



# EMIF10-COM01F2

IPAD™

## EMI FILTER INCLUDING ESD PROTECTION

### MAIN PRODUCT CHARACTERISTICS

EMI filtering and ESD protection for:

- Computers and printers
- Communication systems
- Mobile phones

### DESCRIPTION

The EMIF10-COM01F2 is a highly integrated device designed to suppress EMI / RFI noise in all systems subjected to electromagnetic interferences. The EMIF10 Flip-Chip packaging means the package size is equal to the die size.

Additionally, this filter includes an ESD protection circuitry which prevents the protected device from destruction when subjected to ESD surges up to 15 kV.

### BENEFITS

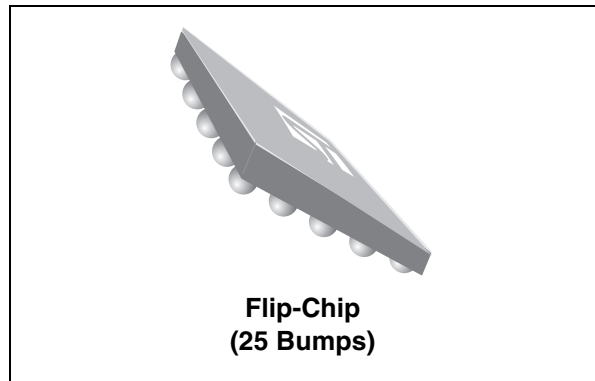
- EMI symmetrical (I/O) low-pass filter
- Lead free package
- Very low PCB space consuming: < 6mm<sup>2</sup>
- Very thin package: 0.65 mm
- High efficiency in ESD suppression on both input & output pins
- High reliability offered by monolithic integration

### COMPLIES WITH THE FOLLOWING STANDARDS:

IEC61000-4-2 level 4

15kV (air discharge)

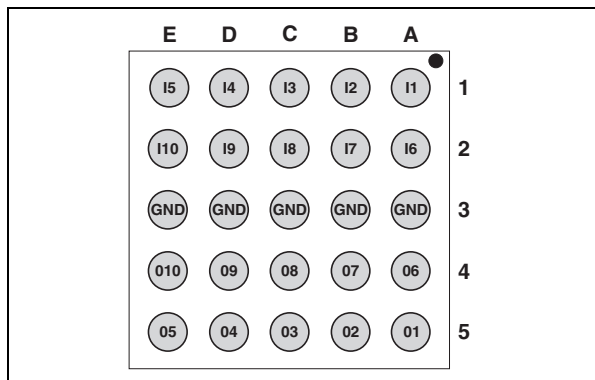
8kV (contact discharge)



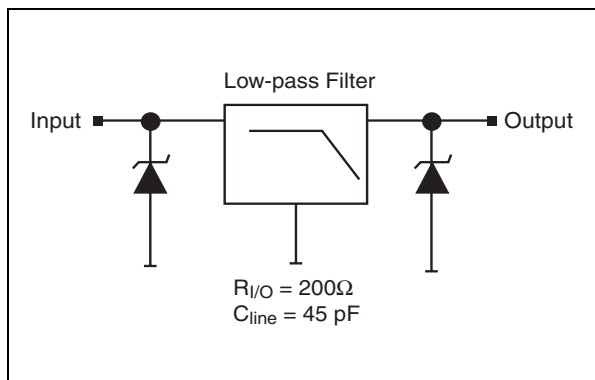
**Table 1: Order Code**

| Part Number     | Marking |
|-----------------|---------|
| EMIF010-COM01F2 | FE      |

**Figure 1: Pin Configuration (Ball side)**



**Figure 2: Basic cell configuration**



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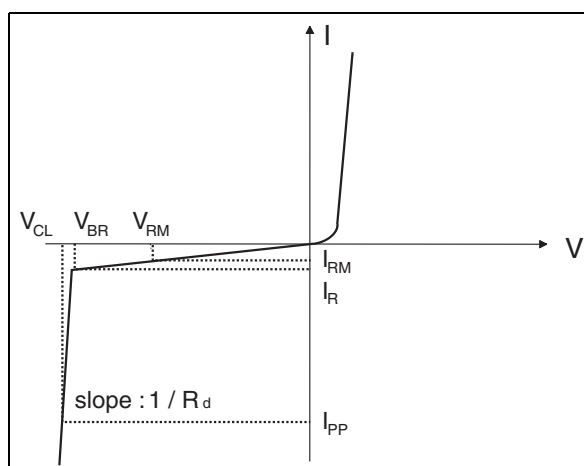
## EMIF10-COM01F2

