

# RDFC topology – Choosing the correct BJT for RDFC applications



**Describes a variety of BJT's available for RDFC applications**

- Number of manufacturers
- Variety of 110V and 230V applications
- Variety of application power outputs.

## Overview

The CamSemi C2470 controller family used in the RDFC (Resonant Discontinuous Forward Converter) topology, uses an external BJT switch for cost effective use.

The RDFC application is an easy to design SMPS topology used for replacing bulky, inefficient and expensive Linear power supplies.

However its resonant topology differs from other SMPS topologies such as flyback and RCC and the way that it uses the BJT to switch the resonant waveform is unusual requiring a number of different parameters in the BJT to be taken care of.

## Related Documentation

To make the design of a power supply as easy as possible, CamSemi have provided a number of technical documents to provide help, all of which are available on our website [www.camsemi.com](http://www.camsemi.com)

Document Description	Number
Basic Design Guide <6 W	DG-2128
Basic Design Guide <40 W	DG-1694
Key RDFC Application Circuit Measurements	AN-2274
Power BJT Specification for RDFC Applications	AN-2276
BJT Primary Switch Ratings in RDFC Applications	AN-2337
Measuring Primary Switch Collector Voltage in RDFC Applications	AN-2497
Testing Key Parameters of High Voltage BJTs for RDFC applications	AN-2576

## Controller Series

Part Number	Package	Power (W)
C2471LX2	SOT23-6	1-6 W
C2472PX2	SOT23-6	6-40 W

## Various Key BJT Parameters

### Collector Voltage Rating ( $V_{CE}$ )

Peak collector voltage during the off state in RDFC applications will be significantly higher than in flyback applications due to the resonant mode of operation. In order to select the correct collector voltage rating, the following breakdown voltage specifications should be taken into account:

- $V_{CEO}$  - Breakdown voltage under common emitter configuration (where emitter is grounded) with base open circuit
- $V_{CBO}$  - Breakdown voltage under common base configuration (where base is common/grounded) with emitter open circuit
- $V_{CES}$  - Breakdown voltage under common emitter configuration with base shorted to emitter.
- $V_{CER}$  - Breakdown voltage under common emitter configuration with a resistor between base and emitter

Typically  $V_{CEO} < V_{CER}^* \approx V_{CES} \approx V_{CBO}$

### Collector Current Rating ( $I_{c-DC}$ )

The collector current rating of the transistor is selected based on the worst-case peak collector current possible in the target application.

### Output Capacitance ( $C_{OB}$ )

Low output capacitance of Q1 is essential for RDFC applications

### DC Current Gain ( $h_{FE}$ )

It is essential that the minimum  $h_{FE}$  is high enough to sustain the required collector current within the available base current from the controller

### RBSOA

The Reverse Biased Safe Operating Area (RBSOA) of the transistor is mainly applicable to the Q1 turn off transient.

### Storage Time ( $T_{STG}$ )

Low storage time is required to achieve optimal turn-off switching operation and reduce peak collector voltages in RDFC applications.

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## Possible Bipolar Junction Transistors (BJT)

### Low Line Applications (110V Input)

Manufacturer	Part No.	VCBO/ VCEV (V)	VCEO (V)	IC(ADC)	Package	Applications Power range (W)
ON Semiconductor	MJE13003	700	400	1.5	TO-126	6-18W, 115Vac
ON Semiconductor	MJE13005	700	400	4	TO-220	18-25W, 115vac
Taiwan Semiconductor	TS13003CT	700	400	1.5	TO-92/TO-126	6-18W, 115Vac
Taiwan Semiconductor	TS13005CZ	700	400	4	TO-220	18-25W, 115vac
Taiwan Semiconductor	TS13007BCZ	700	400	8	TO-220	30-40W, 115Vac
Taiwan Semiconductor	TS13003HV	900	400	1.5	TO-126	6-18W, 115Vac
KEC	MJE13003HV	900	530	1.5	TO-126	6-18W, 115Vac
AUK	STD13003	700	400	1.5	TO-126	6-18W, 115Vac

### Hi Line Applications (230V Input)

Manufacturer	Part No.	VCBO/ VCEV (V)	VCEO (V)	IC(ADC)	Package	Applications Power Range (W)
Sanyo	2SC6084	1500	800	5	TO-220	18-40W, 230Vac
Sanyo	TT2274A	1400	800	1	TO-126	6-12W, 230Vac
Sanyo	TT2274T	1400	800	1	TP	6-12W, 230Vac
Fairchild	KSC5042M	1500	900	0.1	TO-126	3-6W, 230Vac
Taiwan Semiconductor	TSC5401CT	1500	700	1	TO-92	30-40W, 230Vac
Sino Microelectronics	3DD5023	1500	600	6	TO-220F	25-40W, 230Vac
Sino Microelectronics	3DD5024	1500	600	8	TO-220F	25-40W, 230Vac
Goodark	2SC3097	1400	600	1.5	TO-126	6-18W, 230Vac
WUXI Hengcheng	BU506AF	1500	800	4	TO-220F	25-40W, 230Vac
JCET	2SC3149	1200	800	0.5	TO-126	6-9W, 230Vac

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