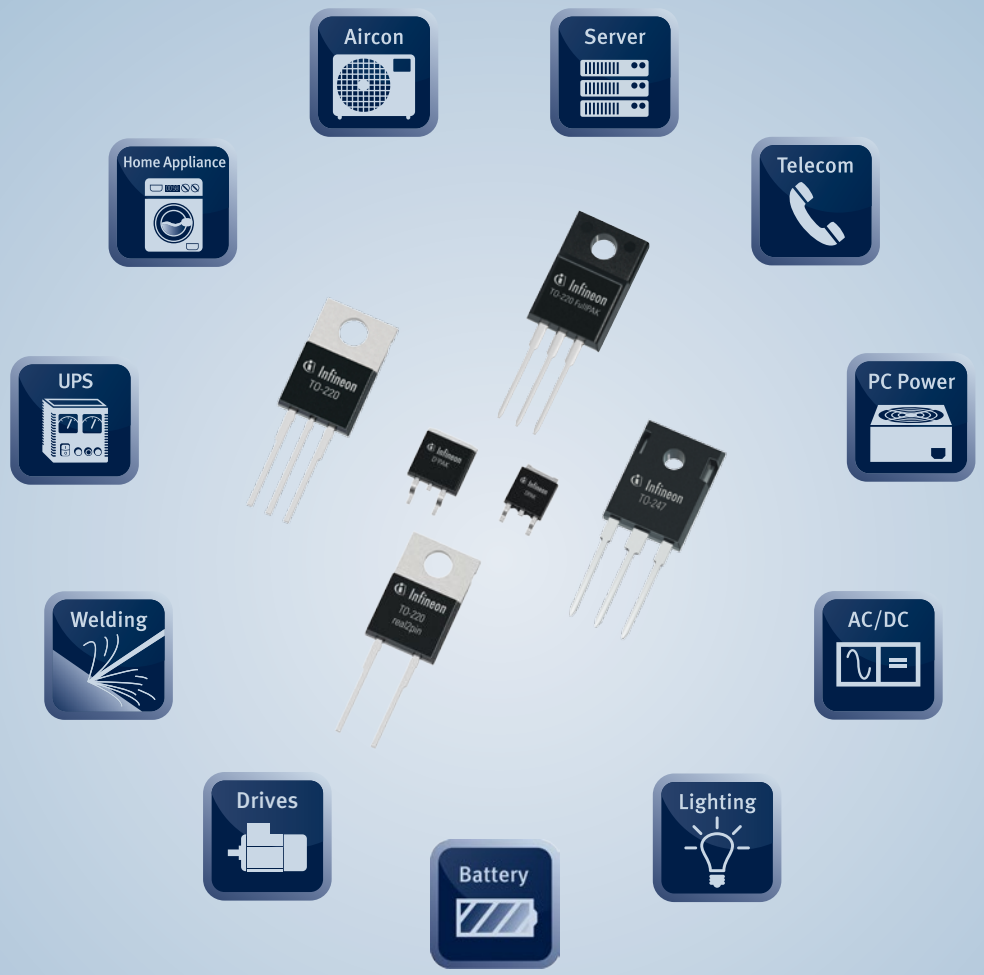


600V/650V Silicon Power Diodes Selection Guide

Highest Efficiency and Price Performance

www.infineon.com/rapiddiodes

Rapid 1 and Rapid 2 Diode Families

The Rapid Diode family complements Infineon's existing high power 600V/650V diodes by filling the gap between SiC diodes and previously released emitter-controlled diodes.
They represent a perfect cost/performance balance and target high efficiency applications switching between 18kHz and 100kHz. Rapid 1 and Rapid 2 are optimized to have excellent compatibility with CoolMOS™ and high speed IGBT (Insulated Gate Bipolar Transistor) such as the TRENCHSTOP™ 5 and HighSpeed 3.

