TransFeed

AVX Multilayer Ceramic Transient Voltage Suppressors
TVS Protection and EMI Attenuation in a Single 0805 Chip - V2F Series

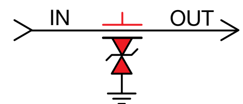
GENERAL DESCRIPTION

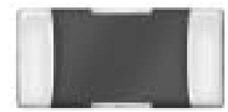
AVX has combined the best electrical characteristics of its TransGuard Transient Voltage Suppressors (TVS) and its Feedthru Capacitors into a single chip for state-of-the-art overvoltage circuit protection and EMI reduction over a broad range of frequencies. This unique combination of multilayer ceramic construction in a feedthru configuration gives the circuit designer a single 0805 chip that responds to transient events faster than any TVS device on the market today, and provides significant EMI attenuation when in the off-state.

The reduction in parallel inductance, typical of the feedthru chip construction when compared to the construction of standard TVS or ceramic capacitor chips, gives the TransFeed product two very important electrical advantages: (1) faster "turn-on" time. Calculated response times of <200 pSec are not unusual with this device, and measured response times range from 200 – 250 pSec. The TransFeed "turn-on" characteristic is less than half that of an equivalent TransGuard part — and TransGuards clamp transient voltages faster than any other bipolar TVS solution such as diodes; (2) the second electrical advantage of lower parallel inductance, coupled with optimal series inductance, is the enhanced attenuation characteristics of the TransFeed product. Not only is there significantly greater attenuation at a higher self-resonance frequency, but the roll-off characteristic becomes much flatter, resulting in EMI filtering over a much broader frequency spectrum. Typical applications include filtering/protection on Microcontroller I/O Lines, Interface I/O Lines, Power Line Conditioning and Power Regulation.

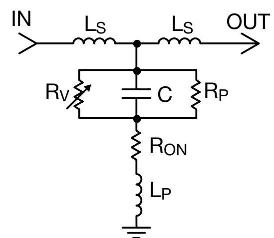
Where designers are concerned with both transient voltage protection and EMI attenuation, either due to the electrical performance of their circuits or due to required compliance to specific EMC regulations, the TransFeed product is an ideal choice.

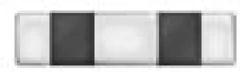
Schematic Diagram





Electrical Model





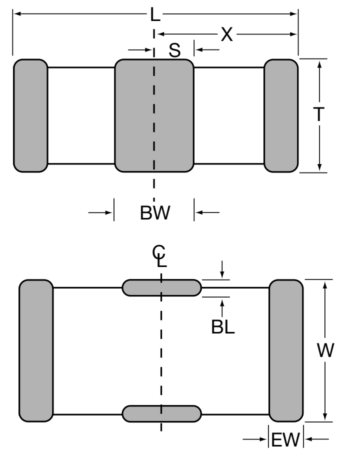
HOW TO ORDER

V	2	F	1	05	A	150	Y	2	E	D	X
Varistor	**Chip Size** 2 = 0805	**Feedthru Capacitor**	**No. of Elements**	**Voltage** 05 = 5.6V 09 = 9.0V 14 = 14.0V 18 = 18.0V	**Energy Rating** X = 0.05J A = 0.1J C = 0.3J	**Varistor Clamping Voltage** 150 = 15.5V 200 = 20.0V 300 = 30.0V 400 = 40.0V 500 = 50.0V	**Capacitance Tolerance** Y = +100/-50%	**DC Resistance** 1 = 0.150 Ohms 2 = 0.200 Ohms 3 = 0.250 Ohms	**Feedthru Current** D = 500 mA E = 750 mA F = 1.0 Amp	**Packaging Code Pcs./Reel** D = 1,000 R = 4,000 T = 10,000	**Termination Finish** X = Pt/Pd/Ag (Non-Plated) P = Ni/Sn Alloy (Plated) Contact Factory for Availability

DIMENSIONS

millimeters (inches)

	L	W	T	BW	BL	EW	X	S
0805	2.01 ± 0.20 (0.079 ± 0.008)	1.25 ± 0.20 (0.049 ± 0.008)	0.76 ± 0.03 (0.030 ± 0.003)	0.46 ± 0.10 (0.018 ± 0.004)	0.18 + 0.25 -0.08 (0.007 + 0.010 -0.003)	0.25 ± 0.13 (0.010 ± 0.005)	1.02 ± 0.10 (0.040 ± 0.004)	0.23 ± 0.05 (0.009 ± 0.002)

