

KA5Q1265RFH/KA5Q12656RTH

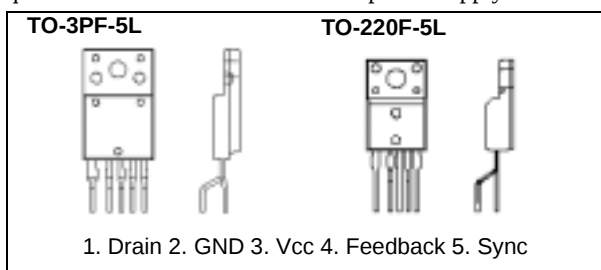
Fairchild Power Switch(FPS)

Features

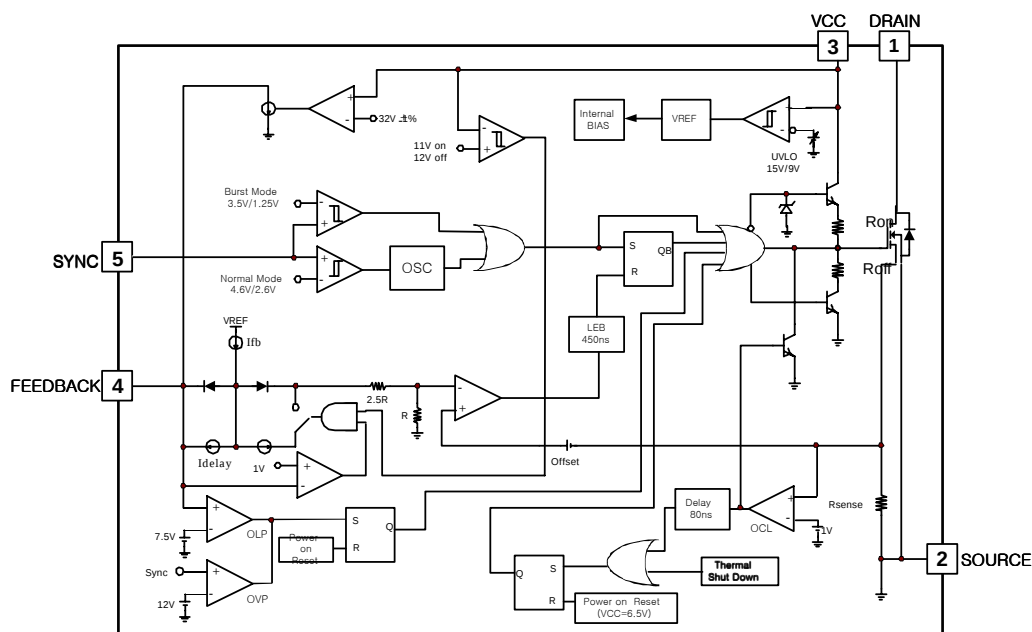
- Quasi Resonant Converter Controller
- Internal Burst Mode Controller for Stand-by Mode
- Pulse by Pulse Current Limiting
- Over Current Latch Protection
- Over Voltage Protection (Vsync: Min. 11V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart 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) consists of a high voltage power SenseFET and a current mode PWM IC. The integrated PWM controller includes the fixed oscillator, the under voltage lock out, the leading edge blanking, the optimized gate turn-on/turn-off driver, the thermal shut down protection, the over voltage protection, and the temperature compensated precision current sources for loop compensation and fault protection circuitry. Compared to a discrete MOSFET and a controller or a RCC switching converter solutions, a Fairchild Power Switch(FPS) can reduce the total number of components, design size, and weight, so it will improve efficiency, productivity, and system reliability. It has a basic platform well suited for cost-effective design in a quasi-resonant converter as a C-TV power supply.



