



# KA5M0765RQC

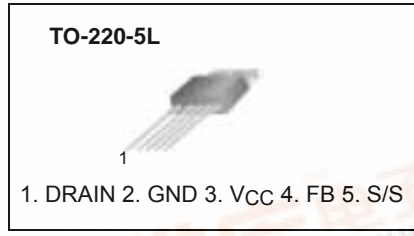
## Fairchild Power Switch(FPS)

### Features

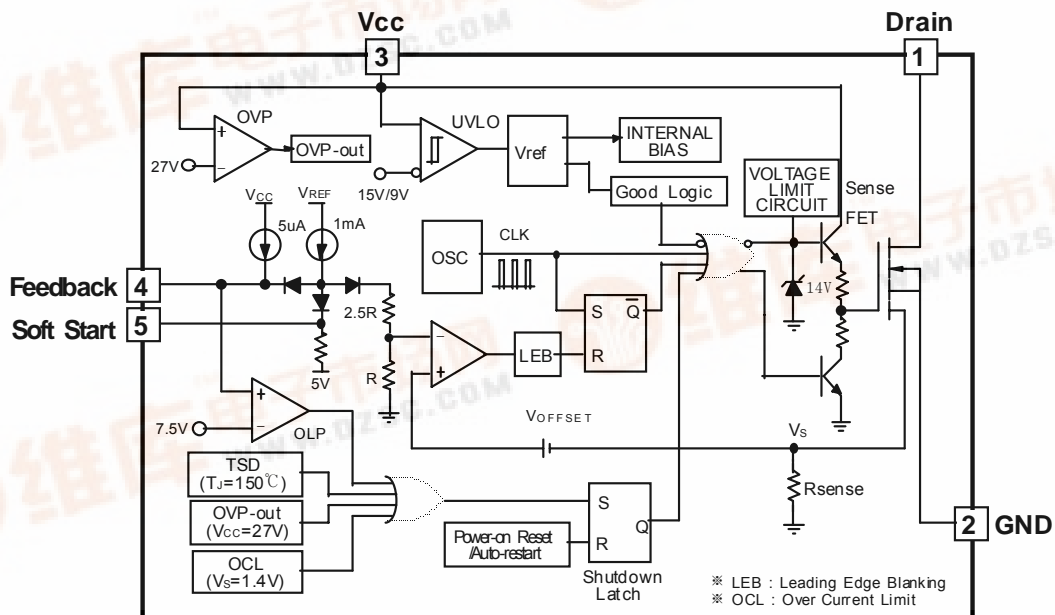
- Precision Fixed Operating Frequency (70kHz)
- Low Start-up Current (Typ. 100µA)
- Pulse by Pulse Current Limiting
- Over Load Protection
- Over Current Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart 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 frequency oscillator, under voltage lock-out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shutdown protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry. compared to discrete MOSFET and PWM controller or RCC 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.



### Internal Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Gate Voltage (RGS=1MΩ)	VDGR	650	V
Gate-Source (GND) Voltage	VGS	±30	V
Drain Current Pulsed <sup>(2)</sup>	IDM	28.0	ADC
Single Pulsed Avalanche Energy <sup>(3)</sup>	EAS	570	mJ
Continuous Drain Current (TC=25°C)	ID	7.0	ADC
Continuous Drain Current (TC=100°C)	ID	5.6	ADC
Maximum Supply Voltage	VCC,MAX	30	V
Input Voltage Range	VFB	-0.3 to VSD	V
Total Power Dissipation	PD	140	W
	Darting	1.11	W/°C
Operating Ambient Temperature	TA	-25 to +85	°C
Storage Temperature	TSTG	-55 to +150	°C

