

KA5x02xx-SERIES

KA5H0265RC, KA5M0265R, KA5L0265R,
KA5H02659RN/KA5M02659RN, KA5H0280R,
KA5M0280R

Fairchild Power Switch(FPS)

Features

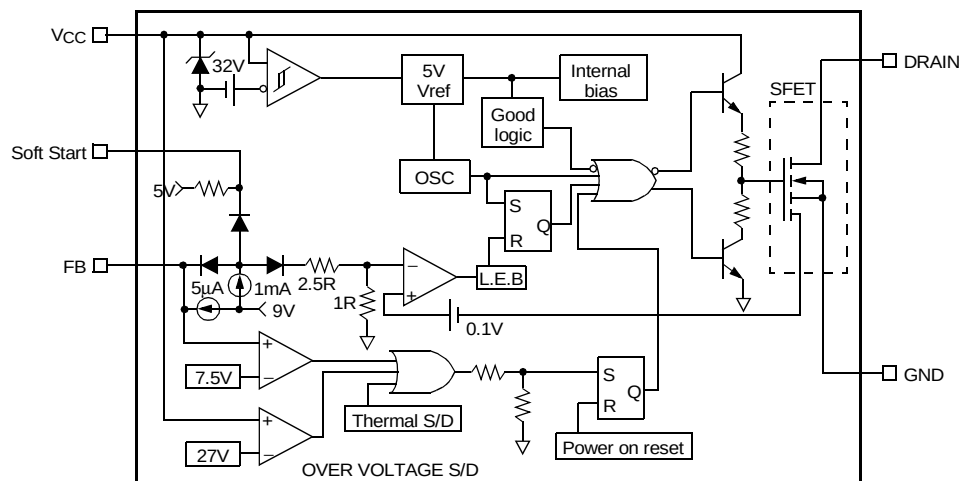
- Precision fixed operating frequency (100/67/50KHz)
- Pulse by pulse current limiting
- Over current protection
- Over voltage protection (Min. 25V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Auto-restart mode

Description

The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry. compared to discrete MOSFET and controller or RCC switching converter solution, a Fairchild Power Switch(FPS) 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 design in either a flyback converter or a forward converter.

TO-220F-4L	8-DIP	TO220-5L
		
1. GND 2. Drain 3. Vcc 4. FB	1.6.7.8. Drain 2. GND 3. Vcc 4. FB 5. NC	1. Drain 2. GND 3. Vcc 4. FB 5. S/S

Internal Block Diagram



Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
KA5x0265xRx			
Maximum Drain Voltage	V _{D,MAX}	650	V
Drain-Gate Voltage (R _{GS} =1MΩ)	V _{DGR}	650	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽¹⁾	I _{DM}	8.0	ADC
Continuous Drain Current (T _C =25°C)	I _D	2.0	ADC
Continuous Drain Current (T _C =100°C)	I _D	1.3	ADC
Single Pulsed Avalanche Energy ⁽²⁾	E _{AS}	68	mJ
Maximum Supply Voltage	V _{CC,MAX}	30	V
Analog Input Voltage Range	V _{FB}	−0.3 to V _{SD}	V
Total Power Dissipation	P _D	42	W
	Derating	0.33	W/°C
Operating Junction Temperature.	T _J	+160	°C
Operating Ambient Temperature.	T _A	−25 to +85	°C
Storage Temperature Range.	T _{STG}	−55 to +150	°C
KA5x0280R			
Maximum Drain Voltage	V _{D,MAX}	800	V
Drain-Gate Voltage (R _{GS} =1MΩ)	V _{DGR}	800	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽¹⁾	I _{DM}	8.0	ADC
Continuous Drain Current (T _C =25°C)	I _D	2.0	ADC
Continuous Drain Current (T _C =100°C)	I _D	1.3	ADC
Single Pulsed Avalanche Energy ⁽²⁾	E _{AS}	90	mJ
Maximum Supply Voltage	V _{CC,MAX}	30	V
Analog Input Voltage Range	V _{FB}	−0.3 to V _{SD}	V
Total Power Dissipation	P _D	35	W
	Derating	0.28	W/°C
Operating Junction Temperature.	T _J	+160	°C
Operating Ambient Temperature.	T _A	−25 to +85	°C
Storage Temperature Range.	T _{STG}	−55 to +150	°C