Internal Block Diagram



Rev.1.0.1

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Parameter	Symbol	Value	Unit
KA5Q1265RFH			
Drain-source Voltage	V _{DSS}	650	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽²⁾	I _{DM}	36	ADC
Continuous Drain Current (T _c = 25°C)	I _D	8.3	ADC
Continuous Drain Current (T _C =100°C)	I _D	5.3	ADC
Single Pulsed Avalanche Energy ⁽³⁾	E _{AS}	950	mJ
Supply Voltage	V _{CC}	40	V
Analog Input Voltage Range	V _{sync}	-0.3 to 13V	V
	V _{FB}	-0.3 to V _{CC}	V
Total Power Dissipation	P _D	95	W
Operating Junction Temperature	T _J	+150	°C
Operating Ambient Temperature	T _A	-25 to +85	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C
Thermal Resistance	R _{thjc}	1.31	°C/W
ESD Capability, HBM Model (All pins)	-	2.0	kV
ESD Capability, Machine Model (All pins)	-	300	V
KA5Q12656RTH			
Drain-source Voltage	V _{DSS}	650	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽²⁾	I _{DM}	21	ADC
Continuous Drain Current (T _c = 25°C)	I _D	5.3	ADC
Continuous Drain Current (T _C =100°C)	I _D	3.4	ADC
Single Pulsed Avalanche Energy ⁽³⁾	E _{AS}	950	mJ
Supply Voltage	V _{CC}	40	V
Analog Input Voltage Range	V _{sync}	-0.3 to 13V	V
	V _{FB}	-0.3 to V _{CC}	V
Total Power Dissipation	P _D	50	W
Operating Junction Temperature	T _J	+150	°C
Operating Ambient Temperature	T _A	-25 to +85	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C
Thermal Resistance	R _{thjc}	2.5	°C/W
ESD Capability, HBM Model (All pins)	-	2.0	kV
ESD Capability, Machine Model (All pins)	-	300	V

Notes:

1. T_J = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 7mH, V_{DD} = 50V, R_G = 25Ω, starting T_J = 25°C
4. L = 13uH, starting T_J = 25°C

Electrical Characteristics (SFET Part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
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	-	-	200	μA
		V _{DS} = 0.8*Max., Rating V _{GS} = 0V, T _C = 85°C	-	-	300	μA
Static Drain-source on Resistance ^(Note)	R _{DS(ON)}	V _{GS} =10V, I _D =6A	-	0.75	0.9	Ω
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f = 1MHz	-	2400	3120	pF
Output Capacitance	C _{oss}		-	175	227	
Reverse Transfer Capacitance	C _{rss}		-	32	41	
Turn on Delay Time	t _{d(on)}	V _{DD} =0.5BV _{DSS} , I _D =12.0A (MOSFET switching time are essentially independent of operating temperature)	-	42	94	nS
Rise Time	t _r		-	106	222	
Turn Off Delay Time	t _{d(off)}		-	330	670	
Fall Time	t _f		-	110	230	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =12.0A, V _{DS} =0.5BV _{DSS} (MOSFET Switching time are Essentially independent of Operating temperature)	-	98	127	nC
Gate-Source Charge	Q _{gs}		-	13	17	
Gate-Drain (Miller) Charge	Q _{gd}		-	40	52	

Note:

1. Pulse test : Pulse width ≤ 300μs, duty ≤ 2%

Electrical Characteristics (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	V _{START}	V _{FB} = GND	14	15	16	V
Stop Threshold Voltage	V _{STOP}	V _{FB} = GND	8	9	10	V
SENSEFET SECTION						
Drain To PKG Breakdown Voltage	BV _{pkg}	60HZ AC, Ta = 25°C	3500	-	-	V
Drain To Source Breakdown Voltage	BV _{dss}	Ta = 25°C	650	-	-	V
Drain To Source Leakage Current	I _{dss}	V _{drain} = 400V, Ta = 25°C	-	-	200	uA
OSCILLATOR SECTION						
Initial Frequency	F _{OSC}	-	18	20	22	kHz
Voltage Stability	F _{STABLE}	12V ≤ V _{cc} ≤ 23V	0	1	3	%
Temperature Stability (Note2)	ΔF _{OSC}	-25°C ≤ Ta ≤ 85°C	0	±5	±10	%
Maximum Duty Cycle	D _{MAX}	-	92	95	98	%
Minimum Duty Cycle	D _{MIN}	-	-	-	0	%
FEEDBACK SECTION						
Feedback Source Current	I _{FB}	V _{FB} = GND	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V _{SD}	V _{fb} ≥ 6.9V	6.9	7.5	8.1	V
Shutdown Delay Current	I _{DELAY}	V _{FB} = 5V	4	5	6	μA
PROTECTION SECTION						
Over Voltage Protection	V _{OVP}	V _{sync} ≥ 11V	11	12	13	V
Over Current Latch Voltage (Note2)	V _{OCL}	-	0.9	1.0	1.1	V
Thermal Shutdown Temp.	T _{SD}	-	140	160	-	°C

Note:

1. These parameters is the current flowing in the Control IC.
2. These parameters, although guaranteed, are tested in EDS(wafer test) process.
3. These parameters indicate Inductor Current.