**Note:**

1. T<sub>j</sub> = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 24mH, starting T<sub>j</sub> = 25°C

## Electrical Characteristics (SFET Part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BVDSS	VGS=0V, ID=50μA	650	-	-	V
Zero Gate Voltage Drain Current	IDSS	VDS=Max., Rating, VGS=0V	-	-	50	μA
		VDS=0.8Max., Rating, VGS=0V, TC=125°C	-	-	200	μA
Static Drain-Source on Resistance <sup>(Note)</sup>	RDS(ON)	VGS=10V, ID=3.5A	-	1.25	1.6	Ω
Forward Transconductance <sup>(Note)</sup>	gfs	VDS=50V, ID=3.5A	3.0	-	-	S
Input Capacitance	Ciss	VGS=0V, VDS=25V, f=1MHz	-	1120	-	pF
Output Capacitance	Coss		-	125	-	
Reverse Transfer Capacitance	Crss		-	25	-	
Turn on Delay Time	td(on)	VDD=0.5BVDSS, ID=7.0A (MOSFET switching time are essentially independent of operating temperature)	-	25	60	nS
Rise Time	tr		-	70	150	
Turn Off Delay Time	td(off)		-	105	220	
Fall Time	tf		-	65	140	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	VGS=10V, ID=7.0A, VDS=0.8BVDSS	-	38	50	nC
Gate-Source Charge	Qgs		-	6.5	-	
Gate-Drain (Miller) Charge	Qgd		-	18	-	

### Note:

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

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

**Electrical Characteristics (Control Part)** (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>UVLO SECTION</b>						
Start Threshold Voltage	V <sub>START</sub>	-	14	15	16	V
Stop Threshold Voltage	V <sub>STOP</sub>	After turn on	8.4	9	9.6	V
<b>OSCILLATOR SECTION</b>						
Initial Accuracy	F <sub>OSC</sub>	Ta=25°C	61	67	73	kHz
Frequency Change With Temperature <sup>(2)</sup>	ΔF/ΔT	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	D <sub>max</sub>	-	74	77	80	%
<b>FEEDBACK SECTION</b>						
Feedback Source Current	I <sub>FB</sub>	Ta=25°C, 0V ≤ V <sub>fb</sub> ≤ 3V	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V <sub>SD</sub>	V <sub>fb</sub> ≥ 6.5V	6.9	7.5	8.1	V
Shutdown Delay Current	I <sub>delay</sub>	Ta=25°C, 5V ≤ V <sub>fb</sub> ≤ V <sub>SD</sub>	4	5	6	μA
<b>SOFT START SECTION</b>						
Soft Start Voltage	V <sub>SS</sub>	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	1.0	1.2	mA
<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	4.40	5.00	5.60	A
<b>PROTECTION SECTION</b>						
Thermal Shutdown Temperature (T <sub>j</sub> ) <sup>(1)</sup>	T <sub>SD</sub>	-	140	160	-	°C
Over Voltage Protection	V <sub>OV</sub> P	-	25	27	29	V
<b>TOTAL DEVICE SECTION</b>						
Start Up Current	I <sub>START</sub>	V <sub>CC</sub> =14V	-	0.1	0.17	mA
Operating Supply Current (Control Part Only)	I <sub>OP</sub>	V <sub>CC</sub> ≤ 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 (SFET part)