Note:

1. Repetitive rating: Pulse width limited by maximum junction temperature
2. L=51mH, starting T_J=25°C

Electrical Characteristics (SFET part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
KA5x0265xRx						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =50μA	650	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =Max. Rating, V _{GS} =0V	-	-	50	μA
		V _{DS} =0.8Max. Rating, V _{GS} =0V, T _C =125°C	-	-	200	μA
Static drain-source on resistance ^(note)	R _{DS(ON)}	V _{GS} =10V, I _D =0.5A	-	5.0	6.0	Ω
Forward transconductance ^(note)	g _{fs}	V _{DS} =50V, I _D =0.5A	1.5	2.5	-	S
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	550	-	pF
Output capacitance	C _{oss}		-	38	-	
Reverse transfer capacitance	C _{rss}		-	17	-	
Turn on delay time	t _{d(on)}	V _{DD} =0.5BV _{DSS} , I _D =1.0A (MOSFET switching time are essentially independent of operating temperature)	-	20	-	nS
Rise time	t _r		-	15	-	
Turn off delay time	t _{d(off)}		-	55	-	
Fall time	t _f		-	25	-	
Total gate charge (gate-source+gate-drain)	Q _g	V _{GS} =10V, I _D =1.0A, V _{DS} =0.5BV _{DSS} (MOSFET switching time are essentially independent of operating temperature)	-	-	35	nC
Gate-source charge	Q _{gs}		-	3	-	
Gate-drain (Miller) charge	Q _{gd}		-	12	-	
KA5x0280R						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =50μA	800	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =Max. Rating, V _{GS} =0V	-	-	50	μA
		V _{DS} =0.8Max. Rating, V _{GS} =0V, T _C =125°C	-	-	200	μA
Static drain-source on resistance ^(note)	R _{DS(ON)}	V _{GS} =10V, I _D =0.5A	-	5.6	7.0	Ω
Forward transconductance ^(note)	g _{fs}	V _{DS} =50V, I _D =0.5A	1.5	2.5	-	S
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	250	-	pF
Output capacitance	C _{oss}		-	52	-	
Reverse transfer capacitance	C _{rss}		-	25	-	
Turn on delay time	t _{d(on)}	V _{DD} =0.5BV _{DSS} , I _D =1.0A (MOSFET switching time are essentially independent of operating temperature)	-	21	-	nS
Rise time	t _r		-	28	-	
Turn off delay time	t _{d(off)}		-	77	-	
Fall time	t _f		-	24	-	
Total gate charge (gate-source+gate-drain)	Q _g	V _{GS} =10V, I _D =1.0A, V _{DS} =0.5BV _{DSS} (MOSFET switching time are essentially independent of operating temperature)	-	-	60	nC
Gate-source charge	Q _{gs}		-	15	-	
Gate-drain (Miller) charge	Q _{gd}		-	20	-	

Note:

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

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

Electrical Characteristics (CONTROL part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	VSTART	VFB=GND	14	15	16	V
Stop Threshold Voltage	VSTOP	VFB=GND	8.4	9	9.6	V
OSCILLATOR SECTION						
Initial accuracy	FOSC	KA5H0265xRx KA5H0280R	90	100	110	kHz
Initial accuracy	FOSC	KA5M0265xRx KA5M0280R	61	67	73	kHz
Initial accuracy	FOSC	KA5L0265R	45	50	55	kHz
Frequency change with temperature ⁽²⁾	ΔF/ΔT	−25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum duty cycle	Dmax	KA5H0265xRx KA5H0280R	62	67	72	%
Maximum duty cycle	Dmax	KA5M0265xRx KA5M0280R KA5L0265R	72	77	82	%
FEEDBACK SECTION						
Feedback source current	IFB	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.7	0.9	1.1	mA
Shutdown feedback voltage	VSD	Vfb ≤ 6.5V	6.9	7.5	8.1	V
Shutdown delay current	Idelay	Ta=25°C, 5V ≤ Vfb ≤ VSD	4	5	6	μA
SOFT START SECTION						
Soft Start Voltage	VSS	KA5H0265RC	4.7	5.0	5.3	V
Soft Start Current	ISS		0.8	1.0	1.2	mA
REFERENCE SECTION						
Output voltage ⁽¹⁾	Vref	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability ⁽¹⁾⁽²⁾	Vref/ΔT	−25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit	I _{OVER}	KA5x02659RN	0.79	0.9	1.01	A
Peak Current Limit	I _{OVER}	KA5x0265Rx KA5x0280R	1.05	1.2	1.34	A
PROTECTION SECTION						
Over voltage protection	VOVP	VCC ≥ 24V	25	27	29	V
Thermal shutdown temperature (Tj) ⁽¹⁾	TSD	-	140	160	-	°C
TOTAL DEVICE SECTION						
Start Up Current	I _{START}	VCC=14V	-	100	170	μA
Operating supply current (control part only)	I _{OPR}	VCC ≤ 28	-	7	12	mA

