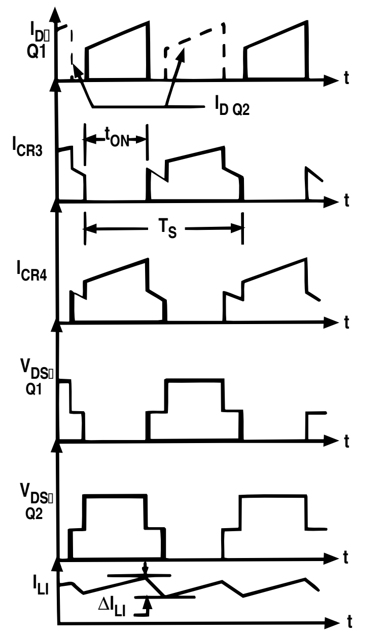
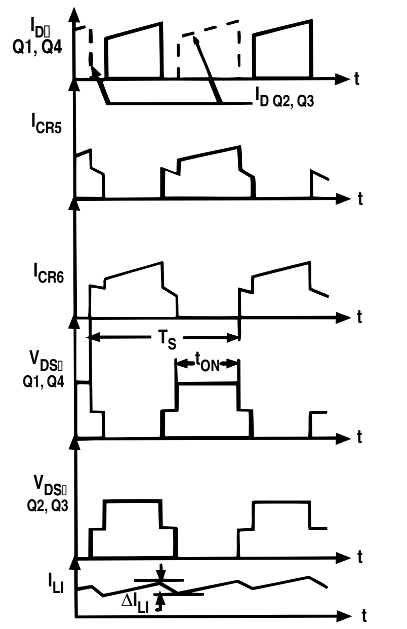
POWER SUPPLY TOPOLOGIES

TYPE OF CONVERTER	Buck (Step Down)	Multi-phase Buck (two-phase example)	Boost (Step Up)	Buck - Boost (Step Down/Up)	SEPIC (Step Down/Up)	CUK (Step Up/Down)
CIRCUIT CONFIGURATION						
IDEAL TRANSFER FUNCTION	$\frac{V_O}{V_{IN}} = \frac{t_{ON}}{T_S} = D$	$\frac{V_O}{V_{IN}} = \frac{t_{ON}}{T_S} = D$	$\frac{V_O}{V_{IN}} = \frac{T_S}{T_S - t_{ON}} = \frac{1}{(1-D)}$	$\frac{V_O}{V_{IN}} = \left(\frac{t_{ON}}{T_S - t_{ON}}\right) = -\left(\frac{D}{1-D}\right)$	$\frac{V_O}{V_{IN}} = \frac{D}{1-D}$	$\frac{V_O}{V_{IN}} = -\left(\frac{t_{ON}}{T_S - t_{ON}}\right) = -\left(\frac{D}{1-D}\right)$
PEAK DRAIN CURRENT*	$I_{DMAX} = I_{RL} + \frac{\Delta I_{L1}}{2}$	$I_{D1MAX} = I_{D2MAX} = \frac{I_{RL}}{2} + \frac{\Delta I_L}{2}$	$I_{DMAX} = I_{RL}\left(\frac{1}{1-D}\right) + \frac{\Delta I_{L1}}{2}$	$I_{DMAX} = I_{RL}\left(\frac{1}{1-D}\right) + \frac{\Delta I_{L1}}{2}$	$I_{DMAX} = I_1 + I_{RL} + \frac{\Delta I_{L1} + \Delta I_{L2}}{2}$	$I_{DMAX} = I_1 + I_2 = I_1\left(\frac{1}{D}\right)$
PEAK DRAIN VOLTAGE*	$V_{DS} = V_{IN} + V_D$	$V_{DS} = V_{IN} + V_D$	$V_{DS} = V_O + V_D$	$V_{DS} = V_{IN} + V_O + V_D$	$V_{DS} = V_O + V_{IN} + V_D$	$V_{DS} = \lvert V_O \rvert + V_{IN} + V_D$
AVERAGE DIODE CURRENTS*	$I_{CR1} = I_{RL}(1-D)$	$I_{CR1} = I_{CR2} = \frac{I_R}{2}(1-D)$	$I_{CR1} = I_{RL}$	$I_{CR1} = I_{RL}$	$I_{CR1} = I_{RL}$	$I_{CR1} = I_1 + I_2$ $I_1 + I_2 = I_1\left(\frac{1}{D}\right) = \left(\frac{1}{1-D}\right)I_{RL}$
DIODE VOLTAGES*	$V_{RM} = V_{IN}$	$V_{RM} = V_{IN}$	$V_{RM} = V_O$	$V_{RM} = \lvert V_O \rvert + V_{IN}$	$V_{RM} = V_O + V_{IN}$	$V_{RM} = \lvert V_O \rvert + V_{IN}$
VOLTAGE AND CURRENT WAVEFORMS		 * Phase displacement is T_S / n where n is the number of phases.				