Electrical Characteristics (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Sync SECTION						
Normal Sync High Threshold Voltage	VNSH	Vcc = 16V, Vfb = 5V	4.0	4.6	5.2	V
Normal Sync Low Threshold Voltage	VNSL	Vcc = 16V, Vfb = 5V	2.3	2.6	2.9	V
Burst Sync High Threshold Voltage	VBSH	Vcc = 10.5V, Vfb = 0V	3.2	3.6	4.0	V
Burst Sync Low Threshold Voltage	VBSL	Vcc = 10.5V, Vfb = 0V	1.1	1.3	1.5	V
BURST MODE SECTION						
Burst mode Low Threshold Voltage	VBURL	Vfb = 0V	10.4	11.0	11.6	V
Burst mode High Threshold Voltage	VBURH	Vfb = 0V	11.4	12.0	12.6	V
Burst mode Enable Feedback Voltage	VBEN	Vcc = 10.5V	0.7	1.0	1.3	V
Burst mode Peak Current Limit	IBU_PK	Vcc = 10.5V	0.65	0.85	1.1	A
PRIMARY SIDE REGULATION SECTION						
Primary Regulation Threshold Voltage	VPR	I _{fb} = 700uA, Vfb = 4V	32.0	32.5	33.0	V
Primary Regulation Transconductance	GPR	-	2.0	2.6	-	mA/V
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit(Note3)	IPK	KA5Q1265RFH	7.04	8.0	8.96	A
		KA5Q12656RTH	5.28	6.0	6.72	A
TOTAL DEVICE SECTION						
Start Up Current	I _{START}	Vfb = GND, V _{CC} = 14V	-	0.1	0.2	mA
Operating Supply Current (Note1)	I _{OP}	Vfb = GND, V _{CC} = 16V	-	10	18	mA
	I _{OP(MIN)}	Vfb = GND, V _{CC} = 10V				
	I _{OP(MAX)}	Vfb = GND, V _{CC} = 28V				

Note:

1. These parameters is the current flowing in the Control IC.
2. These parameters, although guaranteed, are tested in EDS(wafer test) process.
3. These parameters indicate Inductor Current.