**Table 2: Absolute Ratings** ( $T_{amb} = 25^{\circ}\text{C}$ )

| Symbol    | Parameter and test conditions  | Value         | Unit               |
|-----------|--|---------------|--------------------|
| $V_{PP}$  | ESD discharge IEC61000-4-2, air discharge<br>ESD discharge IEC61000-4-2, contact discharge | 15<br>8       | kV                 |
| $T_j$     | Junction temperature   | 125           | $^{\circ}\text{C}$ |
| $T_{op}$  | Operating temperature range  | - 40 to + 85  | $^{\circ}\text{C}$ |
| $T_{stg}$ | Storage temperature range  | - 55 to + 150 | $^{\circ}\text{C}$ |

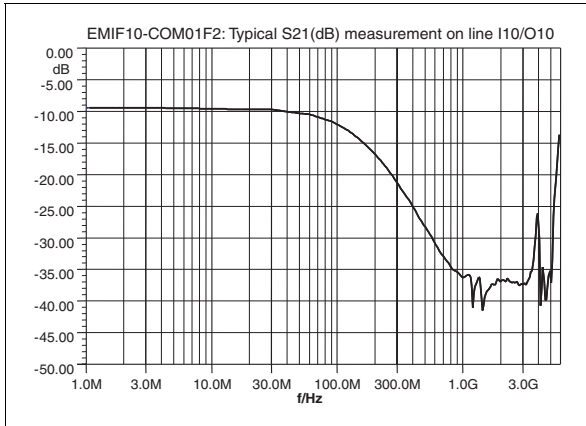
**Table 3: Electrical Characteristics** ( $T_{amb} = 25^{\circ}\text{C}$ )

| Symbol     | Parameter                                |
|------------|--|
| $V_{BR}$   | Breakdown voltage                        |
| $I_{RM}$   | Leakage current @ $V_{RM}$               |
| $V_{RM}$   | Stand-off voltage                        |
| $V_{CL}$   | Clamping voltage                         |
| $R_d$      | Dynamic impedance                        |
| $I_{PP}$   | Peak pulse current                       |
| $R_{I/O}$  | Series resistance between Input & Output |
| $C_{line}$ | Input capacitance per line               |



| Symbol     | Test conditions  | Min. | Typ. | Max. | Unit     |
|------------|--|------|------|------|----------|
| $V_{BR}$   | $I_R = 1 \text{ mA}$                                     | 6    | 8    | 10   | V        |
| $I_{RM}$   | $V_{RM} = 3\text{V}$ per line                            |      |      | 500  | nA       |
| $R_d$      | $I_{PP} = 10\text{A}$ , $t_p = 2.5\mu\text{s}$           |      | 1    |      | $\Omega$ |
| $R_{I/O}$  |  | 180  | 200  | 220  | $\Omega$ |
| $C_{line}$ | At 0V bias   |      | 45   | 50   | pF       |
| $t_{LH}$   | $V_{input} = 2.8\text{V}$ $R_{load} = 100\text{k}\Omega$ |      |      | 25   | ns       |

Figure 3: S21(dB) attenuation measurement



Note: Spikes at high frequencies are induced by the PCB layout

Figure 4: Analog crosstalk

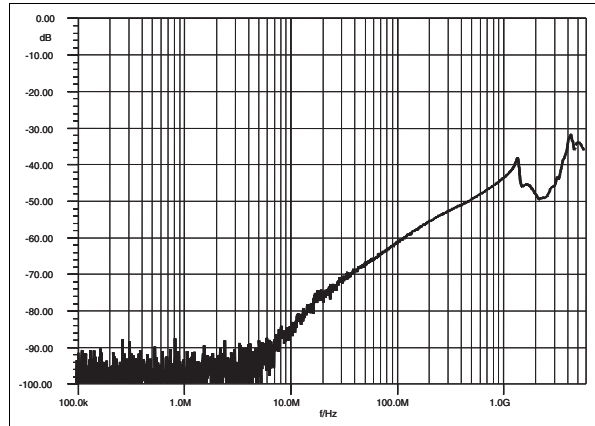


Figure 5: ESD response to IEC61000-4-2 (+15kV air discharge) on one input V(in) and on one output (Vout)

