

# KA3S0965R/KA3S0965RF

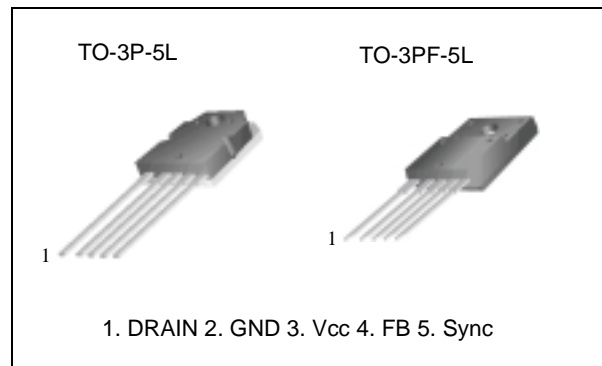
## Fairchild Power Switch(SPS)

### Features

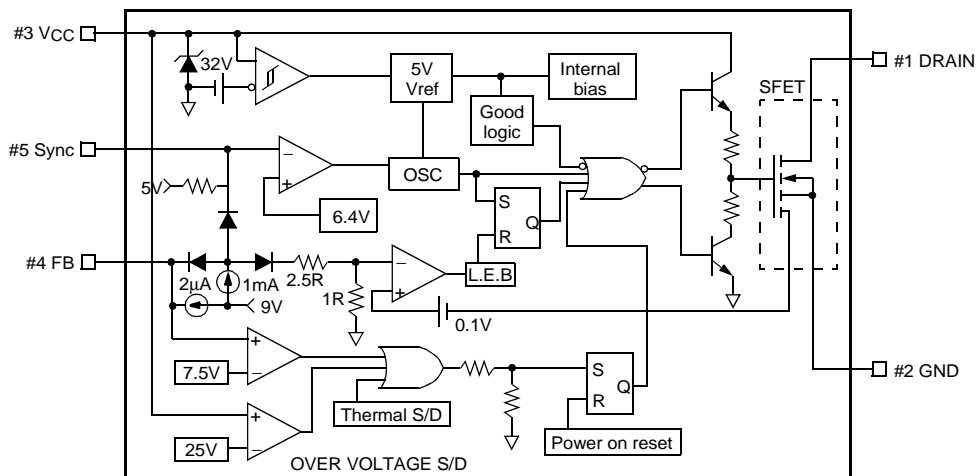
- Wide operating frequency range up to (150kHz)
- Pulse by pulse over current limiting
- Over load protection
- Over voltage protecton (Min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- External sync terminal
- Auto Restart Mode

### Description

The SPS product family is specially designed for an offline SMPS with minimal external components. The SPS consist of high voltage power SenseFET and current mode PWM Controller IC. control IC features a trimmed oscillator, under voltage lock-out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, temperature compensated precision current sources for loop compensation and fault protection circuit. Compared to discrete MOSFET and controller or RCC switching converter solution, a SPS can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability. It has a basic platform well suited for cost-effective C-TV power supply.



### Internal Block Diagram



## Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Maximum drain voltage <sup>(1)</sup>	V <sub>D,MAX</sub>	650	V
Drain-gate voltage (R <sub>GS</sub> =1MΩ)	V <sub>DGR</sub>	650	V
Gate-source (GND) voltage	V <sub>GS</sub>	±30	V
Drain current pulsed <sup>(2)</sup>	I <sub>DM</sub>	36.0	ADC
Single pulsed avalanche energy <sup>(3)</sup>	E <sub>AS</sub>	950	mJ
Continuous drain current (T <sub>C</sub> =25°C)	I <sub>D</sub>	9.0	ADC
Continuous drain current (T <sub>C</sub> =100°C)	I <sub>D</sub>	5.5	ADC
Maximum supply voltage	V <sub>CC,MAX</sub>	30	V
Input voltage range	V <sub>FB</sub>	-0.3 to V <sub>SD</sub>	V
Total power dissipation	P <sub>D</sub>	170	W
	Derating	1.33	W/°C
Operating ambient temperature	T <sub>A</sub>	-25 to +85	°C
Storage temperature	T <sub>STG</sub>	-55 to +150	°C