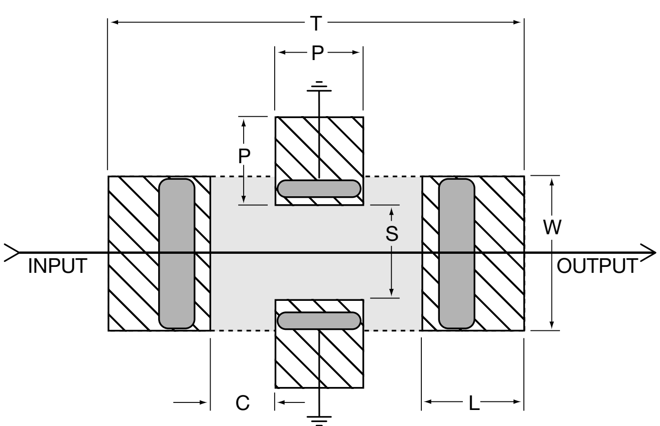


RECOMMENDED SOLDER PAD LAYOUT (Typical Dimensions)

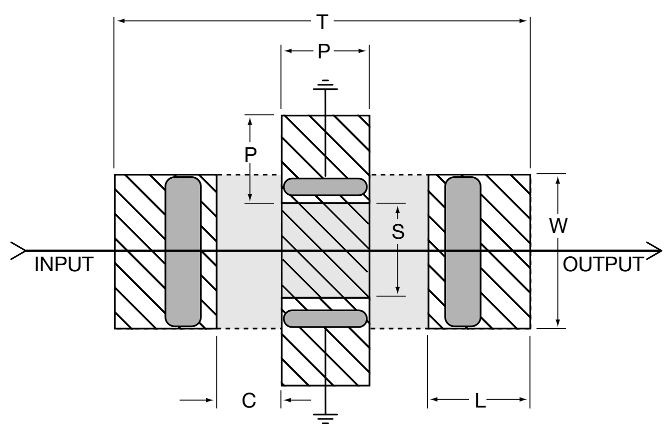
millimeters (inches)

	T	P	S	W	L	C
0805	3.45 (0.136)	0.51 (0.020)	0.76 (0.030)	1.27 (0.050)	1.02 (0.040)	0.46 (0.018)

4 Pad Layout



3 Pad Layout



Note: It is only necessary to ground one center terminal. However, AVX recommends that both side terminals be connected.

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TRANSFEED ELECTRICAL SPECIFICATIONS (0805 CHIP SIZE)

AVX Part Number	Working Voltage	Breakdown Voltage	Clamping Voltage	Peak Current	Transient Energy	Capacitance	DC Resistance Ohms	Feedthru Current
Symbol	V_{WM}	V_B	V_C	I_{peak}	E_{trans}	C	Ohms	I
Units	Volts (max.)	Volts	Volts (max.)	Amp (max.)	Joules (max.)	pF (typ.)	Ω	Amp.
Test Condition	<50µA	1mA DC	8/20µS†	8/20µs	10/1000µS	0.5Vrms @: 1 MHz		
V2F105A150Y2E _ _	5.6	7.6 - 9.3	15.5	30	0.1	800	0.200	750 mA
V2F109A200Y2E _ _	9.0	11.0 - 14.0	20.0	30	0.1	575	0.200	750 mA
V2F114A300Y2E _ _	14.0	16.5 - 20.3	30.0	30	0.1	300	0.200	750 mA
V2F118A400Y2E _ _	18.0	22.9 - 28.0	40.0	30	0.1	200	0.200	750 mA
V2F118X500Y3D _ _	<18.0	N/A	<50.0	20	0.05	<100	0.250	500 mA
V2F105C150Y1F _ _	5.6	7.1 - 8.7	15.5	120	0.3	2500	0.150	1 Amp
V2F109C200Y1F _ _	9.0	10.5 - 13.5	20.0	120	0.3	1800	0.150	1 Amp
V2F114C300Y1F _ _	14.0	15.9 - 19.4	30.0	120	0.3	900	0.150	1 Amp
V2F118C400Y1F _ _	18.0	22.5 - 27.5	40.0	120	0.3	500	0.150	1 Amp

Termination Finish: X = Pt/Pd/Ag (Non-Plated)
P = Ni/Sn Alloy (Plated)