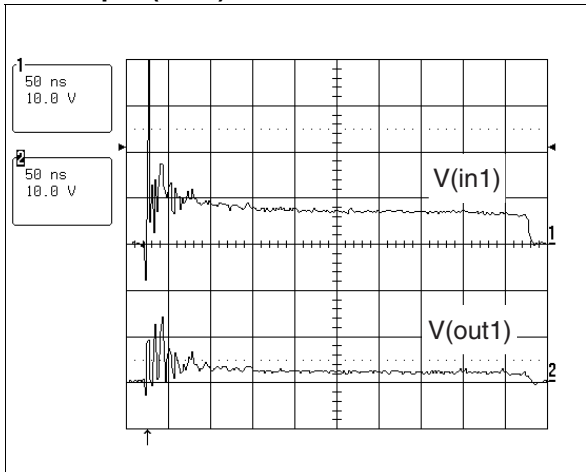


Figure 6: ESD response to IEC61000-4-2 (-15kV air discharge) on one input V(in) and on one output (Vout)

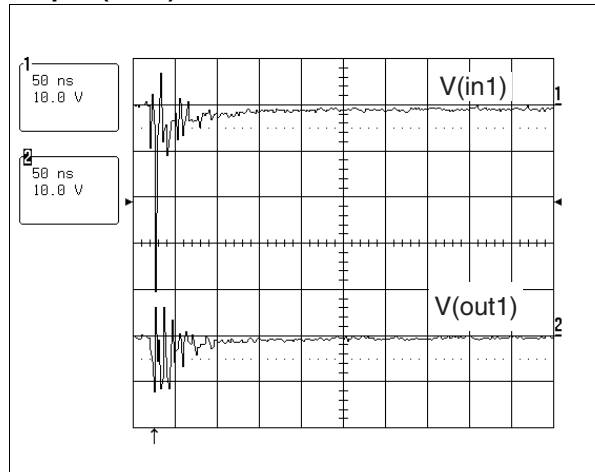
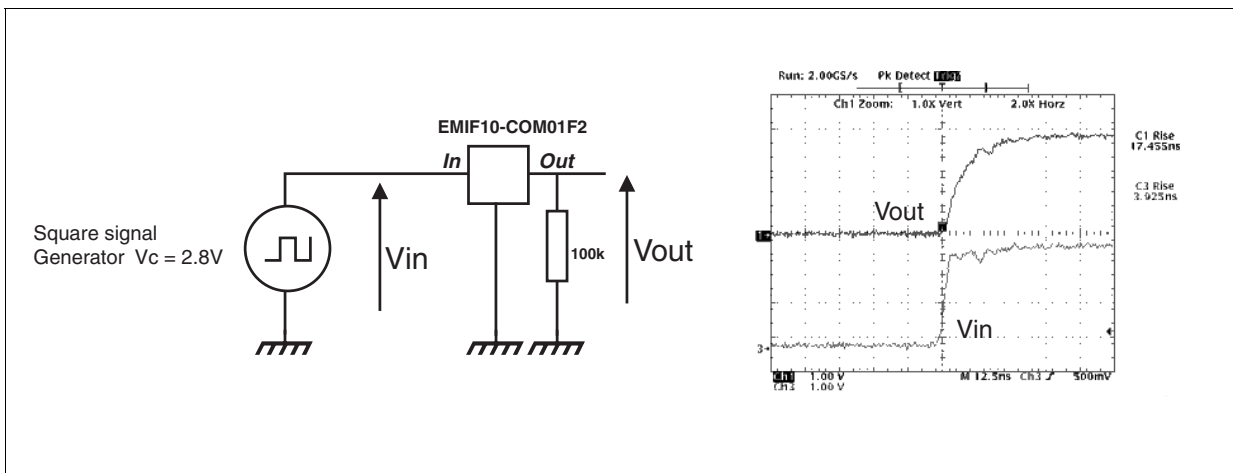
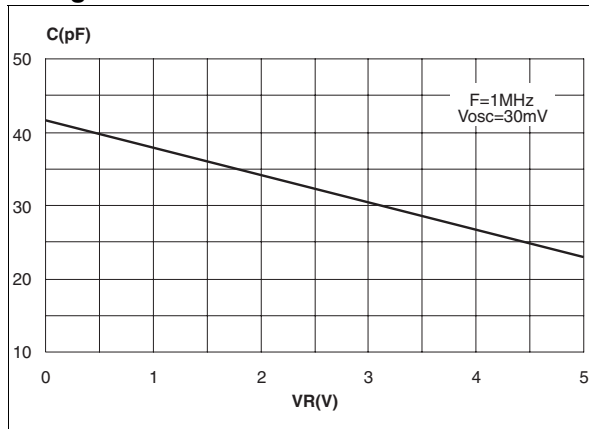


