Smart Charging Solutions

AC/DC Primary Controllers, Secondary Side Controllers, and Secondary-Protocol Controllers

AC/DC Primary Controllers

The TEA1936x offers high-featured low-cost DCM and QR mode flyback converter controllers. They provide high efficiency at all power levels and very low no-load power consumption at nominal output voltage in burst mode operation. They are designed to support multiple-output-voltage applications.

Each controller boasts a robust selection of, green, protective, and general features. These features include:

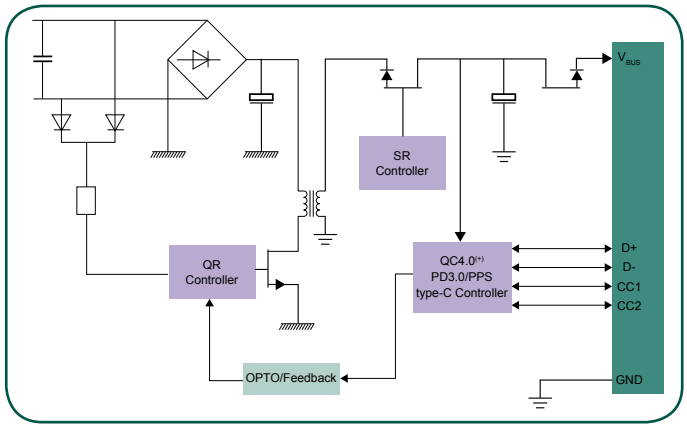
- SMPS controller IC supporting smart-charging applications and multiple-output-voltage applications
- Wide output range (5 V to 20 V in CV mode, 3 V to 20 V in CC mode, and 3 V to 6 V in direct charging mode)
- Continuous VCC regulation during start-up and protection via the HV pin, allowing a minimum VCC capacitor value
- Adaptive dual supply for highest efficiency over the entire output voltage range
- Low supply current during normal operation (0.6 mA without load)
- Low supply current during non-switching state in burst mode (0.2-.25 mA)
- Valley switching for minimum switching losses
- Frequency reduction with fixed minimum peak current to maintain high efficiency at low output power levels
- Mains voltage compensated OverPower Protection (OPP)

End application graphics

- OverTemperature Protection (OTP)
- Integrated overpower timeout
- Integrated restart timer for system fault conditions
- Housed in a small SO10 package

Applications

- Notebooks and tablet adapters
- Fast charging adapters
- Direct charging adapters
- USB PD (Type C) power supplies



AC/DC PRIMARY CONTROLLERS SELECTION GUIDE

Product #	Description	Distinguishing Features
TEA19361T	GreenChip SMPS primary side control IC with QR/DCM operation	• Suited for mobile charger applications that require low Common-Mode Noise (CMN) distortion (meeting the IEC EN62684 specification) • Minimal audible noise and output voltage ripple in all operating modes • All protections are safe restart protections. • Supports portable applications
TEA19362T	GreenChip SMPS primary side control IC with fixed frequency operation	• Fixed-frequency operation suited for mobile charger applications that require low CMN distortion and high spectral purity • Minimal output voltage ripple in all operating modes • Demagnetization switching for minimum switching losses • Instead of valley switching • No frequency reduction • All protections are safe restart protections
TEA19363LT	GreenChip SMPS primary side control IC with QR/DCM operation and active X-capacitor discharge	• Integrated X-capacitor discharge • Minimal audible noise and output voltage ripple in all operating modes • The OVP and OTP protections are latched protections. All others are safe restart protections.
TEA19363T	GreenChip SMPS primary side control IC with QR/DCM operation and X-capacitor discharge	• Integrated X-capacitor discharge • Minimal audible noise and output voltage ripple in all operating modes • All protections are safe restart protections. • Supports gaming and display applications

Secondary Side Controllers

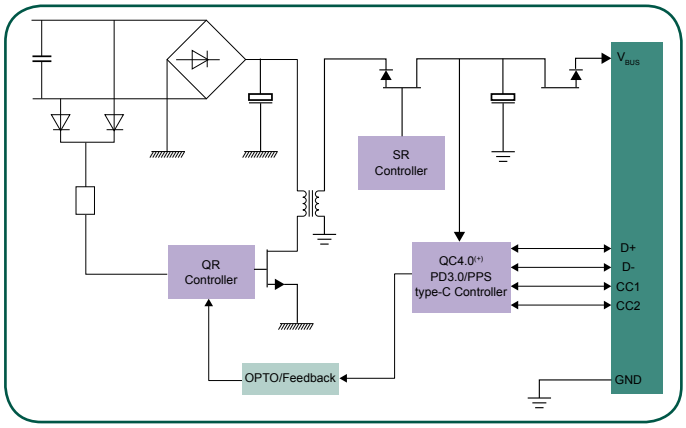
Our extremely efficient and highly integrated GreenChip ICs control synchronous rectification in a compact form factor. These 'smart' solutions mitigate increasing power demands for designing more energy-efficient and cost-effective power supplies. They serve as the backbone for power supplies with very low and or variable output voltage.