Note:

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process

Typical Performance Characteristics

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

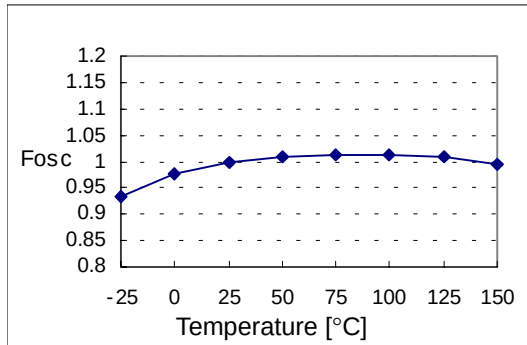


Figure 1. Operating Frequency

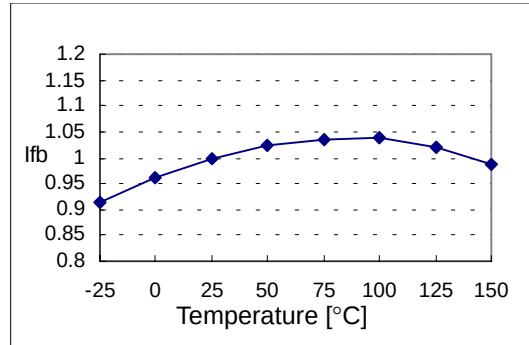


Figure 2. Feedback Source Current

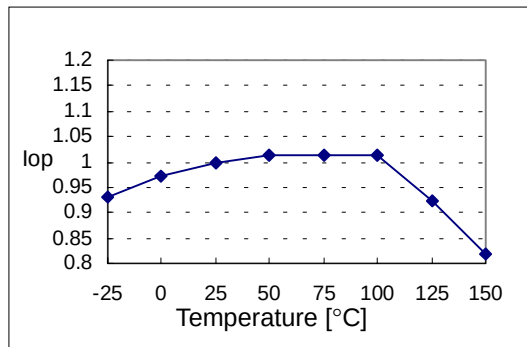


Figure 3. Operating Supply Current

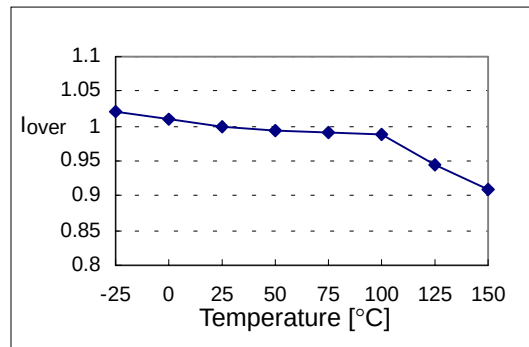


Figure 4. Peak Current Limit

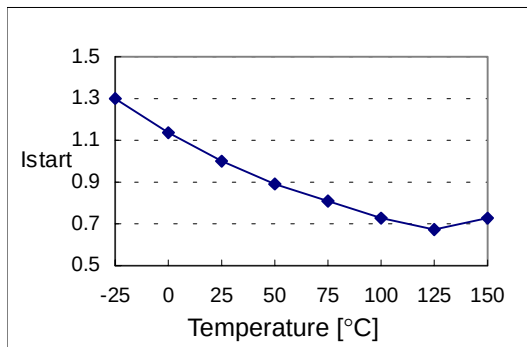


Figure 5. Start up Current

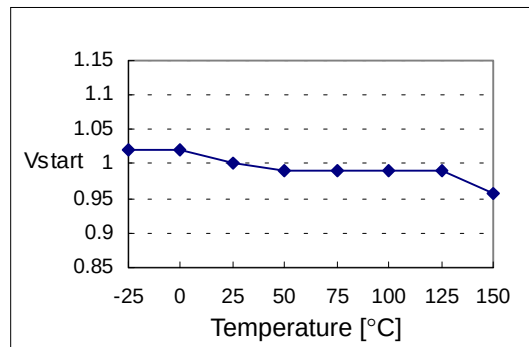


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at Ta=25°C)

