



Fast Recovery Rectifier

Rectifier diodes in switching applications dissipate power due to conduction and switching losses (Equation 1). This application note describes the power dissipation mechanisms and provides a selection of Fast Recovery Rectifiers that minimize switching losses and thus increase efficiency.

$$P_{\text{tot}} = P_{\text{cond.}} + P_{\text{sw}} \quad (1)$$

When biased in forward direction with current flowing, the conduction power loss is proportional to the diode's forward voltage and current (Equation 2).

$$P_{\text{cond.}} = V_F \cdot I_F \quad (2)$$

When the polarity across the diode is reversed and the voltage falls below V_F , the diode enters blocking mode. During the transition phase from conduction to blocking mode (Fig. 1), the current decreases until it reaches maximum Reverse Peak Pulse Current I_{PPM} . The duration of this transient process is defined by the Reverse Recovery Time t_{rr} . Multiplying I_{PPM} and t_{rr} by the value of the Reverse Voltage V_{RM} and Switching Frequency f_{sw} results in the Switching Power Loss P_{sw} (Equation 3).

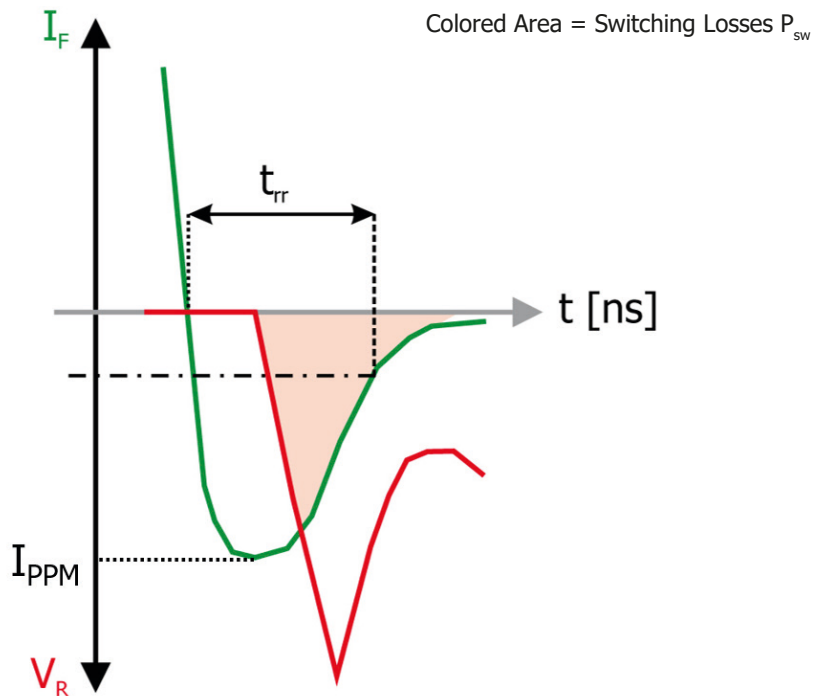

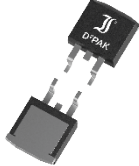
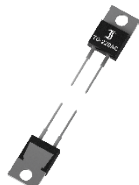







Figure 1: Transition from Conduction to Blocking Mode

$$P_{\text{sw}} = V_{\text{RM}} \cdot I_{\text{PPM}} \cdot t_{\text{rr}} \cdot f_{\text{sw}} \quad (3)$$

Minimizing the reverse recovery time will increase system efficiency by reducing the amount of switching losses. The following selection provides an overview of Diotec's Fast Recovery Rectifier.

Part Number	V_{RRM} [V]	I_{FAV} [A]	t_{rr} [ns]	Outline
RGL34A..M	50 ... 1000	0.5	150 ... 500	DO-213AA (Mini-Melf) 
RGL1A..M	50 ... 1000	1	150 ... 500	
RAL1A..M (Avalanche)	50 ... 1000	1	150 ... 500	
SA154..160	50 ... 1000	1	300	DO-213AB (Melf) 
SA261..SA265	1200 ... 2000	2	500	
FRL1A..M	50 ... 1000	1	150 ... 500	SOD-123FL 
FR1A..M	50 ... 1000	1	150 ... 500	DO-214AC (SMA) 
FR2TSMA..FR2YS-MA	1300 ... 2000	2	500	
FR2A..M	50 ... 1000	2	150 ... 500	DO-214AA (SMB) 
FR3A..M	50 ... 1000	3	150 ... 500	DO-214AB (SMC) 

Part Number	V_{RRM} [V]	I_{FAV} [A]	t_{rr} [ns]	Outline
FR20AKD2.. FR20GKD2	50 ... 400	20	200	TO-263AB (D2PAK) 
FR20AAD2.. FR20GAD2	50 ... 400	20	200	
FT2000KA..G	50 ... 400	20	200	TO-220AC 
FT2000AA..G	50 ... 400	20	200	

Part Number	V_{RRM} [V]	I_{FAV} [A]	t_{rr} [ns]	Outline
HV1.5..HV2	1500 ... 2000	0.5	400	DO-41 
1N4933..4937	50 ... 600	1	200	
BA157..159	400 ... 1000	1	300	
HV3, HV4	3000, 4000	0.2	200	
HV5, HV6	5000, 6000	0.2	200	DO-15 
BY296..299	100 ... 800	2	500	DO-201 
BY396..BY399 D-BY228G	100 ... 800 1500	3	500 1000	
RGP30K, RGP30M	800, 1000	3	500	
BY500-50.-1000	50 ... 1000	5	200	5.4 x 7.5 
MR820..828	50 ... 800	5	300	8 x 7.5 

Disclaimer

This application note describes device proposals and shall not be considered as assured and proven solution for any circuit. No warranty or guarantee, expressed or implied is made regarding the capacity, performance or suitability of any device, circuit etc.