Applications

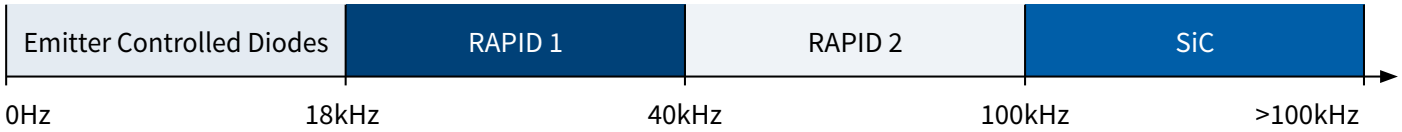
- Air Conditioners
- UPS
- Welding Machines
- Server
- Telecom
- PC Power (>90W)
- Lighting
- Battery charger

The Rapid 1 diode family

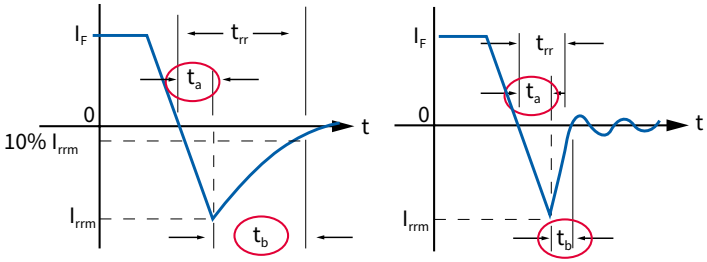
- 1.35V temperature-stable forward voltage (V_F)
- Lowest peak reverse recovery current (I_{rrm})
- Reverse recovery time (t_{rr}) < 100ns
- High Softness factor
- Designed for applications switching between 18kHz and 40kHz

The Rapid 2 diode family

- Lowest reverse recovery charge (Q_{rr}): V_F ratio for BIC performance
- Lowest I_{rrm}
- t_{rr} < 50ns
- High Softness factor
- Designed for applications switching between 40kHz and 100kHz



Key Parameters - V_F, I_{rrm}, t_{rr}, S-factor



Soft recovery diode „Snappy" recovery diode

Diode forward voltage, V_F

- Defines the diode conduction losses
- Rapid diode V_F is the lowest and temperature stable

→ **Customer value:** Up to 0.8% higher efficiency at 60kHz than the best competitor hyperfast Si diode

Peak reverse recovery current, I_{rrm}

- Boost power switch turn-on peak current losses

→ **Customer value:** Rapid diode has the lowest I_{rrm} that provides lower power switch losses (E_{on})

Reverse Recovery time, t_{rr}

- Defined by diode Q_{rr} and I_{rrm}
- Rapid Diode technology has the lowest t_{rr} temperature dependency

→ **Customer value:** Easy design and reliability due to stable device performance over the wide operating temperature range from 25°C to 125°C

Softness (S-factor) = t_b / t_a

- Defines overvoltage stress on the diode and EMI requirements
- Rapid diode has a soft recovery, $t_b > t_a$

→ **Customer value:** Lower system cost because snubber circuit is not required plus lower EMI filtering

Silicon Power Diodes Selection Tree

Frequency Range*				
	0-18kHz Emiter Controlled Diode	18kHz - 40kHz Rapid 1 Diode	40kHz -100kHz Rapid 2 Diode	100kHz* SiC Diode
Voltage Range				
	600V	1200V	650V	650V	600V, 650V, 1200V
Part Number				
	IDpccE60	IDpccE120	IDpccE65D1 IDpccC65D1	IDpccE65D2 IDpccC65D2	
Application				
	UPS Welding Drives Home Appliance Battery Charger		Aircon UPS Battery Charger PC Power Lighting	Server Telecom UPS Aircon Welding PC Power Battery Charger	

Rapid Diode Portfolio

	Continuous current I_C T_C = 100°C [A]	TO-220-2	TO-220-2 FP	TO-220-3	TO-247-3	TO-247-3 Common Cathode
Rapid 1 650V	8	IDP08E65D1				
	9					
	15	IDP15E65D1				
	20		IDV20E65D1			
	30	IDP30E65D1			IDW30E65D1	IDW30C65D1
	40				IDW40E65D1	
	60					IDW60C65D1
	75					IDW75D65D1
	80					IDW80C65D1
Rapid 2 650V	8	IDP08E65D2	IDV08E65D2			
	15	IDP15E65D2	IDV15E65D2		IDW15E65D2	
	20	IDP20E65D2		IDP20C65D2		IDW20C65D2
	30	IDP30E65D2	IDV30E65D2	IDP30C65D2		IDW30C65D2
	40	IDP40E65D2			IDW40E65D2	