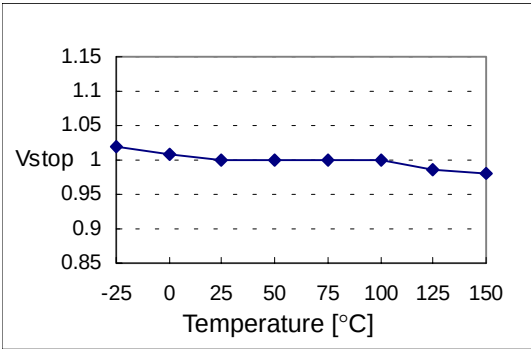


Figure 7. Stop Threshold Voltage

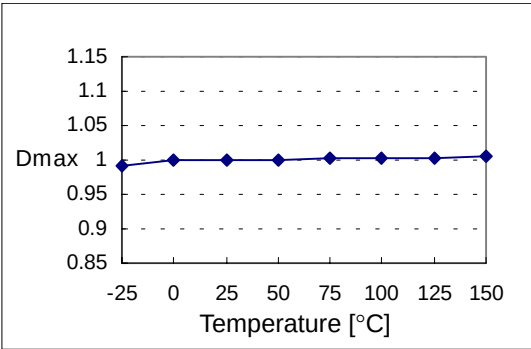


Figure 8. Maximum Duty Cycle

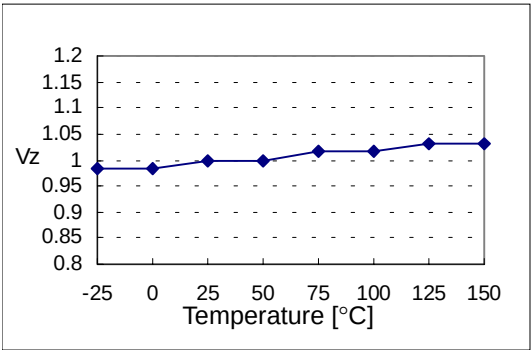


Figure 9. VCC Zener Voltage

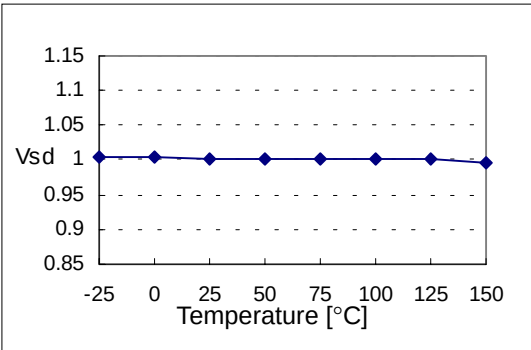


Figure 10. Shutdown Feedback Voltage

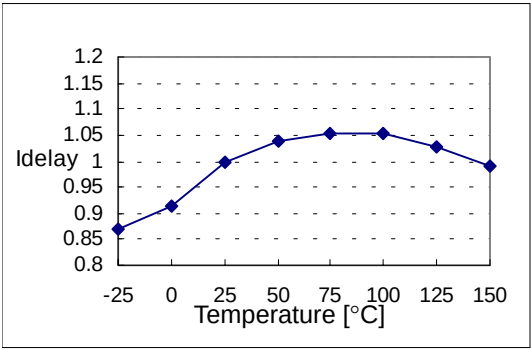