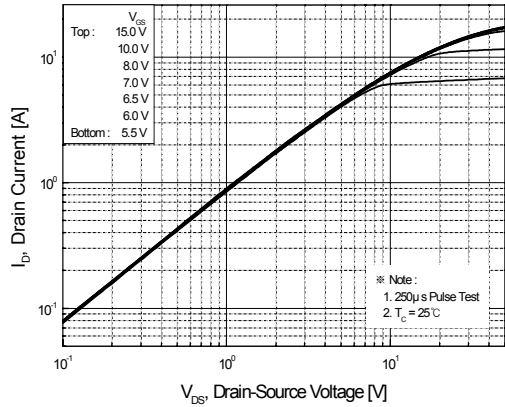


Figure 1. Output Characteristics

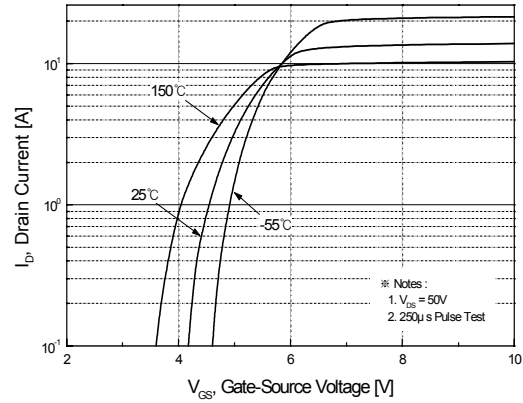


Figure 2. Transfer Characteristics

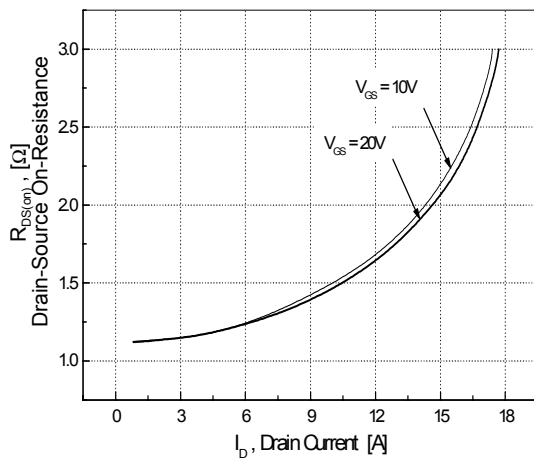


Figure 3. On-Resistance vs. Drain Current

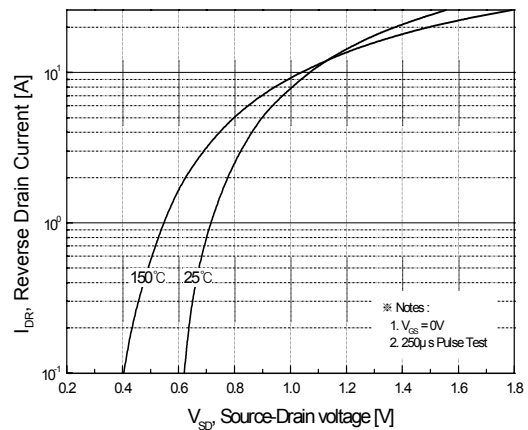


Figure 4. Source-Drain Diode Forward Voltage

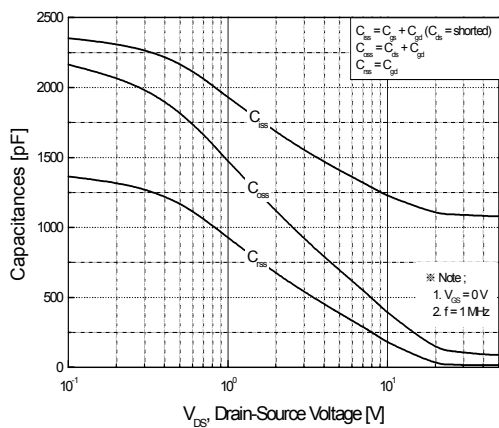


Figure 5. Capacitance vs. Drain-Source Voltage

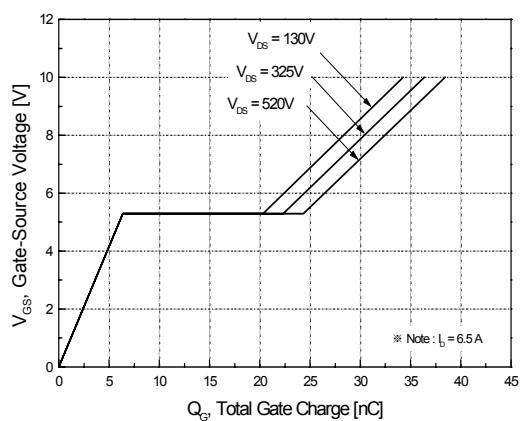


Figure 6. Gate Charge vs. Gate-Source Voltage

Typical Performance Characteristics (SFET part) (Continued)