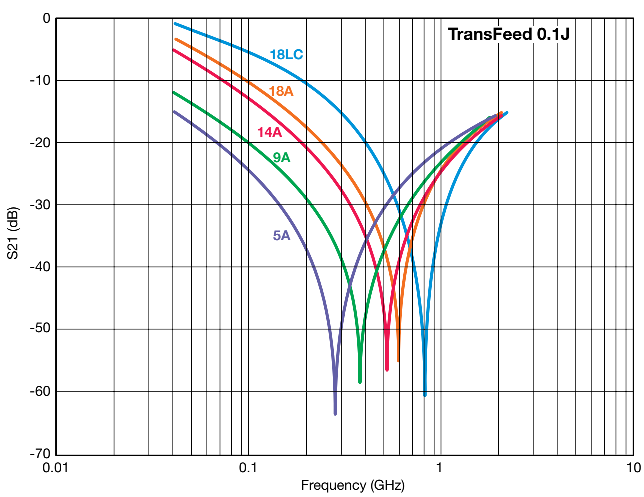
Packaging (Pcs/Reel): see page 2

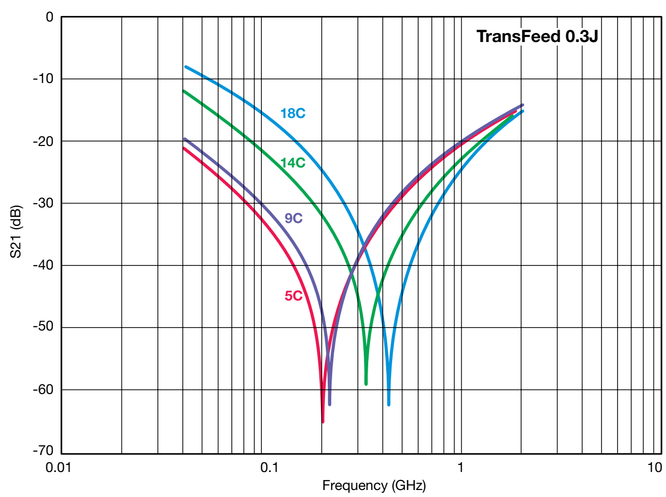
V_C—Maximum peak voltage across the varistor measured at a specified pulse current and waveform

†Transient Energy Rating	Pulse Current & Waveform
0.05 Joule	1A 8/20µS
0.01 Joule	2A 8/20µS
0.2 - 0.3 Joules	5A 8/20µS