Figure 11. Shutdown Delay Current

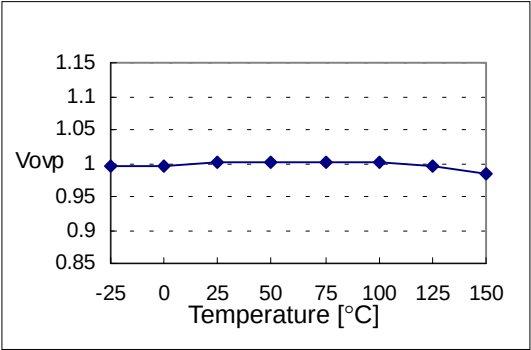


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

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

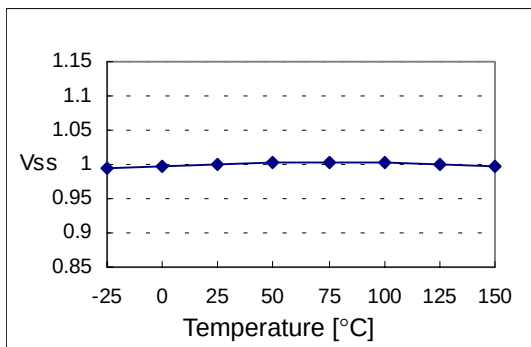


Figure13. Soft Start Voltage

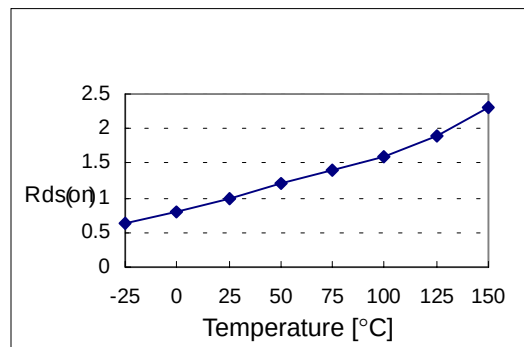
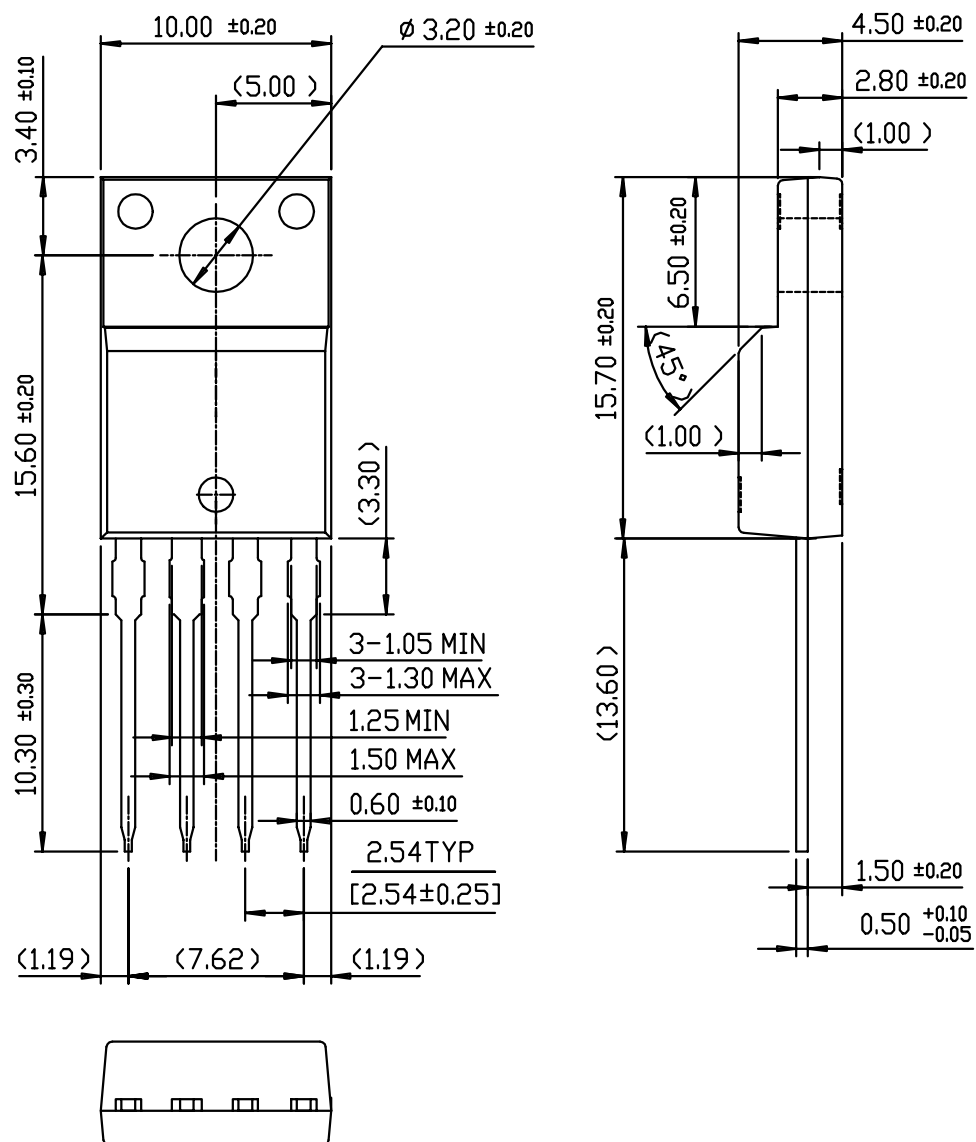