Typical Performance Characteristics

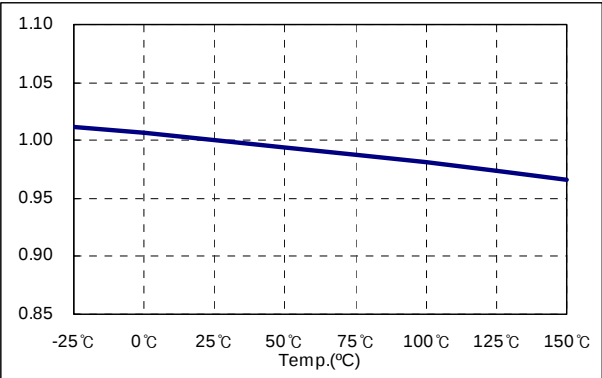


Figure 1. Start Voltage

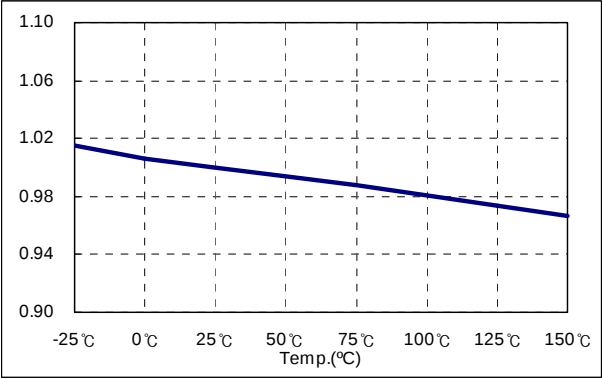


Figure 2. Stop Voltage

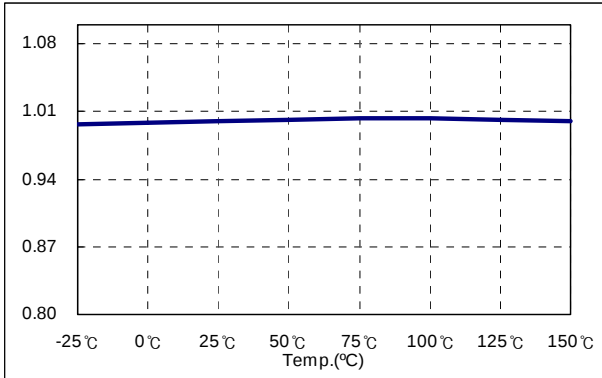


Figure 3. Stand by Current

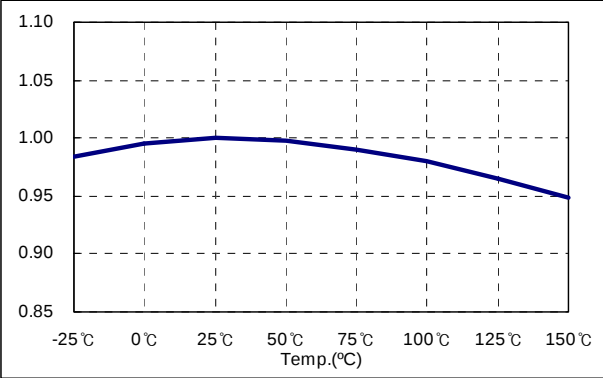


Figure 4. Operating Current

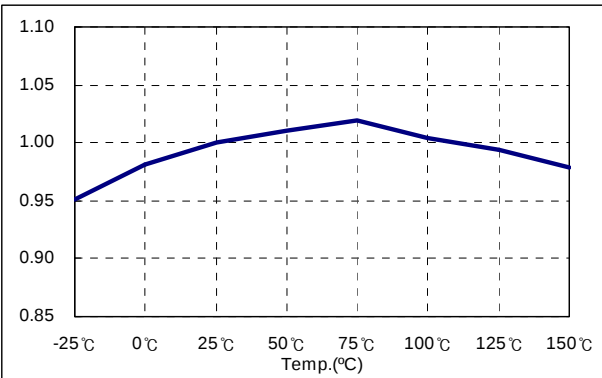


Figure 5. Initial Frequency

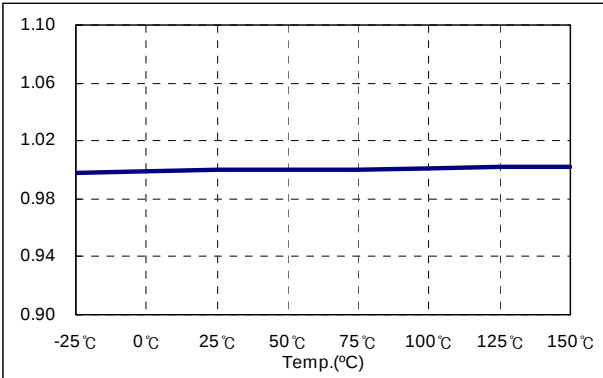
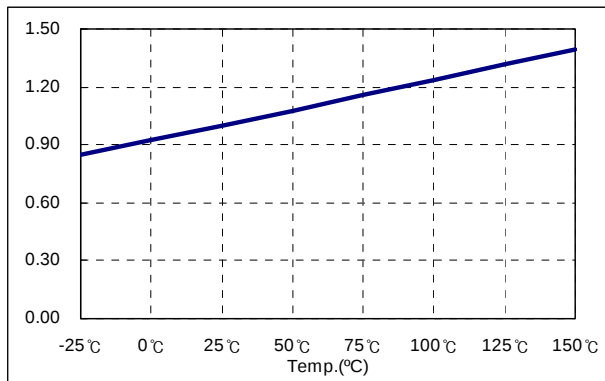
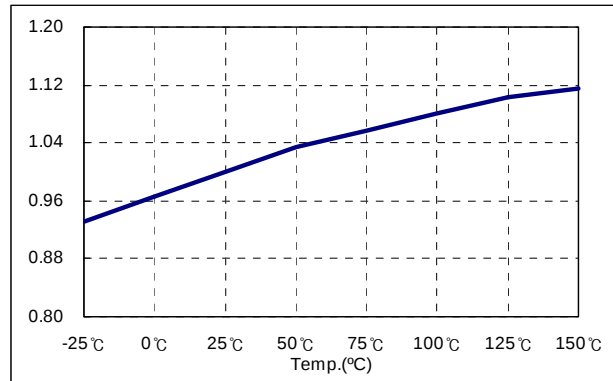