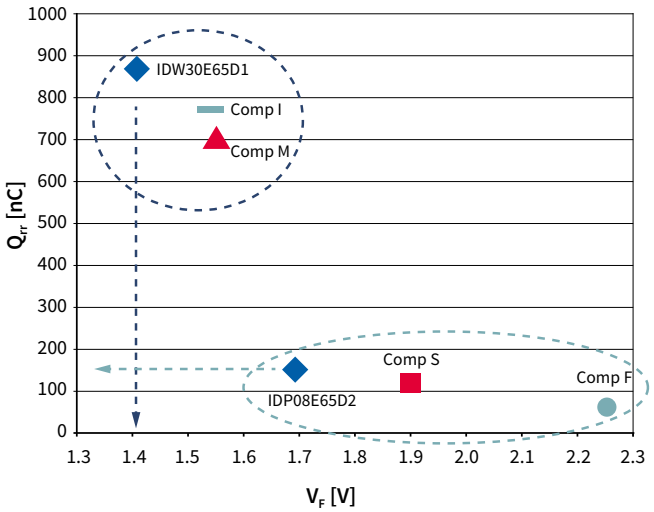
Emitter Control Diode Portfolio

	Continuous current I_C T_C = 100°C [A]	TO-220-2	TO-252 DPAK	TO-263 D²PAK	TO-247-3
600V	6		IDD06E60		
	9		IDD09E60		
	15	IDP15E60	IDD15E60	IDB15E60	
	30	IDP30E60		IDB30E60	IDW30E60
	45	IDP45E60			
	50				IDW50E60
	75				IDW75E60
	100				IDW100E60
1200V	4	IDP04E120			
	9	IDP09E120			
	12	IDP12E120			
	18	IDP18E120			
	20				
	30	IDP30E120		IDB30E120	

* For switching frequencies > 100kHz please visit: www.infineon.com/sic

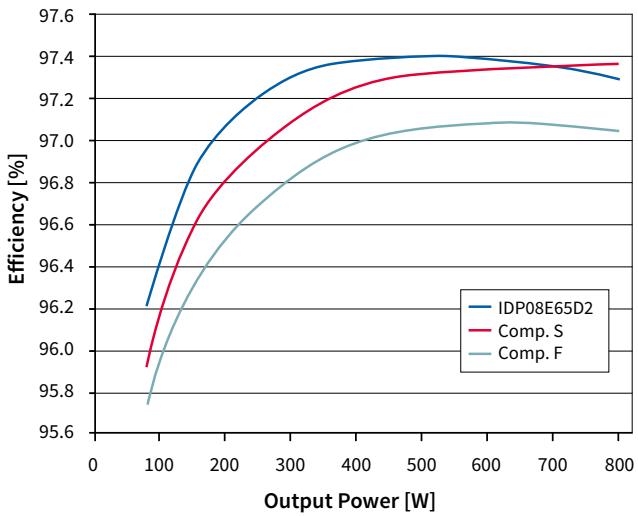
Common Silicon Power Diodes Applications and Topologies