**Notes:**

1. T<sub>j</sub>=25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L=10mH, V<sub>DD</sub>=50V, R<sub>G</sub>=27Ω, starting T<sub>j</sub>=25 °C

## Electrical Characteristics (SFET part)

(Ta = 25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =50μA	650	–	–	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =Max., Rating, V <sub>GS</sub> =0V	–	–	50	μA
		V <sub>DS</sub> =0.8Max., Rating, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	–	–	200	μA
Static drain-source on resistance <sup>(note)</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A	–	0.96	1.2	Ω
Forward transconductance <sup>(note)</sup>	g <sub>fs</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =4.5A	5.0	–	–	S
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	–	1750	–	pF
Output capacitance	C <sub>oss</sub>		–	190	–	
Reverse transfer capacitance	C <sub>rss</sub>		–	78	–	
Turn on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =0.5BV <sub>DSS</sub> , I <sub>D</sub> =9.0A (MOSFET switching time are essentially independent of operating temperature)	–	20	50	nS
Rise time	t <sub>r</sub>		–	23	55	
Turn off delay time	t <sub>d(off)</sub>		–	85	180	
Fall time	t <sub>f</sub>		–	30	70	
Total gate charge (gate-source+gate-drain)	Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =9.0A, V <sub>DS</sub> =0.5BV <sub>DSS</sub> (MOSFET switching time are essentially independent of operating temperature)	–	74	95	nC
Gate-source charge	Q <sub>gs</sub>		–	12	–	
Gate-drain (Miller) charge	Q <sub>gd</sub>		–	35.4	–	

**Note:**

Pulse test: Pulse width ≤ 300μS, duty cycle ≤ 2%

$$S = \frac{1}{R}$$

## Electrical Characteristics (CONTROL part)

(Ta = 25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
<b>UVLO SECTION</b>						
Start threshold voltage	VSTART	-	14	15	16	V
Stop threshold voltage	VSTOP	After turn on	9	10	11	V
<b>OSCILLATOR SECTION</b>						
Initial accuracy	FOSC	Ta=25°C	18	20	22	kHz
Frequency change with temperature <sup>(2)</sup>	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum duty cycle	Dmax	-	92	95	98	%
<b>FEEDBACK SECTION</b>						
Feedback source current	I <sub>FB</sub>	Ta=25°C, V <sub>fb</sub> =GND	0.8	1	1.2	mA
Shutdown feedback voltage	VSD	-	6.9	7.5	8.1	V
Shutdown delay current	I <sub>delay</sub>	Ta=25°C, 5V ≤ V <sub>fb</sub> ≤ VSD	1.4	1.8	2.2	μA
<b>SYNC. &amp; SOFT START SECTION</b>						
Soft start voltage	VSS	V <sub>FB</sub> = 2V	4.7	5.0	5.3	V
Soft start current	I <sub>SS</sub>	Sync & S/S=GND	0.8	-	-	mA
Sync threshold voltage <sup>(3)</sup>	V <sub>SYTH</sub>	V <sub>fb</sub> =5V	6.0	6.4	6.8	V
<b>REFERENCE SECTION</b>						
Output voltage <sup>(1)</sup>	V <sub>ref</sub>	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability <sup>(1)(2)</sup>	V <sub>ref</sub> /ΔT	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
<b>CURRENT LIMIT (SELF-PROTECTION) SECTION</b>						
Peak Current Limit	I <sub>OVER</sub>	Max. inductor current	5.28	6.00	6.72	A
<b>PROTECTION SECTION</b>						
Thermal shutdown temperature (T <sub>j</sub> ) <sup>(1)</sup>	TSD	-	140	160	-	°C
<b>TOTAL DEVICE SECTION</b>						
Start Up current	I <sub>START</sub>	VCC=14V	0.1	0.3	0.55	mA
Operating supply current (Control Part Only)	I <sub>OP</sub>	Ta=25°C	6	12	18	mA
VCC Zener voltage	V <sub>Z</sub>	I <sub>CC</sub> =20mA	30	32.5	35	V