TYPE OF CONVERTER	Forward	Flyback	Push-Pull	Two-Switch Forward	Half Bridge	Full Bridge
CIRCUIT CONFIGURATION						
IDEAL TRANSFER FUNCTION	$\frac{V_O}{V_{IN}} = \frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S}\right) = \frac{N_2}{N_1}(D)$	$\frac{V_O}{V_{IN}} = \frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S - t_{ON}}\right) = \frac{N_2}{N_1}\left(\frac{D}{1-D}\right)$	$\frac{V_O}{V_{IN}} = 2\frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S}\right) = 2\frac{N_2}{N_1}(D)$	$\frac{V_O}{V_{IN}} = \frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S}\right) = \frac{N_2}{N_1}(D)$	$\frac{V_O}{V_{IN}} = \frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S}\right) = \frac{N_2}{N_1}(D)$	$\frac{V_O}{V_{IN}} = 2\frac{N_2}{N_1}\left(\frac{t_{ON}}{T_S}\right) = 2\frac{N_2}{N_1}(D)$
PEAK DRAIN CURRENT*	$I_{DMAX} = \frac{N_2}{N_1}\left(I_{RL} + \frac{\Delta I_{L1}}{2}\right) + \hat{I}_{MAG}$ ($\hat{I}_{MAG}$ = Peak magnetizing current.)	$I_{DMAX} = I_{RL}\left(\frac{N_2}{N_1}\right)\left(\frac{1}{1-D}\right) + \frac{\Delta I_{L1}}{2}$	$I_{DMAX} = \frac{N_2}{N_1}\left(I_{RL} + \frac{\Delta I_{L1}}{2}\right) + \hat{I}_{MAG}$ ($\hat{I}_{MAG}$ = Peak magnetizing current.)	$I_{DMAX} = \frac{N_2}{N_1}\left(I_{RL} + \frac{\Delta I_{L1}}{2}\right) + \hat{I}_{MAG}$ ($\hat{I}_{MAG}$ = Peak magnetizing current.)	$I_{DMAX} = \frac{N_2}{N_1}\left(I_{RL} + \frac{\Delta I_{L1}}{2}\right) + \hat{I}_{MAG}$ ($\hat{I}_{MAG}$ = Peak magnetizing current.)	$I_{DMAX} = \frac{N_2}{N_1}\left(I_{RL} + \frac{\Delta I_{L1}}{2}\right) + \hat{I}_{MAG}$ ($\hat{I}_{MAG}$ = Peak magnetizing current.)
PEAK DRAIN VOLTAGE*	$V_{DS} = V_{IN}\left(1 + \frac{N_1}{N_3}\right)$	$V_{DS} = V_{IN} + \left(\frac{N_1}{N_2}\right)(V_{OUT} + V_D)$	$V_{DS} = 2V_{IN}$	(Q_1 or Q_2) $V_{DS} = V_{IN} = V_{D1}$	$V_{DS} = V_{IN}$	$V_{DS} = V_{IN}$
AVERAGE DIODE CURRENTS*	$I_{CR1} = \frac{\hat{I}_{MAG}}{2}(D)$ $I_{CR2} = I_{RL}(D)$ $I_{CR3} = I_{RL}(1-D)$	$I_{CR1} = I_{RL}$	$I_{CR1} = \frac{I_{RL}}{2}$ $I_{CR2} = \frac{I_{RL}}{2}$	$I_{CR1,AVE} = I_{CR2,AVE} = \frac{\hat{I}_{MAG}D}{2}$ $I_{CR3,AVE} = I_{RL}D$ $I_{CR4,AVE} = I_{RL}(1-D)$	$I_{CR3} = \frac{I_{RL}}{2}$ $I_{CR4} = \frac{I_{RL}}{2}$	$I_{CR5} = \frac{I_{RL}}{2}$ $I_{CR6} = \frac{I_{RL}}{2}$
DIODE VOLTAGES*	$V_{RM}\left\{\begin{array}{l} V_{CR1} = V_{IN}\left(1 + \frac{N_3}{N_1}\right) \\ V_{CR2} = V_{IN}\left(\frac{N_2}{N_3}\right) \\ V_{CR3} = V_{IN}\left(\frac{N_2}{N_1}\right) \end{array}\right.$	$V_{RM} = V_{IN}\left(\frac{N_2}{N_1}\right) + V_O$	$V_{RM}\left\{\begin{array}{l} V_{CR1} = 2V_{IN}\left(\frac{N_2}{N_1}\right) \\ V_{CR2} = 2V_{IN}\left(\frac{N_2}{N_1}\right) \end{array}\right.$	$V_{CR1,PK} = V_{CR2,PK} = V_{IN}$ $V_{CR3} = V_{CR4} = \left(\frac{N_2}{N_1}\right)V_{IN}$	$V_{RM}\left\{\begin{array}{l} V_{CR3} = V_{IN}\left(\frac{N_2}{N_1}\right) \\ V_{CR4} = V_{IN}\left(\frac{N_2}{N_1}\right) \end{array}\right.$	$V_{RM}\left\{\begin{array}{ll} V_{CR5} = 2V_{IN}\left(\frac{N_2}{N_1}\right) & V_{CR1} = V_{IN} \\ V_{CR6} = 2V_{IN}\left(\frac{N_2}{N_1}\right) & V_{CR2} = V_{IN} \end{array}\right.$
VOLTAGE AND CURRENT WAVEFORMS						