PERFORMANCE CHARACTERISTICS

dB Attenuation vs Frequency

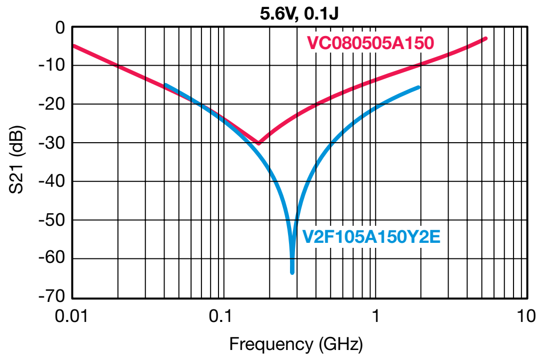


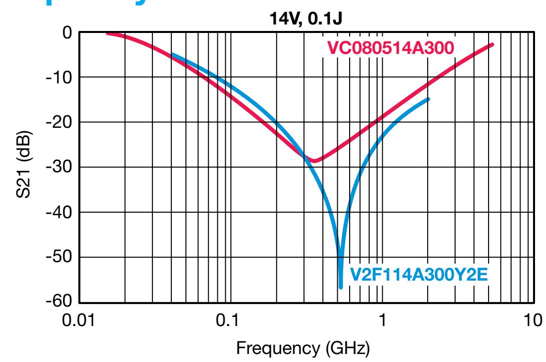


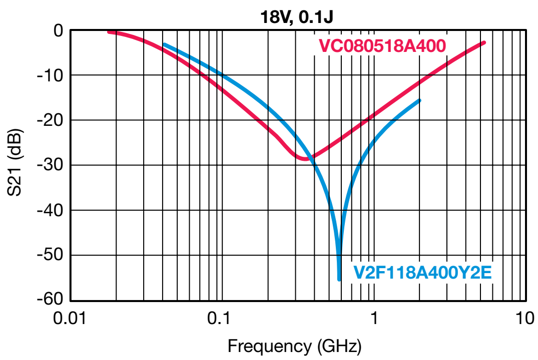
PERFORMANCE CHARACTERISTICS

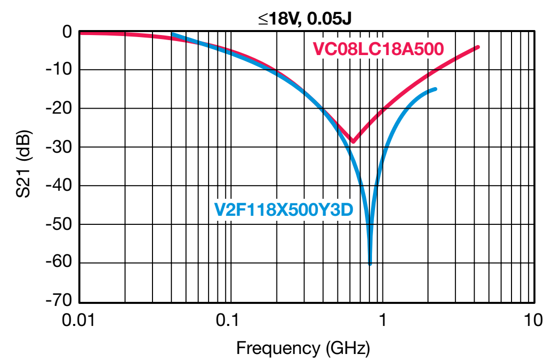
INSERTION LOSS COMPARISON
(TransFeed vs TransGuard)