Figure 14. Static Drain-Source on Resistance

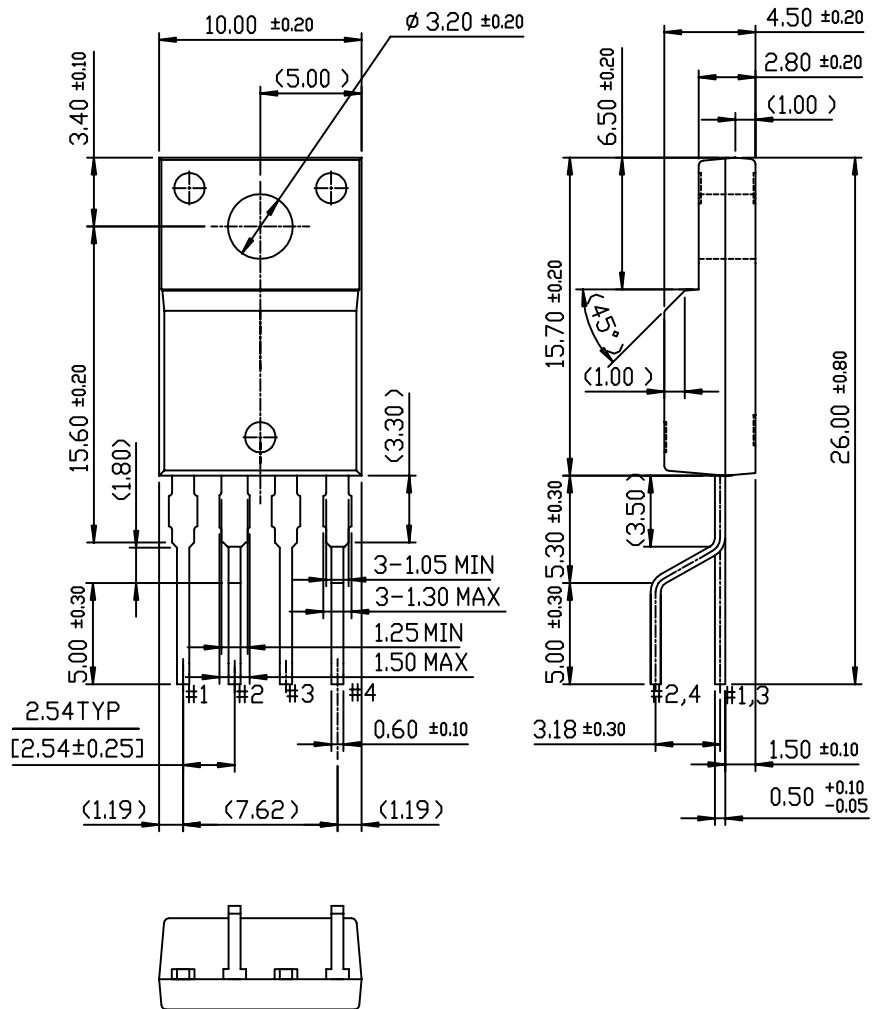
Package Dimensions

TO-220F-4L



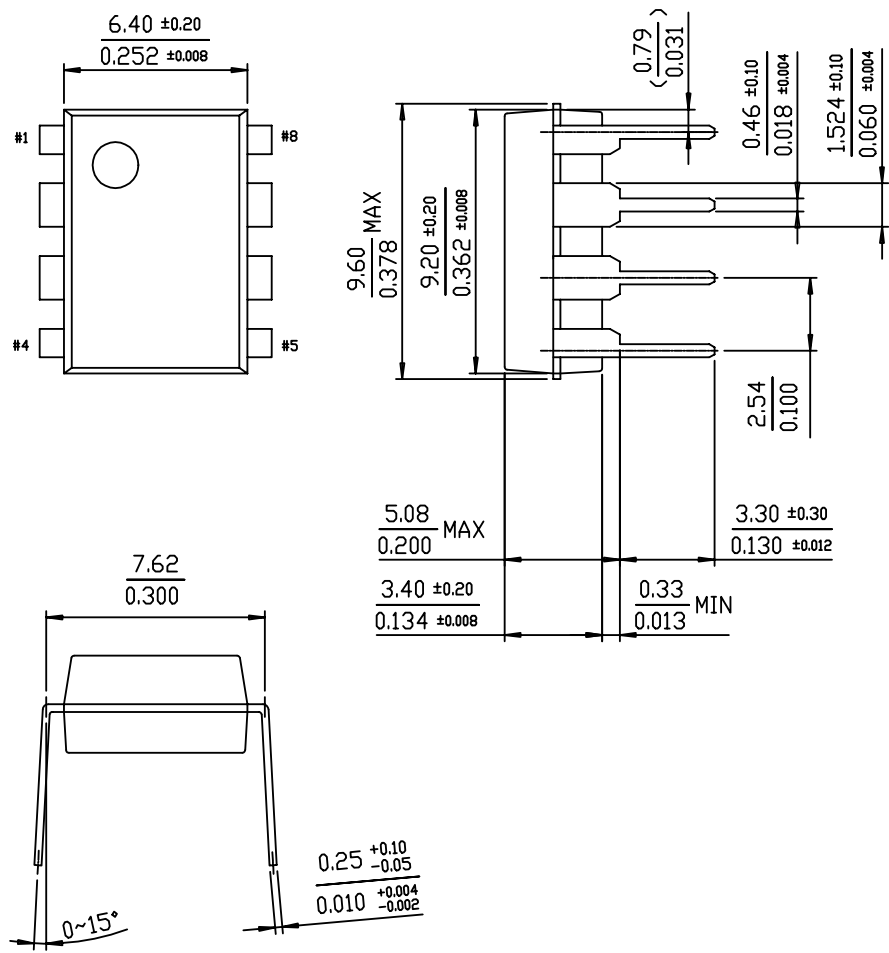
Package Dimensions (Continued)

TO-220F-4L(Forming)



Package Dimensions (Continued)

8-DIP



Technical drawing of a 5-pin D-subminiature connector. The drawing includes three views: a top view, a side view, and a front view.

