International Rectifier

APPLICATION NOTE

Application Note AN-1134

Production-Friendly Trimming Example of IR2520D

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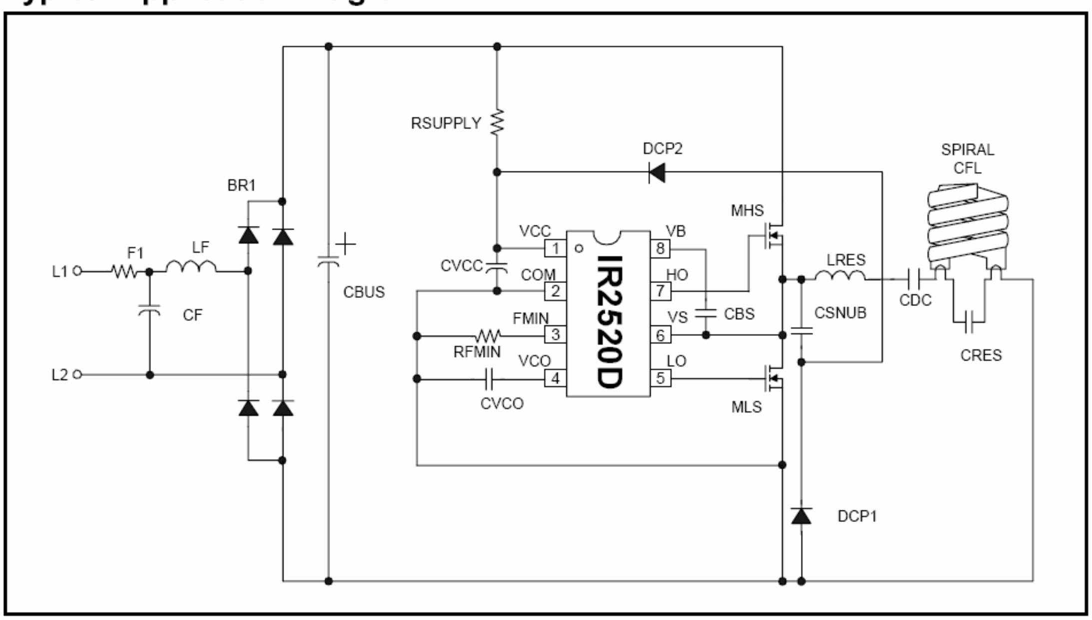
Introduction

In ballast designs, IC trimming techniques can be applied to reduce wide parameter tolerances improving the quality and reliability of the end product. The tolerances often specified on an IC's datasheet depict the expected performance range across many IC production lots while the tolerance for a given parameter within one lot is normally much tighter.

One approach to trimming, the trial and error replacement of resistors in production, leads to bottlenecks in production and problems with logistics.
This Application Note will suggest an alternative trimming technique involving IR's IR2520D CFL ballast IC which, through the addition of two resistors used to set the minimum running frequency (RFMIN), reduces the running frequency tolerance to one third of that specified in the data sheet and minimizes production issues.

Typical Application Diagram



IR2520D Datasheet Information

Looking at the IR2520D datasheet, the expected frequency tolerances for RFMIN = 82 kΩ is 34 kHz ± 12%.

Electrical Characteristics

$V_{CC} = V_{BS} = V_{BIAS}$ = 14V +/- 0.25V, C_{LO}=C_{HO}=1000pF, R_{FMIN} = 82kΩ and T_A = 25°C unless otherwise specified.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
Oscillator I/O Characteristics						
$f_{(min)}$	Minimum oscillator frequency (Note 4)	29.6	34	38.2	kHz	V_{VCO}=6V
$f_{(max)}$	Maximum oscillator frequency (Note 4)	67	86	96	kHz	V_{VCO}=0V

Figure 14 of IR2520D datasheet provides the information needed to reduce the frequency tolerance. Note that below 60 kHz, temperature variation does not have a significant impact on the frequency.