These controllers come with a multitude of diverse efficiency, application, and control features, including:

- Adaptive gate drive for maximum efficiency at any load
- Drain sense pin capable of handling input voltages up to 100-120 V
- Self-supplying for operation with low output voltage
- Self-supplying for high-side rectification without the use of an auxiliary winding
- Operates with standard and logic level SR MOSFETs
- Supports USB BC and Quick charge applications
- Adaptive gate drive for fast turn-off at the end of conduction
- UnderVoltage LockOut (UVLO) with active gate pull-down

Applications

- Chargers
- Adapters
- Flyback power supplies



SECONDARY SIDE CONTROLLERS SELECTION GUIDE

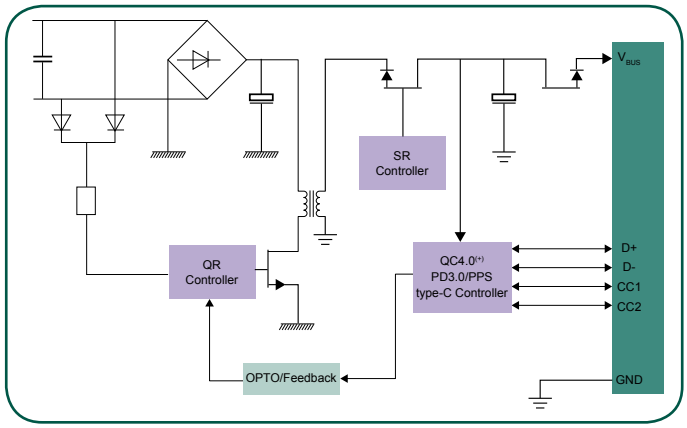
	Vdrain_ max [V]	XV_ max [V]	Turn-on delay [ns]	Turn-off delay [ns]	Min. SR Active Time		Enable Pin SR On/Off	Drive Current		VREG_ DRV [mV]	VSELREG Pin	Package	Application
					[us]	Blanking Pin		Isource [A]	Isink [A]				
TEA1892TS	120	38	75	100	0.8	n.a.	n.a.	-0.4	1.4	-42	RSELREG_ GND < 15 kΩ	TSOP6	Single Vout
										-30	RSELREG_ GND < 700 kΩ		
TEA1993TS	120	38	65	40	1.5	n.a.	n.a.	-0.13	0.5	-37	n.a.	TSOP6	USB PD
TEA1998TS	60	10.5	40	40	1.4	n.a.	n.a.	-0.7	0.5	-25	n.a.	TSOP6	Direct Charge
TEA1999TS	120	26	40	40	1.4	n.a.	n.a.	-0.7	0.5	-25	n.a.	TSOP6	USB PD & Direct Charge
TEA1999TK					1.4	Vblanking = open or Vcap	On @ XV > 2V Off @ 0V Auto @ floating					HVSON8	USB PD & Direct Charge
					0.7	Vblanking = 0							

Secondary-Protocol Controllers

NXP's highly configurable secondary side SMPS controllers support a wide range of protocols, like USB Type-C v.1.3, USB Power Delivery (USB-PD), Programmable Power Supply (PPS), Battery Charging 1.2 (BC1.2) and Quick Charge®, QC2.0, QC3.0 and QC4+. These highly integrated devices reduce component count for more cost-effective fast charging solutions of mobile technologies, offering highest efficiency and significantly cooler chargers.

NXP's Secondary-Protocol Controllers are available with numerous features and protections, which include:

- Best-in-class full safe application for high-power adapters, which protect against overload conditions
- Wide output voltage operating range (2.9 V to 20 V)
- Ultra-high efficiency together with TEA193x QR/DCM controller and TEA199x SR controller
- Very low no-load power (< 30 mW for the complete system solution)
- OverTemperature Protection (OTP): one internal and two external
- Adaptive OverVoltage Protection (OVP)
- Adaptive UnderVoltage Protection (UVP)
- OverCurrent Protection (OCP)



For more information, visit **https://www.nxp.com/products/power-management/ac-to-dc-solutions:MC_34098**

SECONDARY-PROTOCOL CONTROLLERS SELECTION GUIDE

Protocol Controller	PD2.0	PD3.0	PPS	QC4.0	QC4.0+	QC3.0	QC2.0
TEA19032	Y	Y	Y	Y	Y	N	N
TEA19051	Y	Y	Y	Y	Y	Y	Y

Available Resources

SMART CHARGING DEMO BOARDS

To see the demo board for these products, please visit the following link:

The TEA1936XDB1530

Check out our other Smart Power demo boards:

- **TEA1936XDB1475**
- **TEA1936XDB1463**
- **TEA19363DB1484**
- **TEA1993DB1357**
- **TEA1998DB1453**
- **TEA1999DB1504**
- **TEA1999DB1546**

Want to get started on fast charging adapter design? Make it easy and painless with our easy-to-use Smart Charging Design Tool!

USB-PD3.0/QC4.0 Smart Charging Design Tool

The NXP® USB-PD3.0 / QC4.0 Smart Charging Design tool helps you design a fast charging adapter supporting BC1.2, USB-PD3.0 and/or QC4.0 charging protocol. NXPs primary QR Flyback controller TEA1936x, secondary side synchronous rectifier controller TEA199x, and USB-PD /QC protocol controller TEA19051 or TEA19032 are very suited for a low-cost solution. The design tool is downloadable and is able to save/print all design parameters, results and graphs automatically for post-processing or presentation purposes.

www.nxp.com

Document number: SMRTCHRGSOLBR REV 0