Top View Dimensions:

- Overall width: 9.88 ± 0.20
- Pin pitch: 1.30 ± 0.10
- Pin diameter: $\varnothing 3.60 \pm 0.10$
- Central feature diameter: $\varnothing 3.60 \pm 0.10$
- Pin 1 diameter: $\varnothing 0.93$
- Pin 2 diameter: 1.10 TYP
- Pin 3 diameter: 0.80 TYP
- Pin 4 diameter: 0.80 TYP
- Pin 5 diameter: 0.80 TYP
- Pin 1 length: $2-1.30 \text{ MAX}$ ($\#1, \#5$)
- Pin 2 length: $3-1.00 \text{ MAX}$ ($\#2, \#3, \#4$)
- Pin 3 length: $5-0.60 \pm 0.10$
- Pin 4 length: $3-1.50 \text{ TYP}$ ($[3-1.50 \pm 0.20]$)
- Pin 5 length: $3-1.50 \text{ TYP}$ ($[3-1.50 \pm 0.20]$)
- Pin 1 angle: 40°
- Pin 1 position: (0.93)
- Pin 2 position: 1.10 TYP
- Pin 3 position: 0.80 TYP
- Pin 4 position: 0.80 TYP
- Pin 5 position: 0.80 TYP
- Pin 1 diameter: $\varnothing 0.93$
- Pin 2 diameter: 1.10 TYP
- Pin 3 diameter: 0.80 TYP
- Pin 4 diameter: 0.80 TYP
- Pin 5 diameter: 0.80 TYP
- Pin 1 length: $2-1.30 \text{ MAX}$ ($\#1, \#5$)
- Pin 2 length: $3-1.00 \text{ MAX}$ ($\#2, \#3, \#4$)
- Pin 3 length: $5-0.60 \pm 0.10$
- Pin 4 length: $3-1.50 \text{ TYP}$ ($[3-1.50 \pm 0.20]$)
- Pin 5 length: $3-1.50 \text{ TYP}$ ($[3-1.50 \pm 0.20]$)
- Pin 1 angle: 40°
- Pin 1 position: (0.93)
- Pin 2 position: 1.10 TYP
- Pin 3 position: 0.80 TYP
- Pin 4 position: 0.80 TYP
- Pin 5 position: 0.80 TYP

Side View Dimensions:

- Overall height: 18.70 ± 0.20
- Pin 1 height: 2.80 ± 0.10
- Pin 2 height: 4.60 ± 0.20
- Pin 3 height: 3.70
- Pin 4 height: 3.00
- Pin 5 height: 3.00
- Pin 1 diameter: $\varnothing 3.60 \pm 0.10$
- Pin 2 diameter: $\varnothing 3.60 \pm 0.10$
- Pin 3 diameter: $\varnothing 3.60 \pm 0.10$
- Pin 4 diameter: $\varnothing 3.60 \pm 0.10$
- Pin 5 diameter: $\varnothing 3.60 \pm 0.10$

Front View Dimensions:

- Overall width: 10.00 ± 0.20
- Pin 1 width: $0.50^{+0.10}_{-0.05}$
- Pin 2 width: 2.40 ± 0.20
- Pin 3 width: 2.40 ± 0.20
- Pin 4 width: 2.40 ± 0.20
- Pin 5 width: 2.40 ± 0.20

[illegible]

Ordering Information

Product Number	Package	Marking Code	BV _{DSS}	F _{OSC}	R _{DS(on)}
KA5H0265RC-TU	TO-220-5L	5H0265RC	650V	100kHz	5Ω
KA5H0265RC-YDTU	TO-220-5L(Forming)				
KA5M0265R-TU	TO-220F-4L	5M0265R	650V	67kHz	5Ω
KA5M0265R-YDTU	TO-220F-4L(Forming)				
KA5L0265R-TU	TO-220F-4L	5L0265R	650V	50kHz	5Ω
KA5L0265R-YDTU	TO-220F-4L(Forming)				

Product Number	Package	Marking Code	BV _{DSS}	F _{OSC}	R _{DS(on)}
KA5H0280R-TU	TO-220F-4L	5H0280R	800V	100kHz	5.6Ω
KA5H0280R-YDTU	TO-220F-4L(Forming)				
KA5M0280R-TU	TO-220F-4L	5M0280R	800V	67kHz	5.6Ω
KA5M0280R-YDTU	TO-220F-4L(Forming)				
Product Number	Package	Marking Code	BV _{DSS}	F _{OSC}	R _{DS(on)}
KA5H02659RN	8-DIP	5H02659R	650V	100kHz	5Ω
KA5M02659RN	8-DIP	5M02659R	650V	67kHz	5Ω

TU : Non Forming Type

YDTU : Forming Type

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.