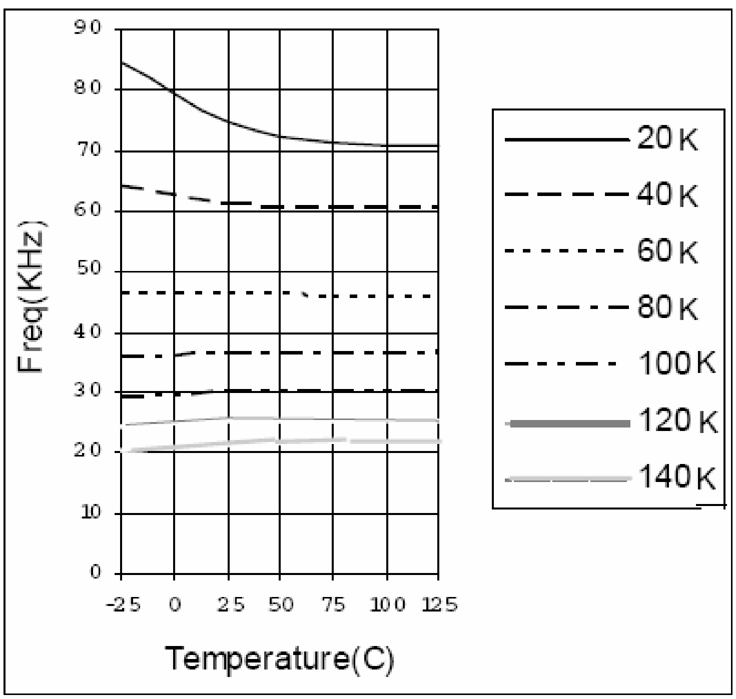
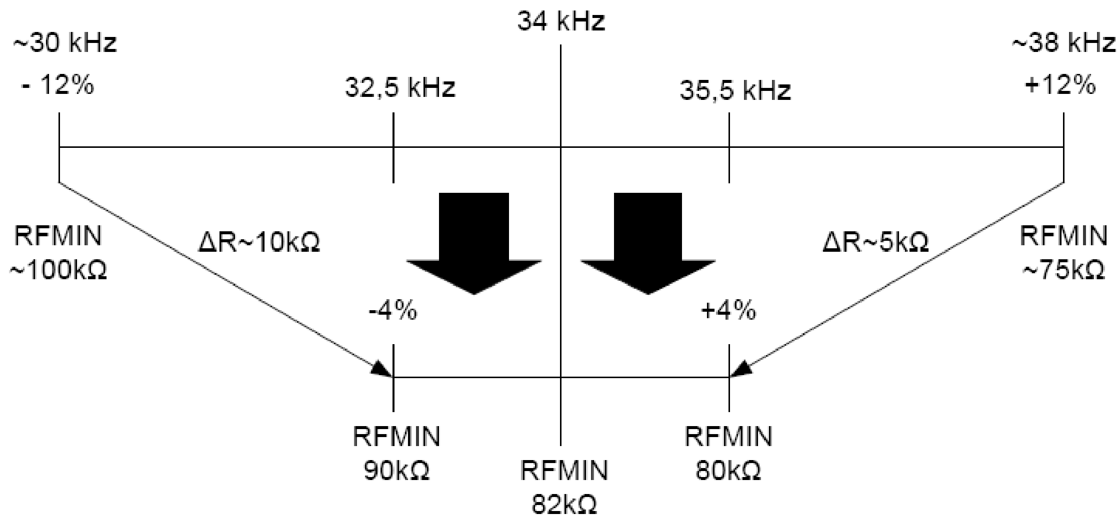


Fig. 14 Frequency vs RFMIN vs TEMP VVCO=6V

Information extracted from Figure 14 of the IR2520D datasheet can be graphically summarised in this way:



If the mean frequency of an IR2520D lot is between 30 and 32.5 kHz, decreasing RFMIN by 10 kΩ will bring the frequency back into the 34 kHz ±4% range.

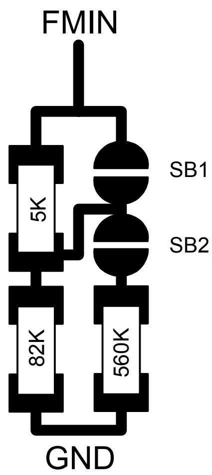
On the other side, if the mean frequency of an IR2520D lot is between 35.5 and 38 kHz, increasing RFMIN by 5 kΩ will bring the frequency back into the 34 kHz ±4% range

As already stated, variations in tolerances across one lot of ballast ICs are typically small and, as a result, production variances within one lot will be minimal. If using ballast ICs from multiple lots, the frequency for each lot will need to be measured and the resistance value for RFMIN adjusted.

Proposed Technique

With two additional resistors, the frequency tolerance can be reduced to within a window of ± 4%.

With 2 solder bumps on the PCB to eventually connect the additional resistors, the resulting resistance for RFMIN can be adapted to the parameters of the ballast.

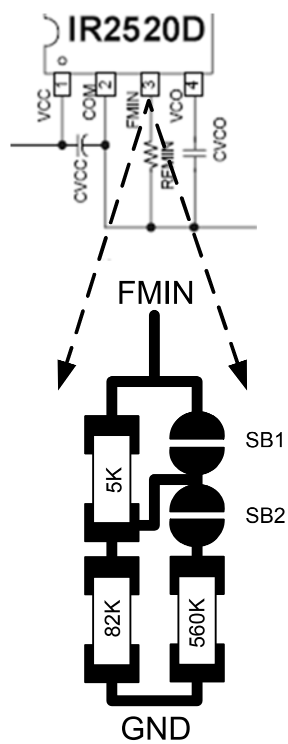


Solder SB1, if the lot is between -4% and +4%

Solder SB1+SB2, if the lot is between -4% and -12%

No Bridge, if the lot is between +4% and +12%

Implementation on the PCB:



If space is constrained, it is also possible to use only one resistor to reach half of the nominal tolerance.

Summary:

This technique provides an easy way to trim the parameters of ballast ICs from different IC production lots.

With preliminary testing, designers can determine the tolerance for the actual lot, and then establish the necessary solder bridge required to produce products that meet the expected tolerance window at final test.

This trimming technique also can be used for other ICs.