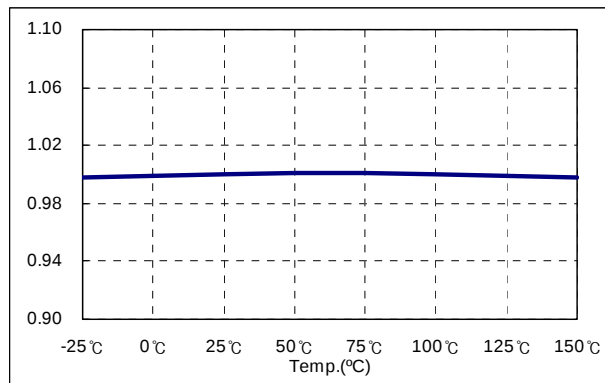
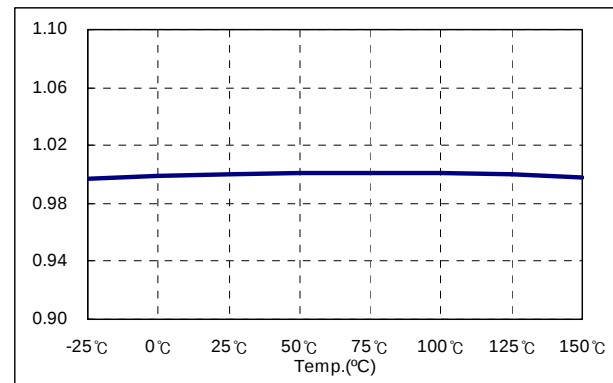
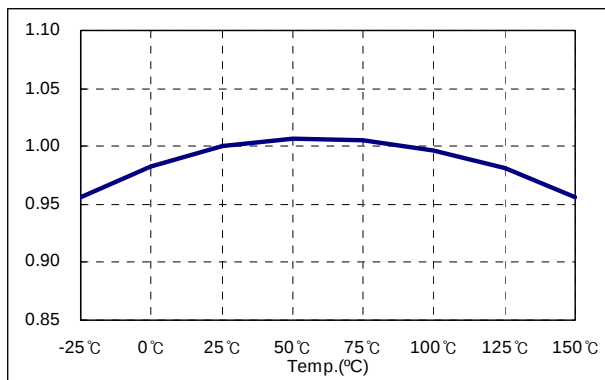
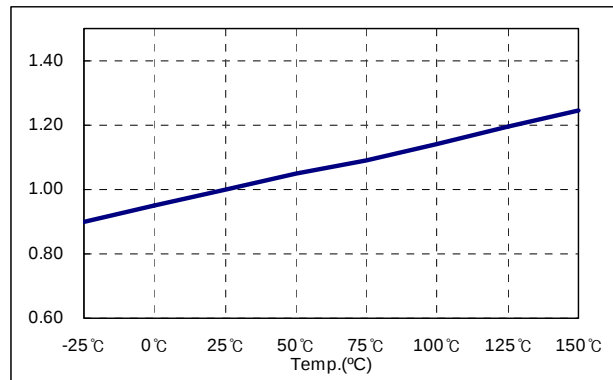


Figure 6. Maximum Duty

Typical Performance Characteristics (Continued)**Figure 7. Feedback Offset Voltage****Figure 8. Feedback Source Current****Figure 9. Over Voltage Protection****Figure 10. Shutdown Feedback Voltage****Figure 11. ShutDown Delay Current****Figure 12. Burst Mode Enable Feedback Voltage**

Typical Performance Characteristics (Continued)