### NOTE:

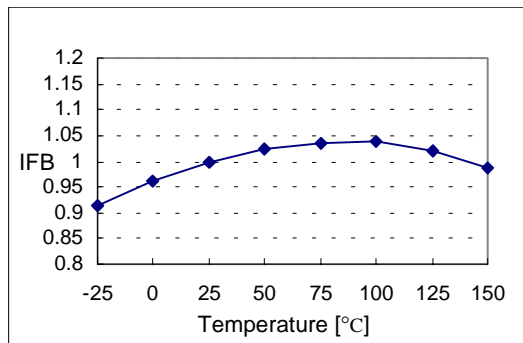
1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS(water test) process
3. The amplitude of the sync. pulse is recommended to be between 2V and 3V for stable sync. function.

## Typical Performance Characteristics

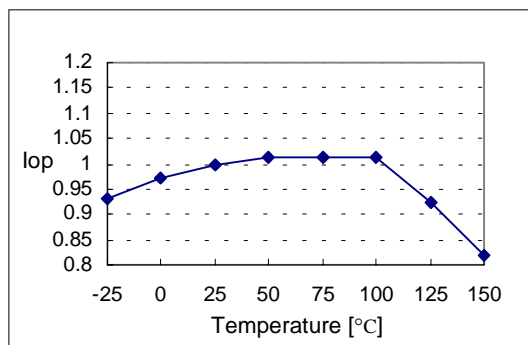
(These characteristic graphs are normalized at  $T_a = 25^\circ\text{C}$ )



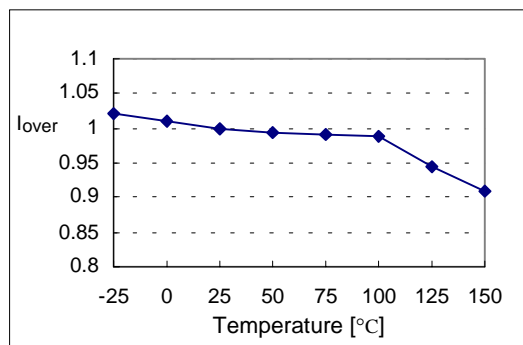
**Figure 1. Operating Frequency**



**Figure 2. Feedback Source Current**



**Figure 3. Operating Supply Current**



**Figure 4. Peak Current Limit**



**Figure 5. Start up Current**



**Figure 6. Start Threshold Voltage**

## Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at  $T_a = 25^\circ\text{C}$ )



Figure 7. Stop Threshold Voltage



Figure 8. Maximum Duty Cycle



Figure 9. VCC Zener Voltage



Figure 10. Shutdown Feedback Voltage



Figure 11. Shutdown Delay Current



Figure 12. Over Voltage Protection

## Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at  $T_a = 25^\circ\text{C}$ )

