

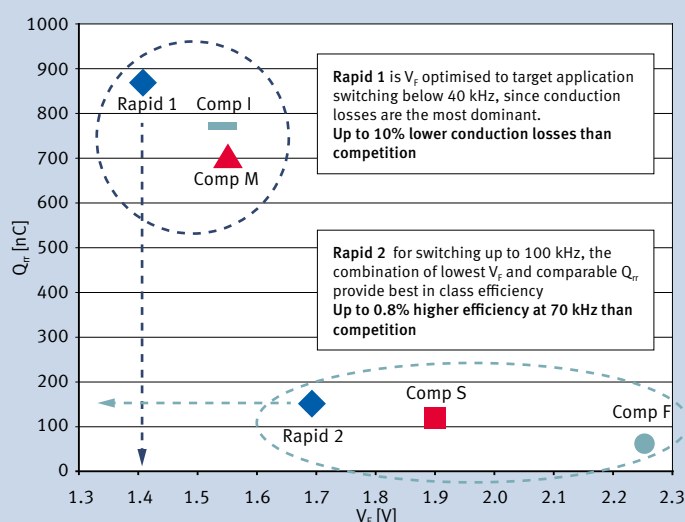
# Ultrafast Reverse Recovery Power Silicon Diodes

## Rapid Diodes - The Perfect Partner to CoolMOS™ and TRENCHSTOP™ 5

With the new 650V Rapid 1 and Rapid 2 Diode families, Infineon enters the high voltage hyperfast silicon diode market. The new Rapid diode family complements Infineon's existing high power 600V/650V diodes by filling the gap between the SiC diodes and the previously available emitter-controlled diodes. They represent a perfect balance between cost and performance and target high efficiency applications switching between 18 kHz and 100 kHz and are optimized to work in harmony with CoolMOS™ and TRENCHSTOP™ 5 in PFC Topologies.

The Rapid Diode will be released as two versions with 650V break-through voltage, where until now 600V was offered. Thus providing an additional 50V for higher reliability without efficiency being penalized. The  $V_F$  is temperature stable. This means from -40°C to 175°C the forward voltage of the diode remains constant. This allows customers to harvest the maximum efficiency out of the diodes regardless of the junction temperature. The Rapid 1 family is optimized with low  $V_F$  and soft recovery and is perfect for applications switching between 18 kHz and 40 kHz, where conduction losses and EMI emissions are critical design parameters. The Rapid 2 family meanwhile is designed for applications switching between 40 kHz and 100 kHz. In this switching range, the main loss component comes from the switching losses; therefore the Rapid 2 has been optimized to provide low  $Q_{rr}$  and  $t_{rr}$ . The Rapid 2 also provides super soft recovery behavior with an S-factor  $\gg 1$ .

Trade-off  $V_F$ - $Q_{rr}$



[www.infineon.com/rapiddiodes](http://www.infineon.com/rapiddiodes)

### Features

- Temperature stable conduction losses ( $V_F$ )
- Rapid 1 offers 250mV lower conduction losses ( $V_F$ ) than best competitor
- Rapid 2 offers lowest  $Q_{rr}$ : $V_F$  ratio
- 10% lower  $I_{rrm}$  than best competitor
- High level of softness

### Benefits

- Rapid 2 offers Best-in-Class efficiency for hyperfast Si diodes at 70 kHz
- Lowest  $I_{rrm}$  improves the  $E_{on}$  of the switch in the PFC by 10%
- High level of softness provides BiC EMI behaviour

### Applications

The boost diode in all PFCs where high efficiency is required and boost topologies in photovoltaic inverters.

PFCs can be found in

- Room air conditioners
- Commercial air conditioners
- Welding machines
- Servers
- Telecom rectifiers
- PC Power (>90W)
- TV PFC (>90W)
- Free-wheeling diodes in Solar inverters
- Two transistor forward topologies (TTF)



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### More background information

Emitter Controlled Diodes	RAPID 1	RAPID 2	SiC
0Hz	18kHz	40kHz	100 kHz
			>100kHz

#### Rapid 1 with optimized $V_F$

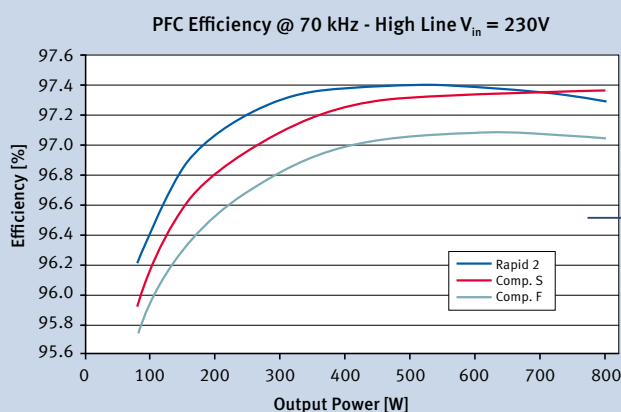
- 1.35V temperature-stable forward voltage ( $V_F$ )
- Highest S-factor for ultimate softness and low EMI filtering needed
- Lowest  $I_{rrm}$  to provide lowest turn-on losses on the boost switch
- For applications switching between 18 kHz and 40 kHz.
- $t_{rr} < 100ns$

#### The Rapid 2 diode family

- Lowest reverse recovery charge ( $Q_{rr}$ ):  $V_F$  ratio for BiC performance
- Low reverse recovery time ( $t_{rr}$ )
- Lowest  $I_{rrm}$  to provide lowest turn-on losses on the boost switch
- Designed for applications switching between 40 kHz and 100 kHz
- $t_{rr} < 50ns$

Here the boost diode shows excellent compatibility with Infineon's CoolMOS™ or the high speed IGBTs (Insulated Gate Bipolar Transistor) such as the TRENCHSTOP™ 5 + HighSpeed 3.

### Rapid 2 Best-in-Class Performance



	Rapid 2	Comp. S	Comp. F
$E_{on} [mJ]$	52	59	59
S	2.5	0.8	0.9
$V_{F(typ)} [V]$	1.7	2.4	3.0

Highest S-factor and lowest  $E_{ON}$  seen in the switch for Best-in-Class system efficiency.

### The New Rapid Diode Families

		TO-220 real 2-leg	TO-220 FullPAK real 2-leg	TO-247
Continuous Current $I_c$ $T_c = 100^\circ C$				
Rapid 1	8	IDP08E65D1		
	15	IDP15E65D1		
	30			IDW30E65D1
	40			IDW40E65D1
Rapid 2	8	IDP08E65D2	IDV08E65D2	
	15	IDP15E65D2	IDV15E65D2	IDW15E65D2
	40	IDP40E65D2		IDW40E65D2

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