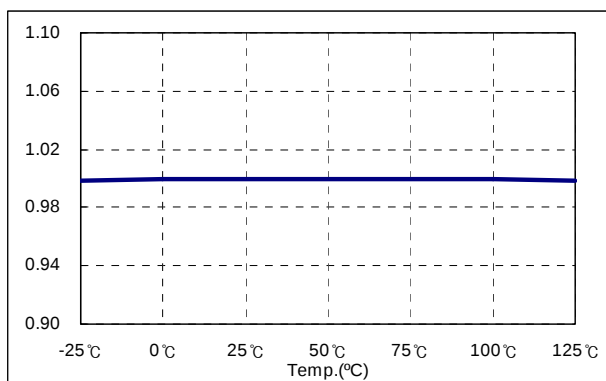


Figure 13. Burst Mode Low Threshold Voltage

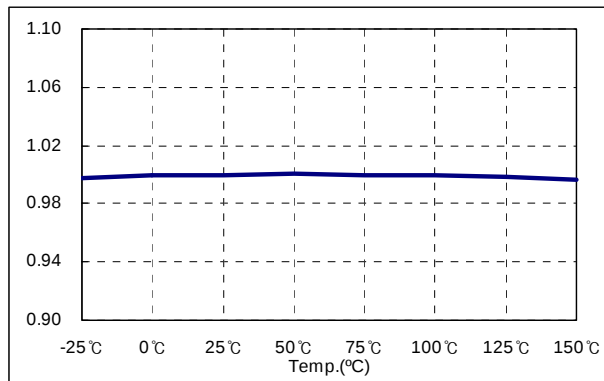


Figure 14. Burst Mode High Threshold Voltage

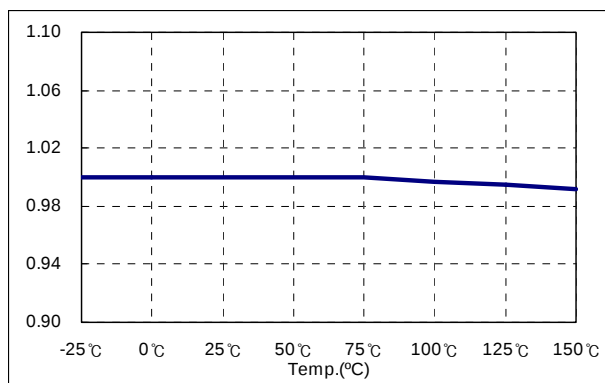


Figure 15. Burst Mode Sync. High Threshold Voltage

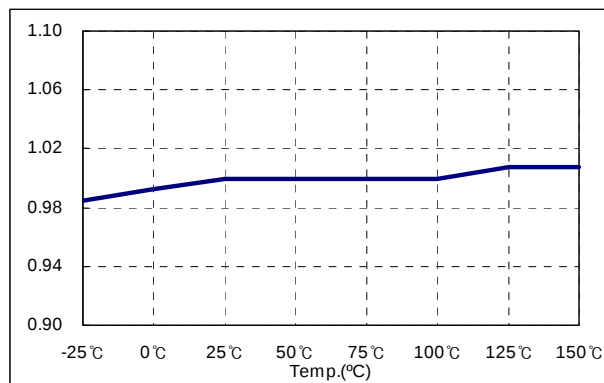


Figure 16. Burst Mode Sync. Low Threshold Voltage

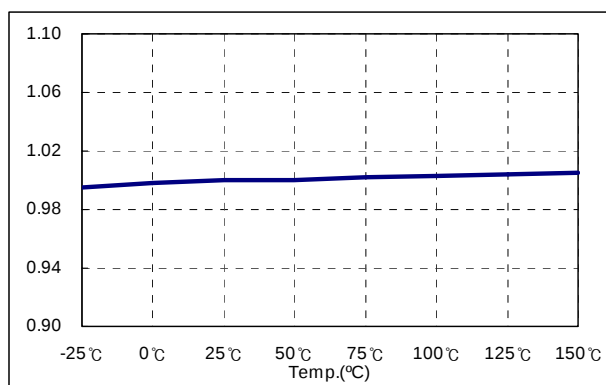


Figure 17. Primary Voltage