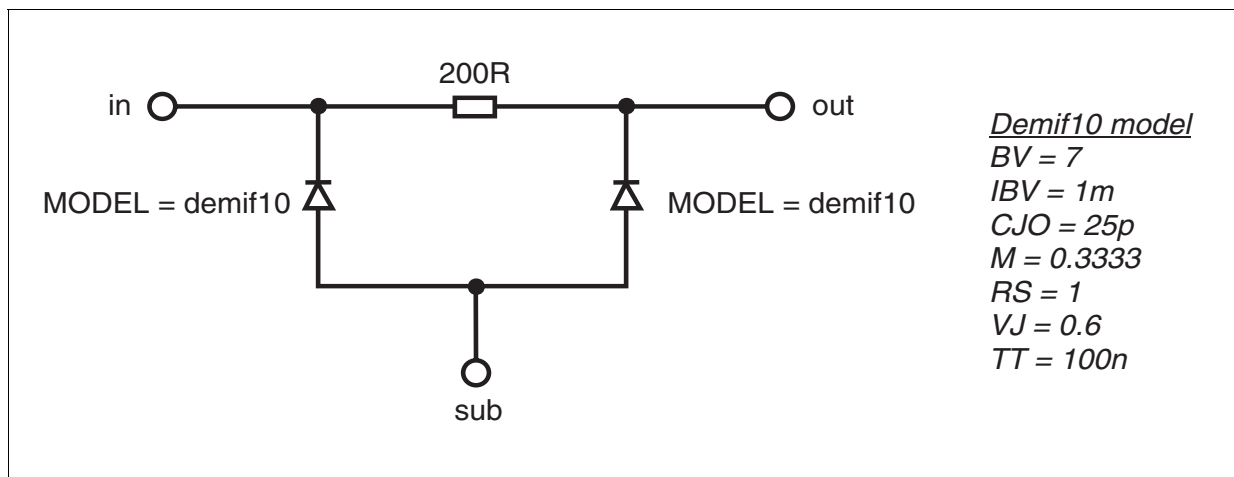
Figure 7: Rise time measurement



**Figure 8: Capacitance versus reverse applied voltage**



**Figure 9: APlac model**



**PCB grounding recommendations**

In order to ensure a good efficiency in terms of ESD protection and filtering behavior, we recommend to implement microvias (100 µm dia.) between the GND bumps and the GND layer. GND bumps can be connected together in PCB layer 1, and in addition, if possible, use through hole vias (200 µm dia.) in both sides of filter to improve contact to GND (layer). This layout will minimize the distance to the ground and thus parasitic inductances. In addition, we recommend to have GND plane wherever possible.