V_F - Q_{rr} Trade-off, Rapid 1 diF/dt = 1000A/us, Rapid 2 diF/dt = 300A/us



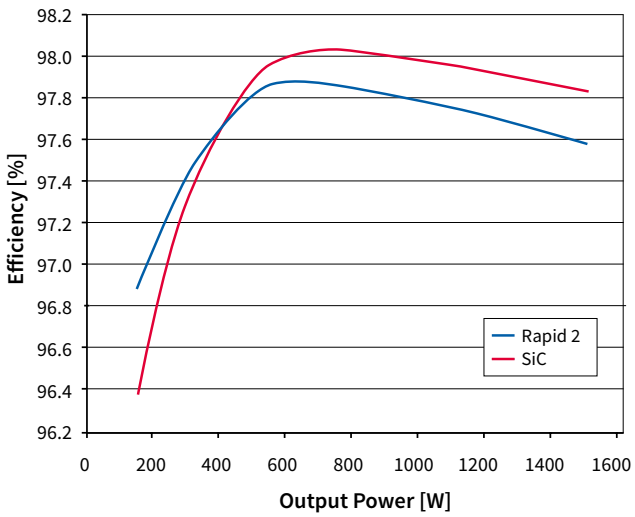
- Rapid 1 is V_F optimized for lower conduction losses
- Rapid 2 is Q_{rr} optimized for lower switching losses

PFC Efficiency @ 60kHz – V_{in} = 230V



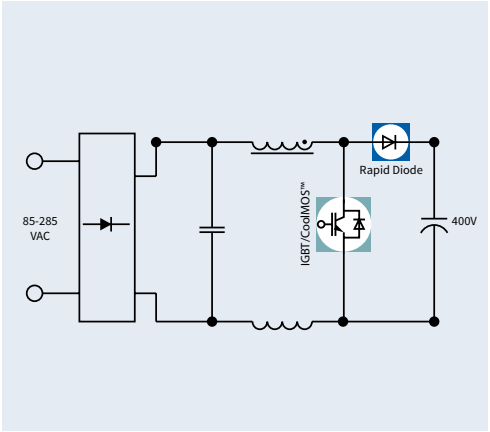
- Rapid 2 best-in-class performance from light load up to 90% full load against competitors

PFC Efficiency @ 70kHz – V_{in} = 230V

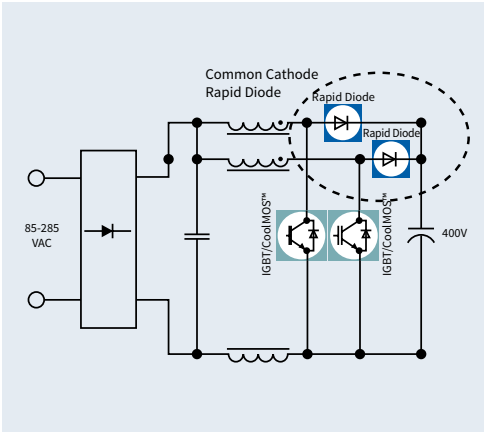


- SiC diode is the choice for high efficiency
- Rapid 2 is the choice for cost-performance
- Rapid 1 is the choice for cost-performance excellence at light load efficiency

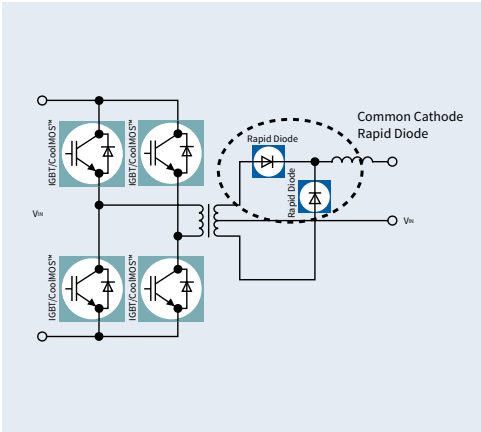
Boost PFC



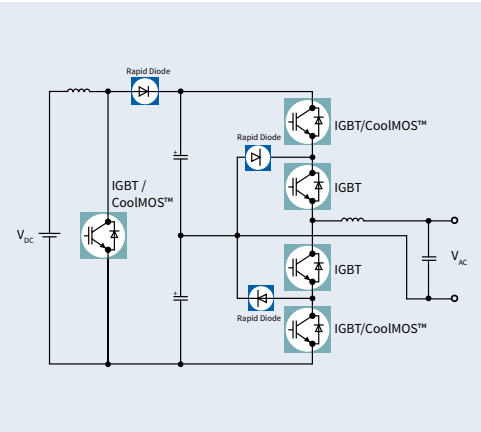
Interleaved PFC



Full Bridge



3 Level Inverter



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