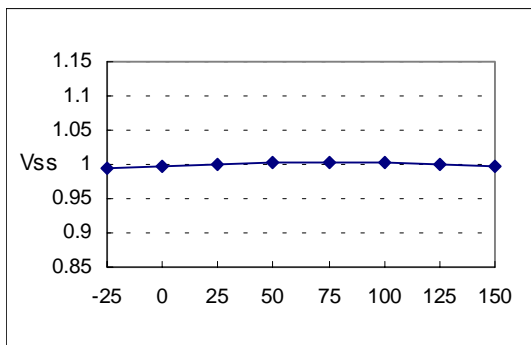


Figure13. Soft Start Voltage

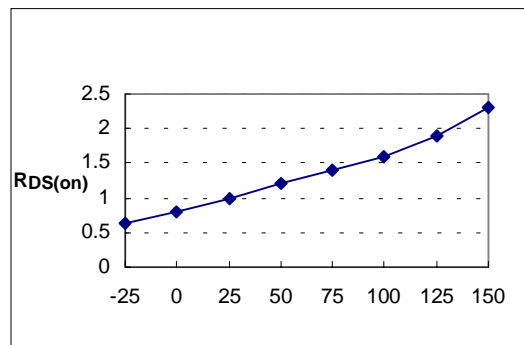
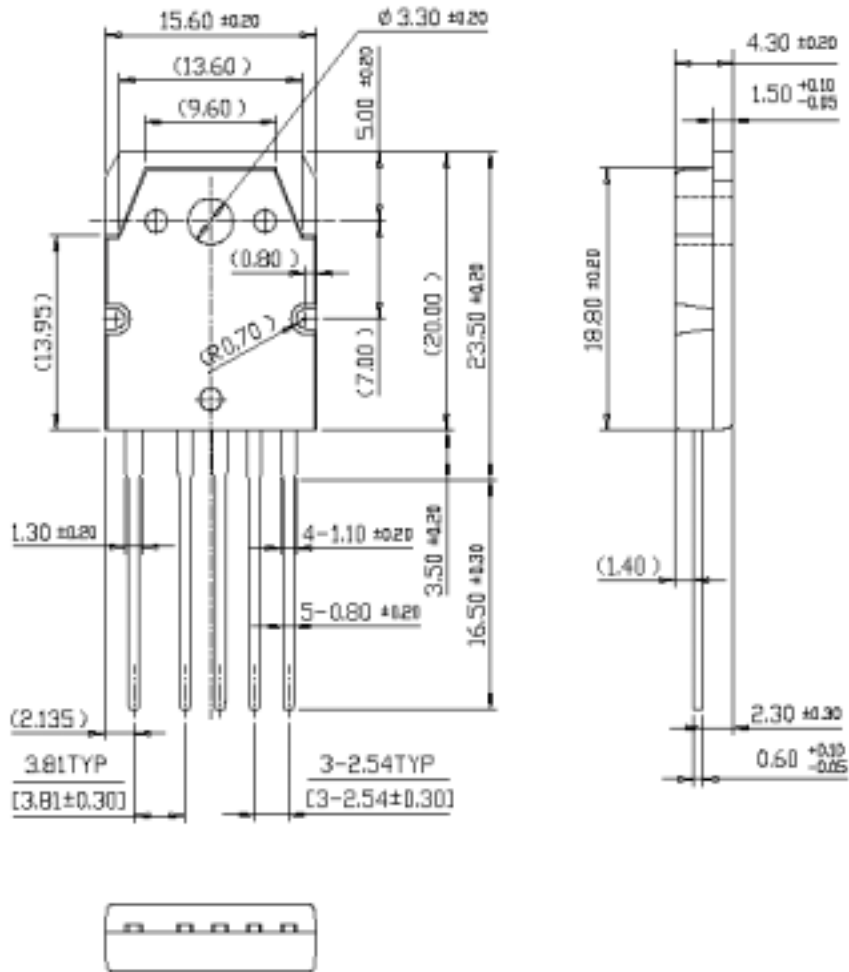