Figure 10: Ordering Information Scheme

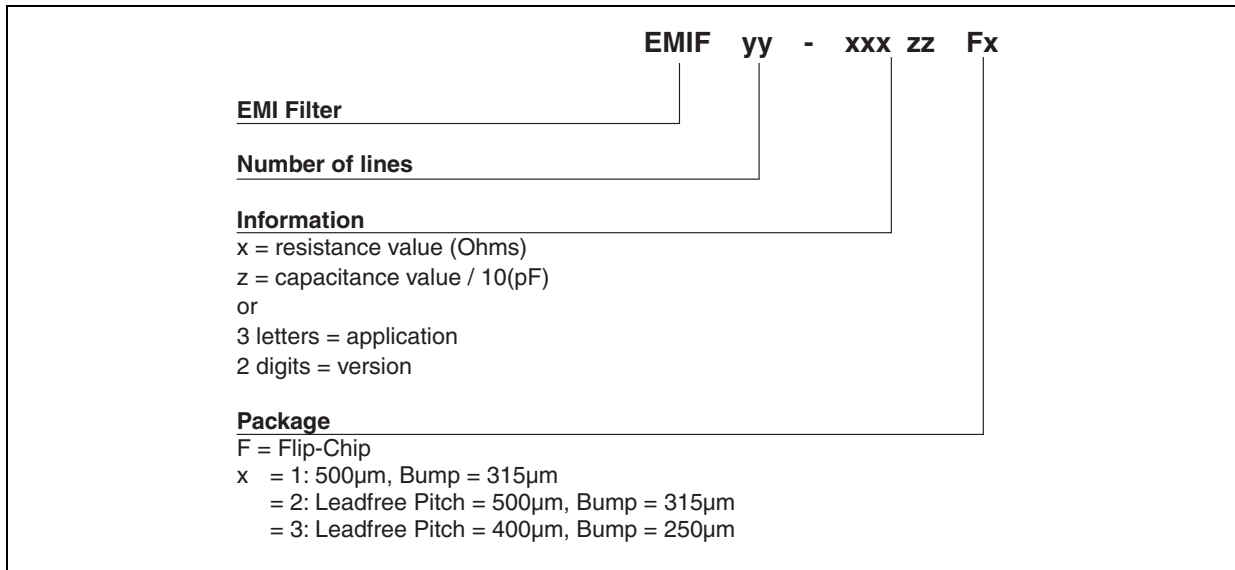


Figure 11: FLIP-CHIP Package Mechanical Data

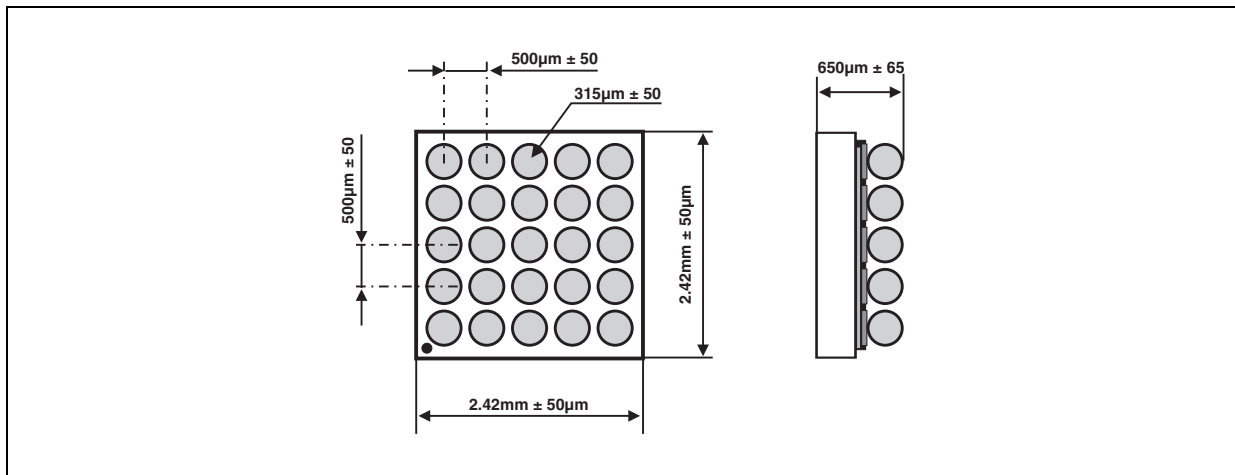


Figure 12: Foot print recommendations

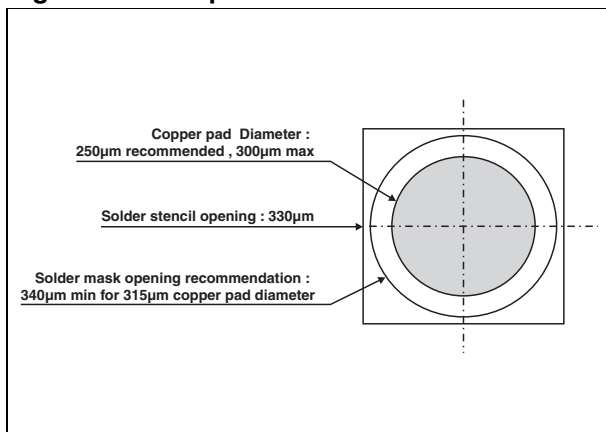


Figure 13: Marking

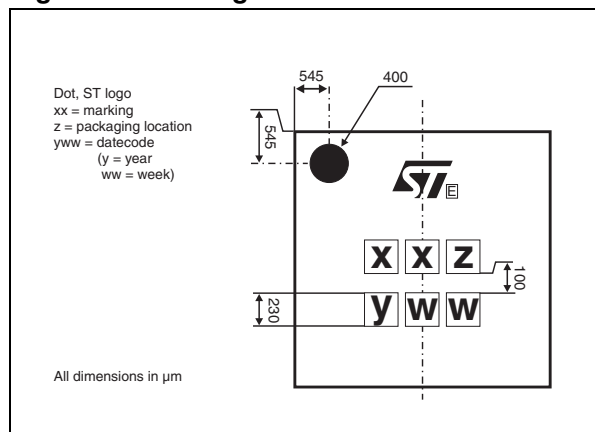


Figure 14: FLIP-CHIP Tape and Reel Specification

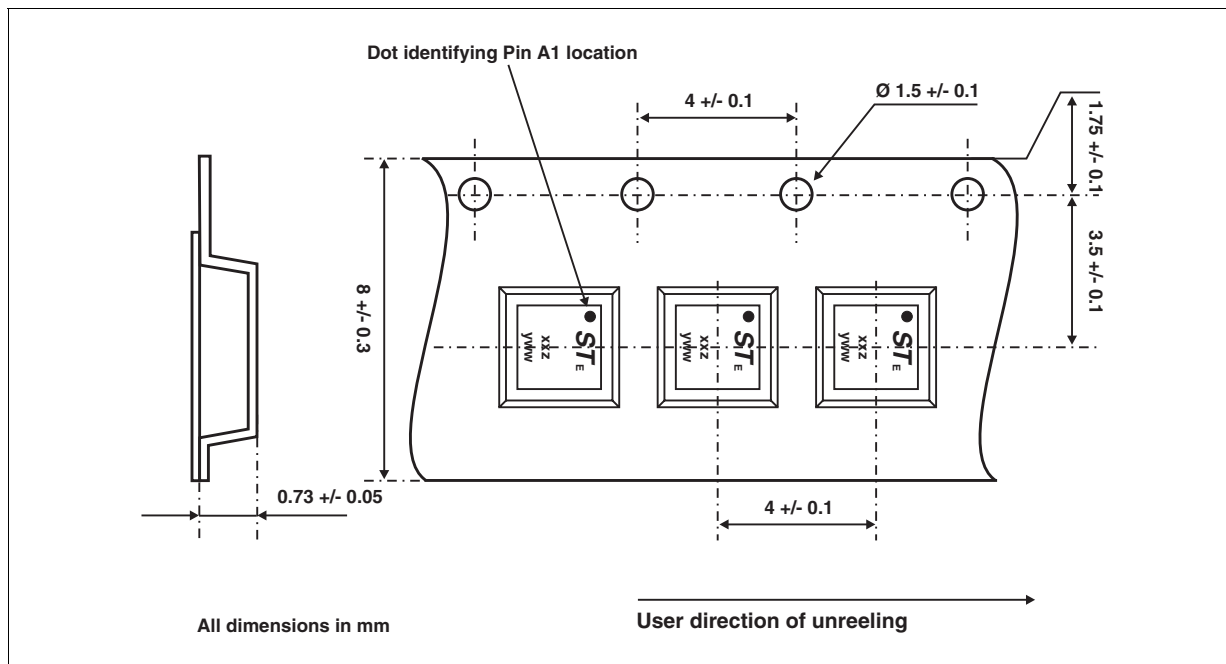


Table 4: Ordering Information

| Ordering code  | Marking | Package   | Weight | Base qty | Delivery mode |
|----------------|---------|-----------|--------|----------|---------------|
| EMIF10-COM01F2 | FE      | Flip-Chip | 8.3 mg | 5000     | Tape & reel   |

Note: More informations are available in the application notes:  
 AN1235: "Flip-Chip: Package description and recommendations for use"  
 AN1751: "EMI Filters: Recommendations and measurements"

Table 5: Revision History

| Date        | Revision | Description of Changes   |
|-------------|----------|--------------------------|
| 14-Dec-2004 | 1        | First issue.             |
| 12-Apr-2005 | 2        | Die clearance reduction. |

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