For reliable operation, follow recommendations in data sheets and application notes. Continuous current mode shown.

PWM Controllers

Intersil offers an extensive selection of switching regulator products for both isolated and non-isolated systems that provide optimum solutions across a wide range of cost vs. performance trade-off points. Intersil provides complete reference designs for specific applications, such as CPU power, as well as generalized designs that can be customized for specific requirements. A wide variety of single- and multiple-output controllers, including products with integrated MOSFETs and linear regulators, provide system designers with the flexibility to optimize power delivery in their systems.

MOSFET Drivers

Intersil offers power MOSFET drivers for a wide array of high performance applications ranging from power supplies to motor drives.

Power MOSFET Driver Features:

- Industry's highest-performance 80V and 100V MOSFET drivers
- Large family of high current, low side, and synchronous buck drivers
- All Intersil drivers feature fast propagation delays for use in multi-MHz power supplies

Integrated DC/DC Switching Regulators

These "plug and play" solutions integrate PWM control, drivers, MOSFETs, and the pass elements along with all the protection and control functions (like soft start, OCP, UVLO & loop compensation) required for precise voltage regulation. The monolithic design of these parts provides a high efficiency compact solution, ideal for space saving applications. Intersil's switching regulator portfolio offers a broad selection of products with choices on switching frequency, output currents and packages. This family is fully supported with detailed application notes, iSIM (Intersil's simulation tool) and Eval boards.

Intersil PWM Controllers and Drivers

Buck Controllers

Single Phase (*External FETs*)
- ISL6420A
- ISL6439
- ISL6526/26A
- ISL6527/27A
- ISL8104/05/05A/06/07*
- ISL8118

Single Phase (*Multiple Output; External FETs*)
- ISL6440/41/42/43/44/45
- ISL8120*

Multiphase (*External FETs*)
- ISL8120*
- ISL8101/02/03

Multiphase (*External Driver and FETs*)
- ISL6558
- ISL6316
- ISL6564A

Integrated DC/DC Switching Regulators

Single Outputs
- ISL6410/10A
- ISL8010/11/12*/13/14*
- EL7554/56
- ISL8502*
- ISL8560*

Multiple Outputs
- ISL6455/55A
- ISL65424*/26
- ISL8501*

Single-Ended Controllers *(Boost, Buck-Boost, SEPIC, CUK, Forward, Flyback, Two-Switch Forward)*
- ISL6840/41/42/43/44/45
- ISL6721/22A/23A
- ISL6729
- ISL6401
- ISL8843
- ISL8840A/41A/42A/43A/44A/45A

Current-Mode Double-Ended Controllers *(Full Bridge, Push-Pull)*
- ISL6551
- ISL6741
- ISL6742
- ISL6752
- ISL6753

Voltage-Mode Double-Ended Controllers *(Half Bridge, Full Bridge)*
- ISL6740/40A
- ISL6742
- ISL6744
- ISL6745
- ISL6753

MOSFET Drivers
- ISL2110/11
- ISL6612B/13B/14B
- ISL6207/08/09
- ISL6700
- EL7202/12/22
- HIP2100/01
- HIP4080/81/82/83/86

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