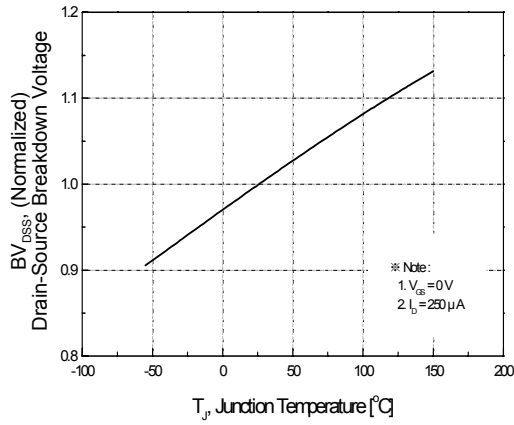


Figure 7. Breakdown Voltage vs. Temperature

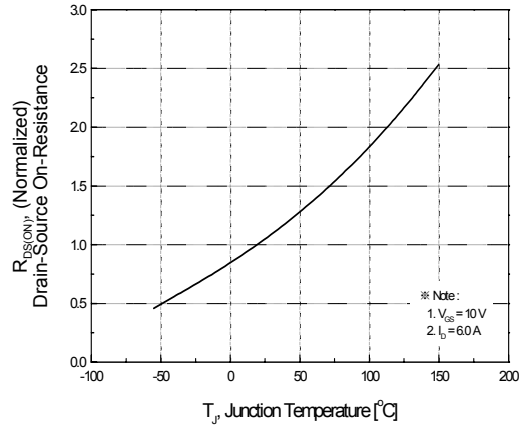


Figure 8. On-Resistance vs. Temperature

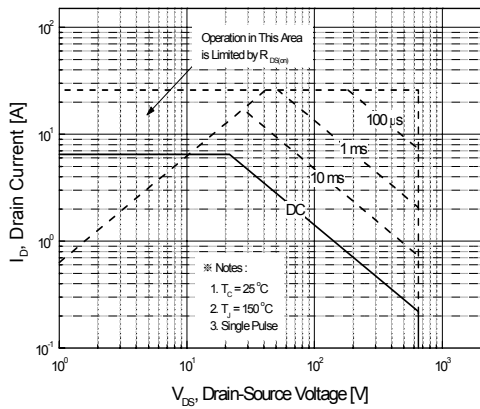


Figure 9. Max. Safe Operating Area

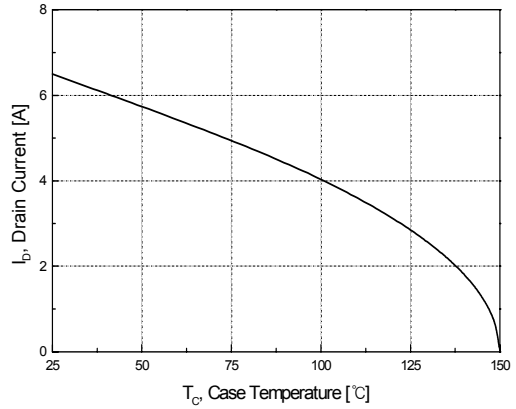


Figure 10. Max. Drain Current vs. Case Temperature

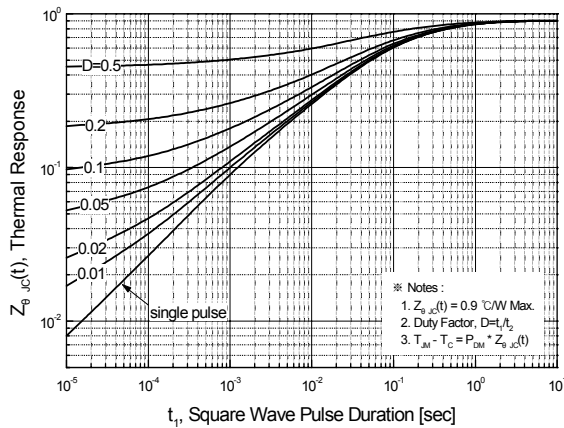


Figure 11. Thermal Response

