Remote Sensing

IMT series of dc/dc converters provide remote sensing so that output voltage regulation is maintained at the load itself, rather than at the output pins. This is achieved by using two sense lines connected from the sense pins of the dc/dc converter to the load which may be located at some distance from the converter. The remote sense can compensate voltage drop of over 0.65v.

These sense lines (one to the load, and one return from the load) will 'sense' the voltage at the load and regulate the dc/dc converter to adjust the output voltage to compensate for the drop in the voltage across the load cables. Remote sense feature is normally used when the load current varies, and hence, the voltage drop is irregular. However, if the load is constant, and the voltage drop is fixed, then, it is recommended that the trim feature be used to compensate for the voltage drop over the load line. This is because trimming is a more efficient way of achieving the voltage compensation.

Please see Figure 6 for connecting remote sense lines to the load.

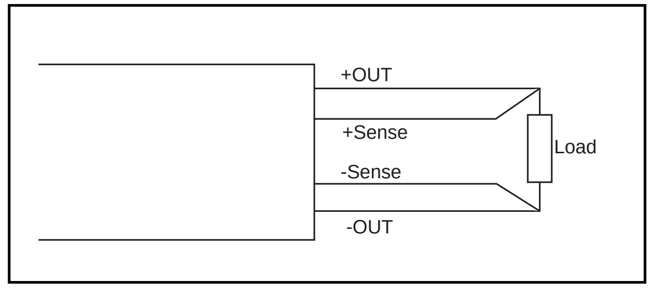

Figure 6. Sense Line Connectivity

The voltage drops between the output pins of dc/dc converter and load is mainly IR in nature. However, when there is substantial inductance between the load cables or circuit traces from the converter to the load, a dynamic L di/dt drop may be significant.

This dynamic L di/dt drop and noise formation can be minimized by connecting a 0.1µF ceramic capacitor in parallel with a 10µF tantalum capacitor at the load. Use of co-axial cables as sense lines is a good method of shielding the sense signal from noise pick up. Twisting the sense cables can also reduce noise pick up. See Figure 7. For different output voltages, please see the capaciator values listed in Table 1.

V_{out}	Power	Ceramic Cap.	Tant. Cap.
2.0	100 watts	3.3µF 10V	330µF 6.3V
3.3	100 watts	1.0µF 10V	220µF 10V
5.0	100 watts	1.0µF 15V	220µF 25V
12	100 watts	0.68µF 50V	100µF 25V
15	100 watts	0.1µF 50V	100µF 35V
2.0	200 watts	3.3µF 10V	470µF 6.3V
3.3	200 watts	2.2µF, 10V	330µF 10V
5.0	200 watts	1.0µF 10V	220µF 15V
12	200 watts	0.68µF 50V	100µF 25V
15	200 watts	0.33µF 50V	100µF 35V
2.0	400 watts	10µF 15V	470µF 6.3V
3.3	400 watts	3.3µF 10V	330µF 10V
5.0	400 watts	1.0µF 15V	220µF 15V
12	400 watts	1.0µF 50V	100µF 25V
15	400 watts	0.68µF 50V	100µF 35V

Table1. Recommended Capacitors for Voltage Out

If the remote sense lines are copper traces on a PCB, it is recommended that the traces be shielded by a ground plane on the other side of the PCB. If noise is coupled into the sense line, the converter may go into oscillation due to its interference on the feedback loop.

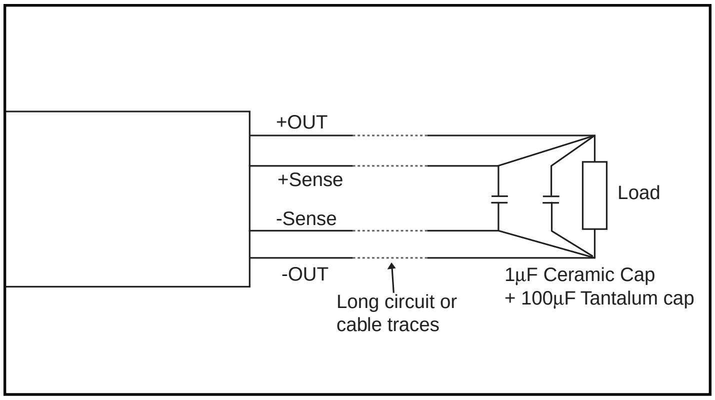

Figure 7. Sense Cable Wiring

The voltage drop (IR) depends on the magnitude of the current (I) and in the case of the dynamic drop, the rate of change of the current (di/dt).

If O-Ring diodes are used in current sharing or N+1 redundancy application, remote sensing can also be used to compensate for the forward voltage drop across the O-Ring diodes. Such a forward drop depends on magnitude of current and the O-Ring diodes junction temperature. Obviously, trimming can also be used to compensate for this drop, if the drop is a known value.

The maximum amount of remote sense voltage compensation is the maximum trim up value, plus the maximum remote sense values as given in the catalog. See Example1. At any rate, the raising of output voltage at the pins as the result of Remote Sensing and Output Trimming MUST NOT exceed the maximum output voltage rating to prevent activating the Over-voltage-Protection.

Example 1: Remote Sense Voltage Compensation

IMT200-300-5. From the specification, the Trimming range is: -6% to +9%. This means that the maximum voltage that can be trimmed up at the output pin is 5v + (5x0.09) = 5 + 0.45v = 5.45v. The specification shows a typical remote sense compensation of 0.1v and a maximum remote sense compensation of 0.15v.

Assuming the converter is not being trimmed, then the maximum sense compensation is 0.15v + 0.45v = 0.60v (0.45v is the maximum trim up value available).

If the converter is trimmed to 5.25v at the output pin, then the maximum remote sense compensation is 0.15v + 0.2v = 0.35v (0.2v is from 0.45v – 0.25v).

If the converter is trimmed down to 4.9v, then the maximum remote sense compensation should be 0.60v.

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