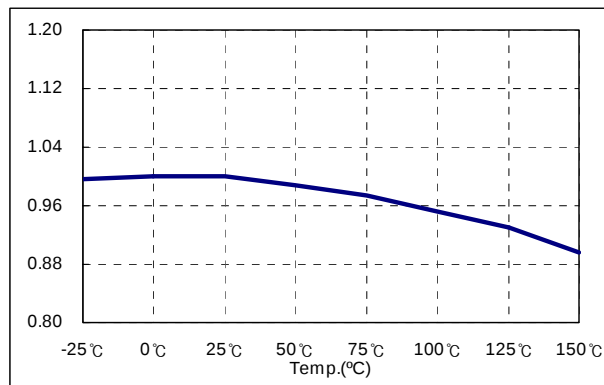
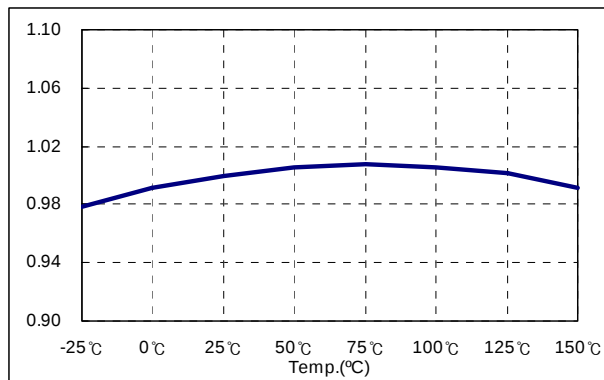
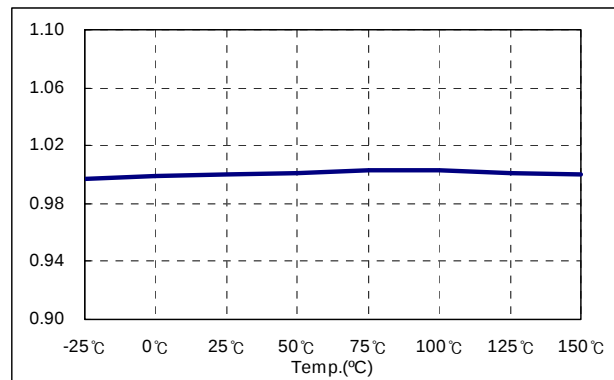
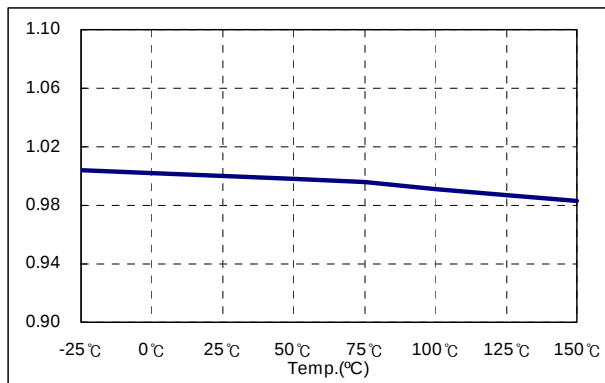
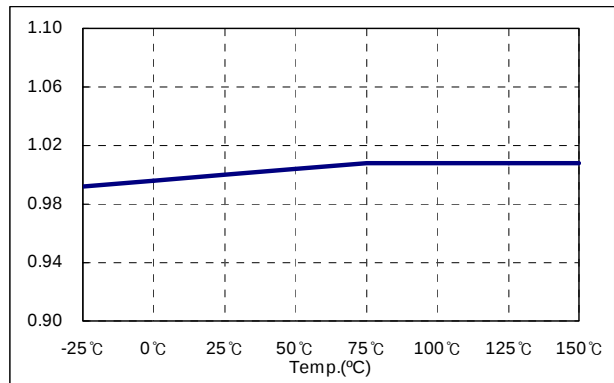
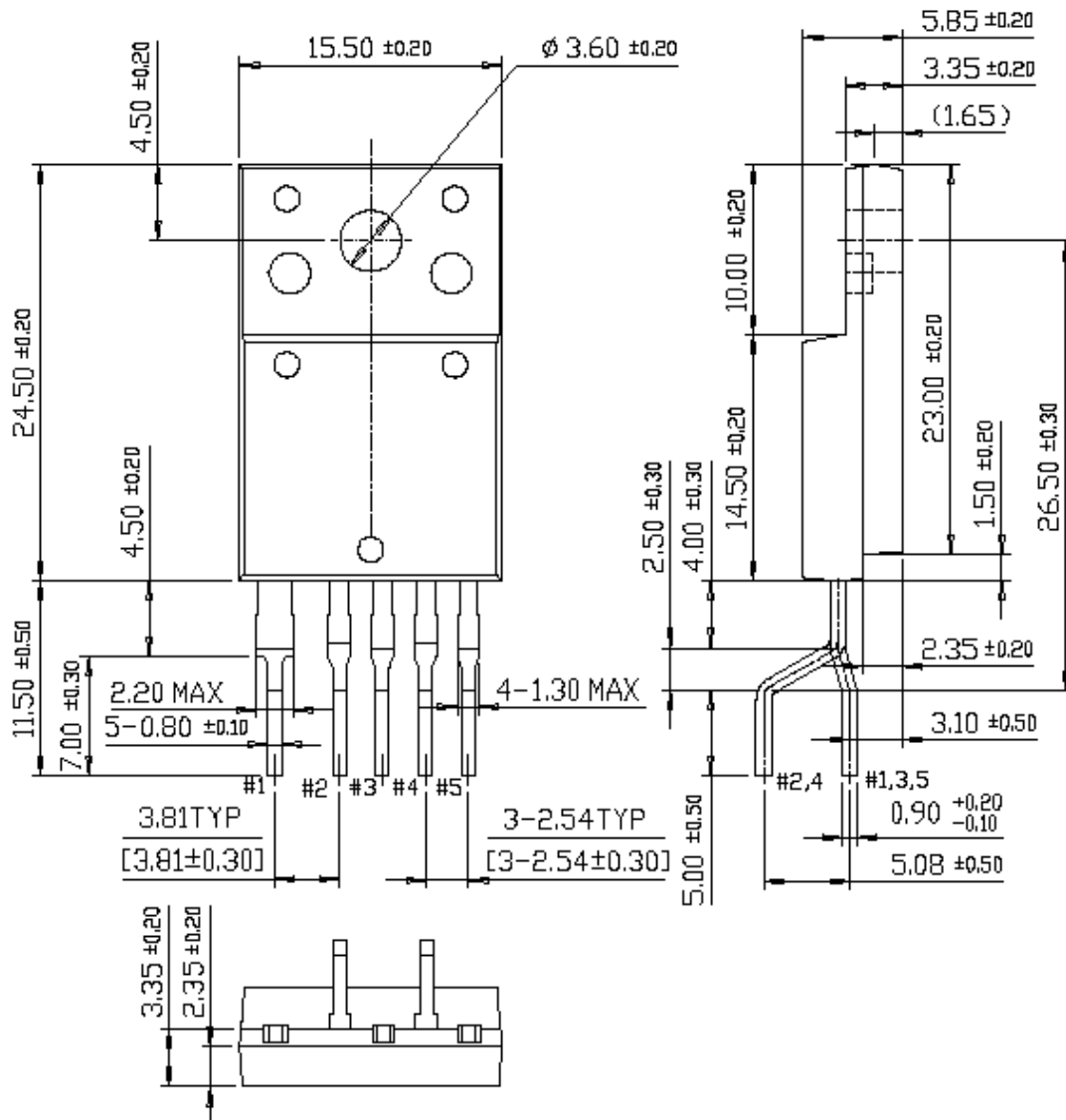


Figure 18. Primary Mode Gain

Typical Performance Characteristics (Continued)**Figure 19. Peak Current Limit****Figure 20. Burst Mode Peak Current Limit****Figure 21. Normal Mode Sync. High Threshold Voltage****Figure 21. Normal Mode Sync. Low Threshold Voltage**

Package Dimensions (Continued)

TO-3PF-5L(Forming)



Ordering Information

Product Number	Package	Operating Temp.
KA5Q1265RFHYDTU	TO-3PF-5L(Forming)	-25°C to +85°C
KA5Q12656RTHYDTU	TO-220F-5L(Forming)	-25°C to +85°C

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
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.