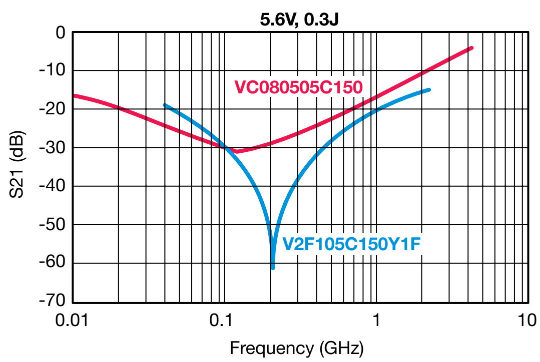
0805 – dB vs Frequency

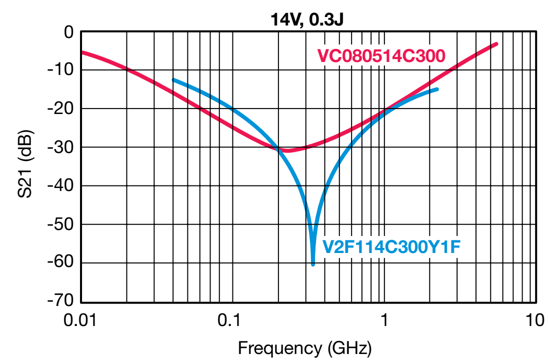


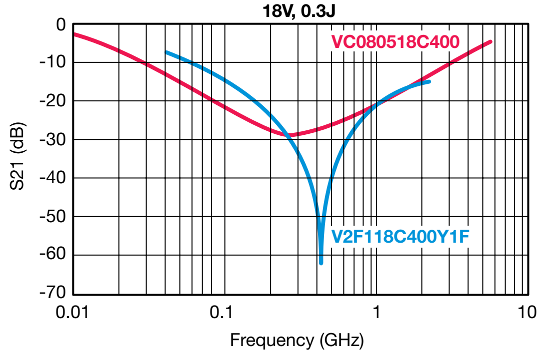








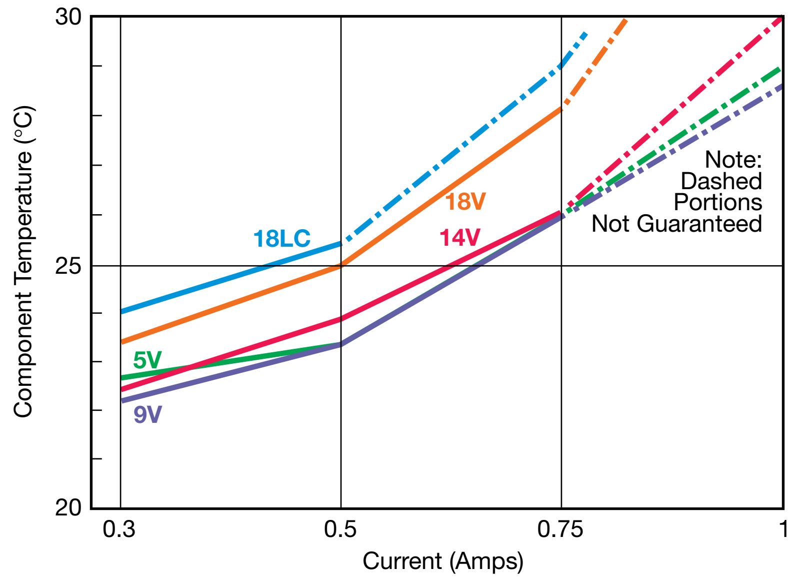




PERFORMANCE CHARACTERISTICS

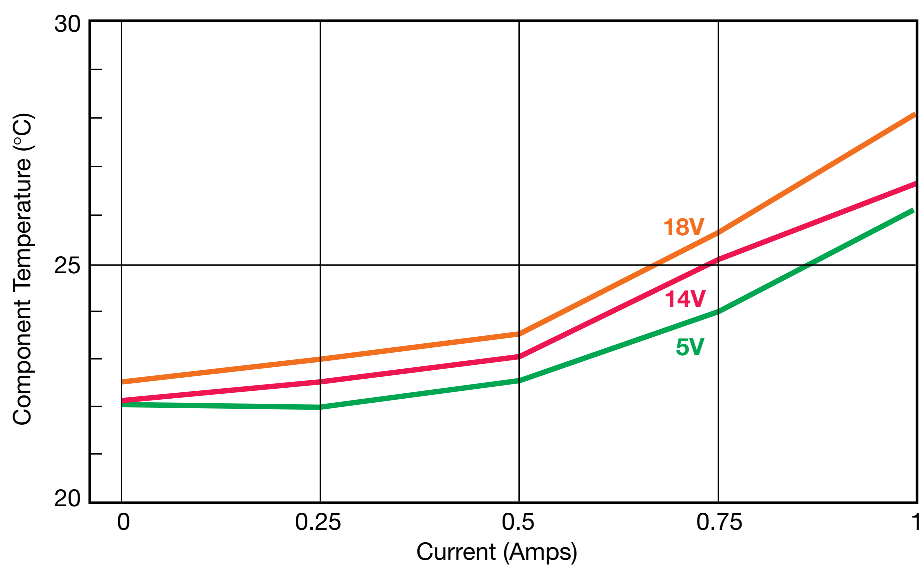
CURRENT vs TEMPERATURE

0805 – 0.1 Joule



CURRENT vs TEMPERATURE

0805 – 0.3 Joule



PERFORMANCE CHARACTERISTICS

FEEDTHRU VARISTORS

AVX Multilayer Feedthru Varistors (MLVF) are an ideal choice for system designers with transient strike and broadband EMI/RFI concerns.

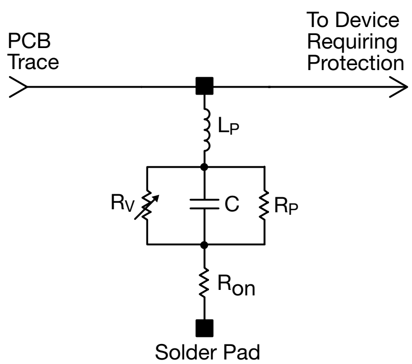
Feedthru Varistors utilize a ZnO varistor material and the electrode pattern of a feedthru capacitor. This combination allows the package advantage of the feedthru and material advantages of the ZnO dielectric to be optimized.

ZnO MLV Feedthrus exhibit electrical and physical advantages over standard ZnO MLVs. Among them are:

1. Faster Turn on Time
2. Broadband EMI attenuation
3. Small size (relative to discrete MLV and EMI filter schemes)

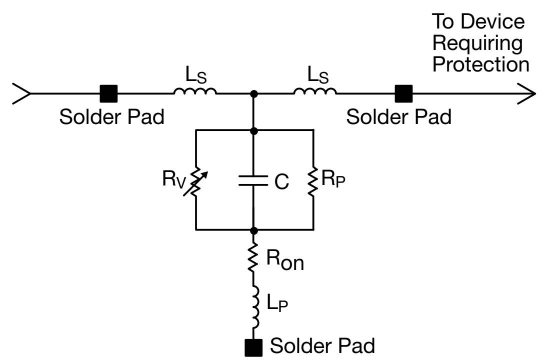
The electrical model for a ZnO MLV and a ZnO Feedthru MLV are shown below. The key difference in the model for the Feedthru is a transformation in parallel to series inductance. The added series inductance helps lower the injected transient peak current (by $2\pi fL$) resulting in an additional benefit of a lower clamping voltage. The lowered parallel inductance decreases the turn on time for the varistor to <250ps.