## Typical Performance Characteristics (Control part) (Continued)

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

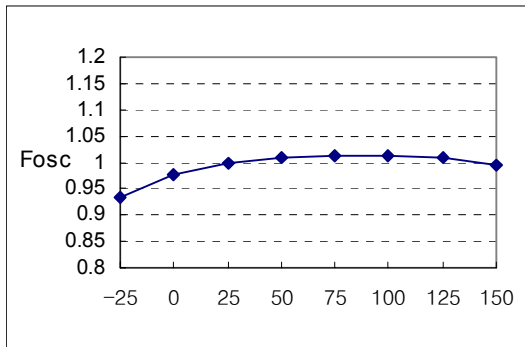


Figure 1. Operating Frequency

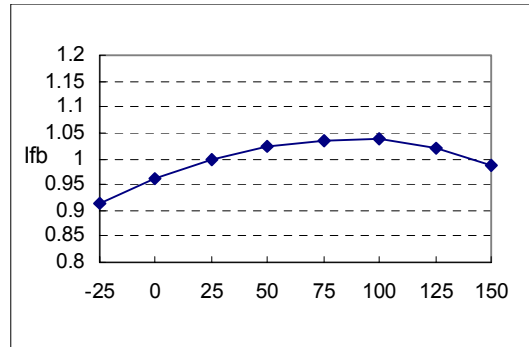


Figure 2. Feedback Source Current

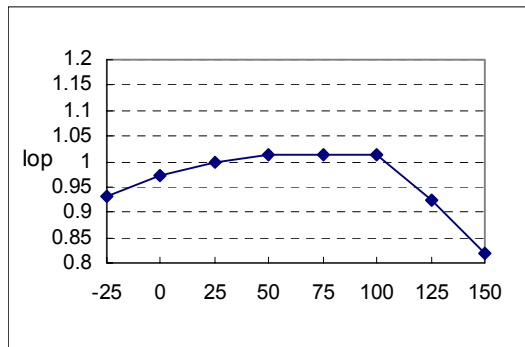


Figure 3. Operating Supply Current

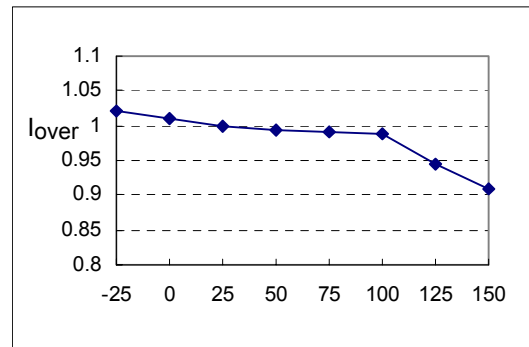


Figure 4. Peak Current Limit

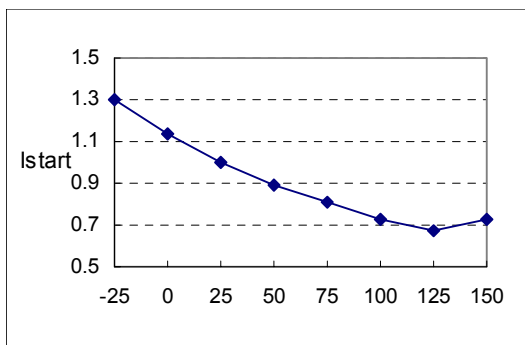


Figure 5. Start up Current