Figure 14. Static Drain-Source on Resistance

# Package Dimensions

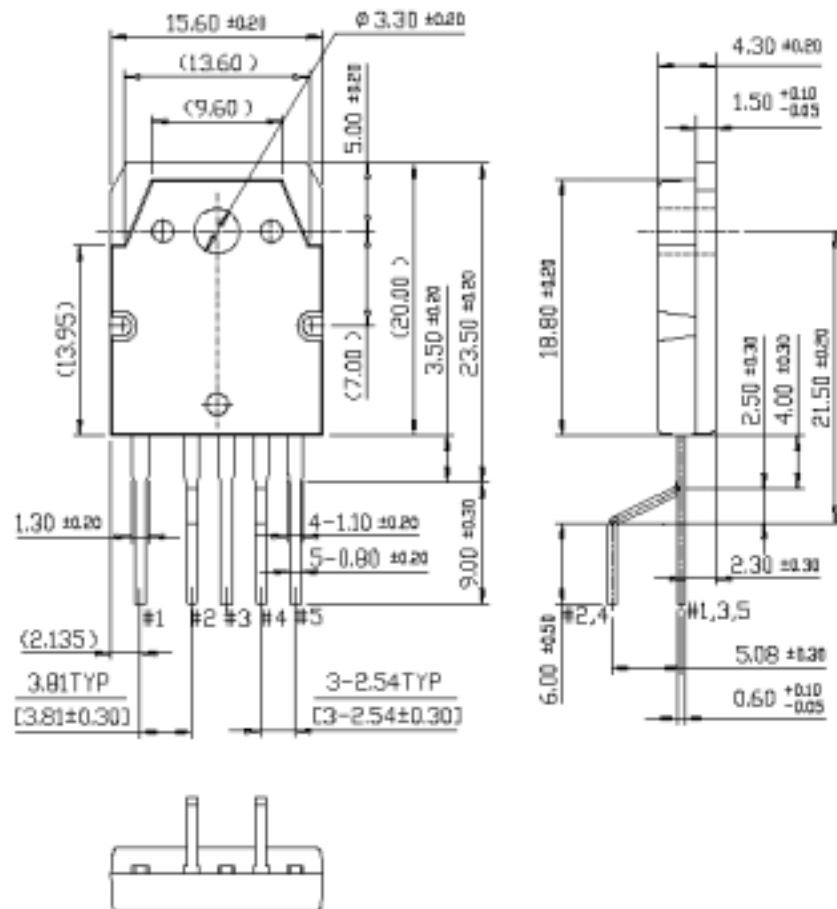
## TO-3P-5L





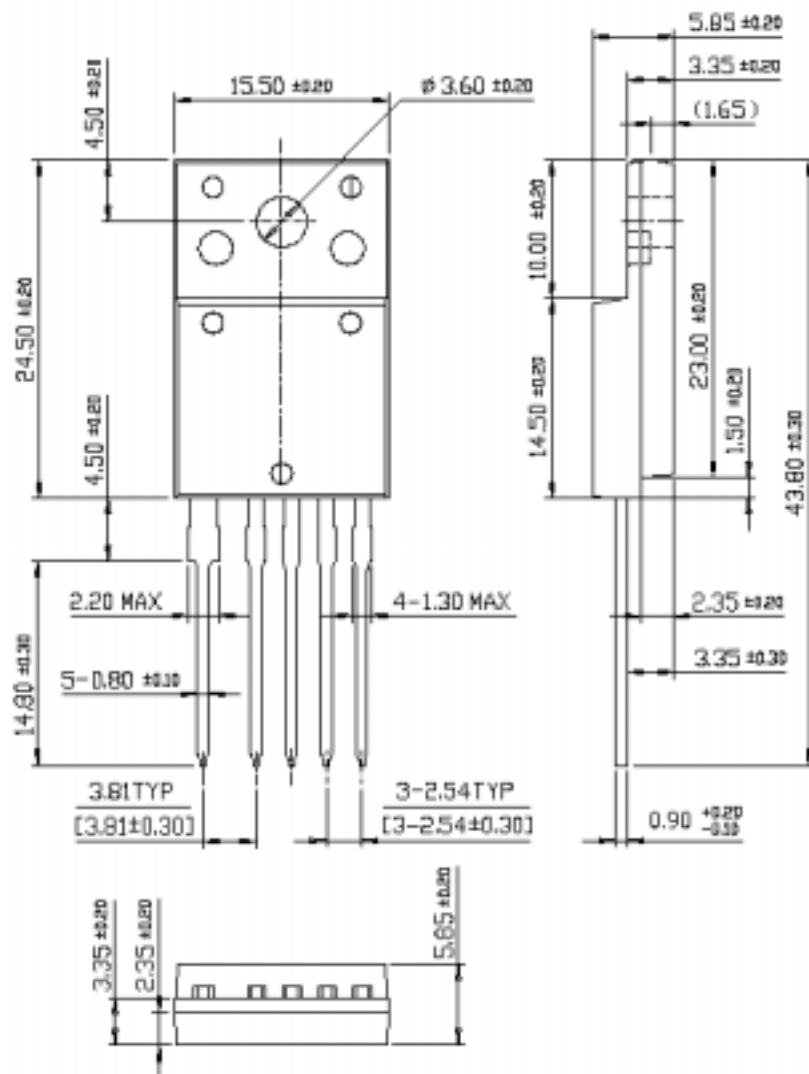
## Package Dimensions (Continued)