Discrete MLV Model



Where: R_V = Voltage Variable resistance (per VI curve)
R_p ≥ 10^{12} Ω
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = parallel body inductance

Discrete MLVF Model



Where: R_V = Voltage Variable resistance (per VI curve)
R_p = Body IR
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = minimized parallel body inductance
L_s = series body inductance

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PERFORMANCE CHARACTERISTICS

APPLICATIONS

- EMI Suppression
- Broadband I/O Filtering
- Vcc Line Conditioning

FEATURES

- Small Size
- Low ESR
- Ultra-fast Response Time
- Broad S21 Characteristics

MARKET SEGMENTS

- Computers
- Automotive
- Power Supplies
- Multimedia Add-On Cards
- Bar Code Scanners
- Remote Terminals
- Medical Instrumentation
- Test Equipment
- Transceivers
- Cellular Phones / Pagers

TYPICAL CIRCUITS REQUIRING TRANSIENT VOLTAGE PROTECTION AND EMI FILTERING

The following applications and schematic diagrams show where TransFeed TVS/ EMI filtering devices might be used:

- System Board Level Interfaces: (Fig. 1)
  - Digital to RF
  - Analog to Digital
  - Digital to Analog
- Voltage Regulation (Fig. 2)
- Power Conversion Circuits (Fig. 3)
- GaAs FET Protection (Fig. 4)

Fig. 1 – System Interface

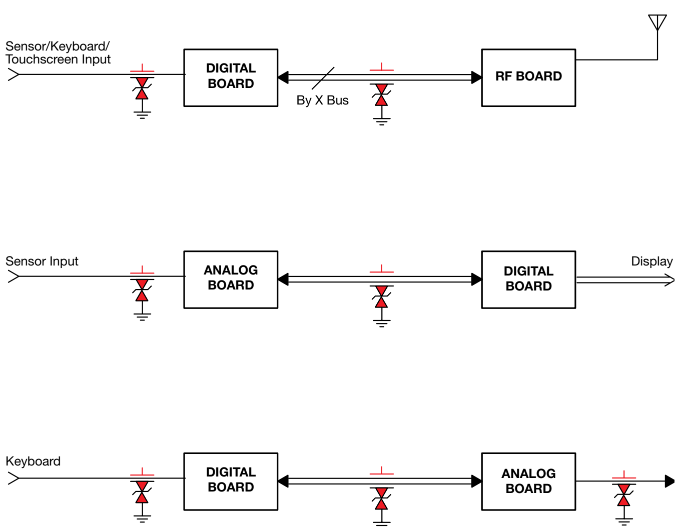


Fig. 2 – Voltage Regulators

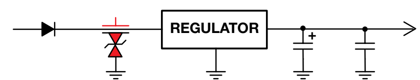


Fig. 3 – Power Conversion Circuits/Power Switching Circuits

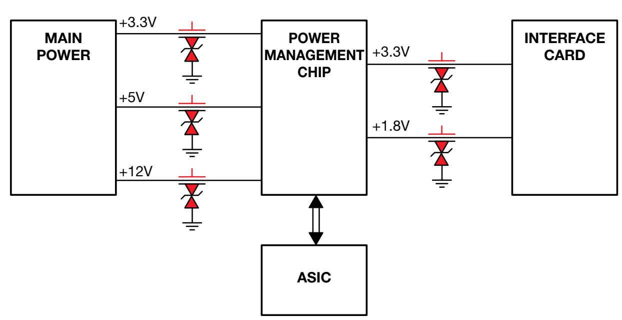
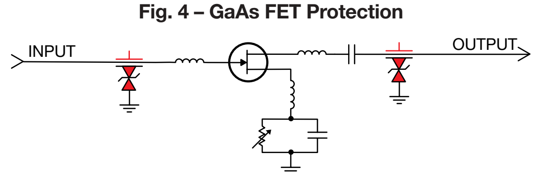


Fig. 4 – GaAs FET Protection



SPECIFICATION COMPARISON

MLVF 0805	PARAMETER		MLV 0805
5ph	L_S	typical	N/A
<600nh	L_P	typical	<1.5nh
<0.025Ω	R_{on}	typical	<0.1Ω
100pf to 2.5nf	C	typical	100pf to 5.5nf
see VI curves	R_V	typical	see VI curves
>0.25 x 10^{12}Ω	R_P	typical	>1 x 10^{12}Ω
<250ps	Typical turn on time Typical frequency response		<500ps

A comparison table showing typical element parameters and resulting performance features for MLV and MLVF is shown above.