

Texas Instruments Power Topologies

Topology	Circuit Diagram	Duty Cycle	Q1 FET Voltage	D1 Diode Voltage	PWM	Q1 FET Voltage	Q1 FET Current	D1 Diode / Q2 FET Voltage	D1 Diode / Q2 FET Current	L1 Inductor Current	L2 Inductor Current
Buck		$D = \frac{V_{out} + V_f}{V_{in} + V_f}$	$V_{Q1} = V_{in} + V_f$	$V_{D1} = V_{in}$							
Synchronous Buck		$D = \frac{V_{out}}{V_{in}}$	$V_{Q1} = V_{in}$	$V_{D2} = V_{in}$							
Boost		$D = \frac{V_{out} + V_f + V_{in}}{V_{out} + V_f}$	$V_{Q1} = V_{out} + V_f$	$V_{D1} = V_{out}$							
Inverting Buck-Boost		$D = \frac{-V_{out} + V_f}{-V_{out} + V_f + V_{in}}$	$V_{Q1} = V_{in} + V_f - V_{out}$	$V_{D1} = V_{in} - V_{out}$							
Sepic		$D = \frac{V_{out} + V_f}{V_{out} + V_f + V_{in}}$	$V_{Q1} = V_{in} + V_{out} + V_f + \frac{V_{C1,ripple}}{2}$	$V_{D1} = V_{in} + V_{out} + \frac{V_{C1,ripple}}{2}$							
Cuk		$D = \frac{-V_{out} + V_f}{-V_{out} + V_f + V_{in}}$	$V_{Q1} = V_{in} - V_{out} + V_f + \frac{V_{C1,ripple}}{2}$	$V_{D1} = V_{in} - V_{out} + \frac{V_{C1,ripple}}{2}$							
Zeta		$D = \frac{V_{out} + V_f}{V_{out} + V_f + V_{in}}$	$V_{Q1} = V_{in} + V_{out} + V_f + \frac{V_{C1,ripple}}{2}$	$V_{D1} = V_{in} + V_{out} + \frac{V_{C1,ripple}}{2}$							
Fly-Buck™		$D = \frac{V_{out,pr}}{V_{in}}$	$V_{Q1} = V_{in}$	$V_{D1} = V_{out,sec} + V_{in} - V_{out,pr} + \frac{N_s}{N_p}$							
Flyback		$D = \frac{V_{out} + V_f + \frac{N_p}{N_s}}{V_{in} + V_{out} + V_f + \frac{N_p}{N_s}}$	$V_{Q1} = V_{in} + V_{out} + V_f + \frac{N_p}{N_s}$	$V_{D1} = V_{out} + V_{in} + \frac{N_s}{N_p}$							
Two Switch Flyback		$D = \frac{V_{out} + V_f + \frac{N_p}{N_s}}{V_{in} + V_{out} + V_f + \frac{N_p}{N_s}}$	$V_{Q1} = \frac{V_{in} + V_{out} + V_f + \frac{N_p}{N_s}}{2}$	$V_{D1} = V_{out} + V_{in} + \frac{N_s}{N_p}$							
Active Clamp Forward		$D = \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = \frac{V_{in}}{1-D}$	$V_{D1} = V_{clamp} + \frac{N_s}{N_p} - V_f$							
Single Switch Forward		$D = \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = 2 \cdot V_{in} - V_f$	$V_{D2} = V_{in} + \frac{N_s}{N_p} - V_f$							
Two Switch Forward		$D = \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = V_{in} - V_f$	$V_{D2} = V_{in} + \frac{N_s}{N_p} - V_f$							
Push-Pull		$D = \frac{1}{2} \cdot \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = 2 \cdot V_{in}$	$V_{D1} = 2 \cdot V_{in} + \frac{N_s}{N_p} - V_f$							
Weinberg		$D = \frac{1}{2} \cdot \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = V_{in} + 2 \cdot \frac{N_s}{N_p} \cdot (V_{out} + V_f)$	$V_{D1} = 2 \cdot V_{in} + \frac{N_s}{N_p} - V_f$							
Half-Bridge		$D = \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = V_{in}$	$V_{D1} = V_{in} + \frac{N_s}{N_p} - V_f$							
Full-Bridge		$D = \frac{1}{2} \cdot \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = V_{in}$	$V_{D2} = 2 \cdot V_{in} + \frac{N_s}{N_p} - V_f$							
Phase Shifted Full-Bridge		$D = \frac{V_{out} + V_f}{V_{in} + \frac{N_s}{N_p}}$	$V_{Q1} = V_{in}$	$V_{D2} = 2 \cdot V_{in} + \frac{N_s}{N_p} - V_f$							
LLC Half-Bridge		50%*	$V_{Q1} = V_{in}$	$V_{D1} = 2 \cdot V_{in} + V_f$							
LLC Full-Bridge		50%*	$V_{Q1} = V_{in}$	$V_{D1} = 2 \cdot V_{out} + V_f$							

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