### TO-3P-5L (Forming)



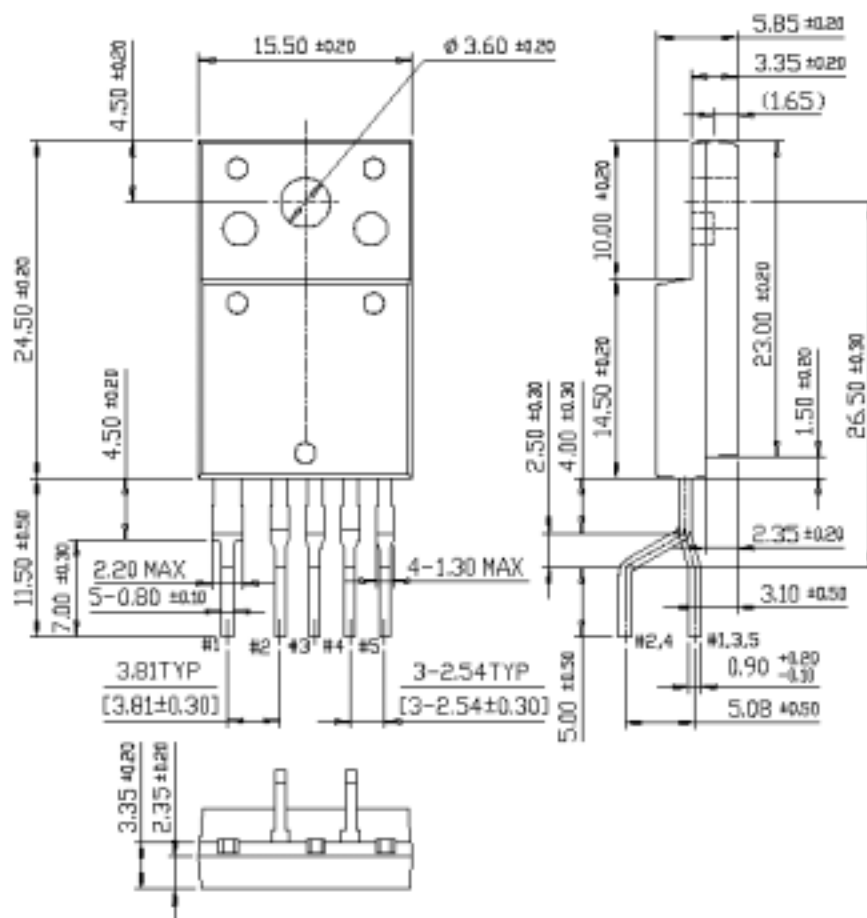
Package Dimensions (Continued)

TO-3PF-5L



## Package Dimensions (Continued)

### TO-3PF-5L(Forming)



## Ordering Information

Product Number	Package	Rating	Operating Temperature
KA3S0965R-TU	TO-3P-5L	650V,9A	-25°C to +85°C
KA3S0965R-YDTU	TO-3P-5L(Forming)		
KA3S0965RF-TU	TO-3PF-5L	650V,9A	-25°C to +85°C
KA3S0965RF-YDTU	TO-3PF-5L(Forming)		

TU : Non Forming Type

YDTU : Forming Type



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