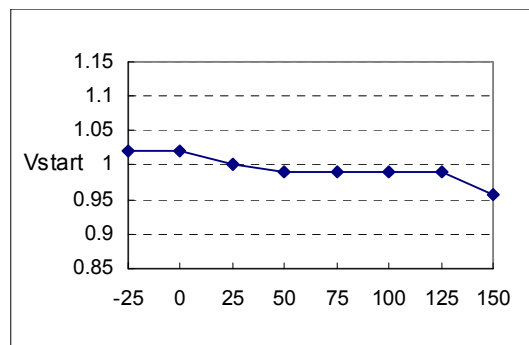
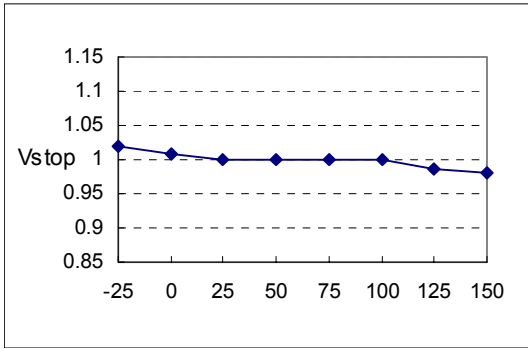


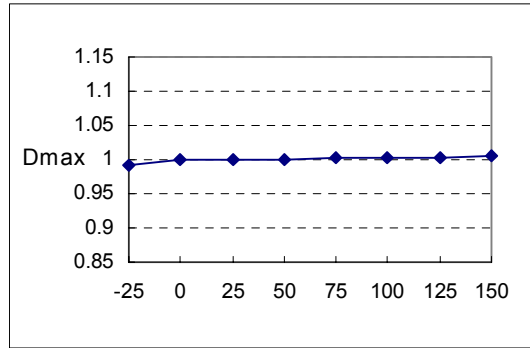
Figure 6. Start Threshold Voltage

**Typical Performance Characteristics** (Continued)

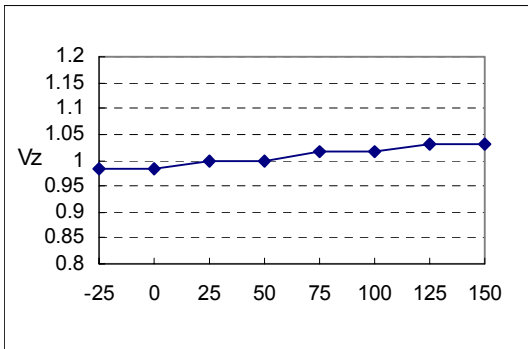
(These characteristic graphs are normalized at Ta=25°C)



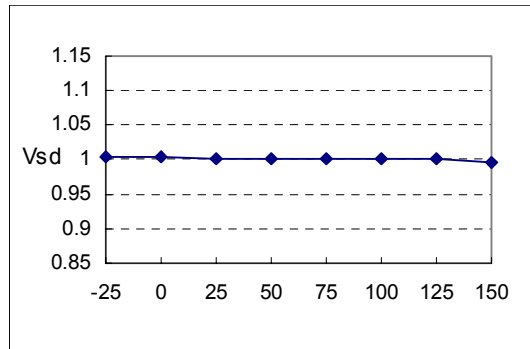
**Figure 7. Stop Threshold Voltage**



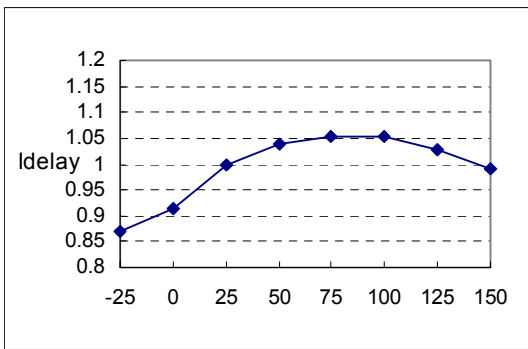
**Figure 8. Maximum Duty Cycle**



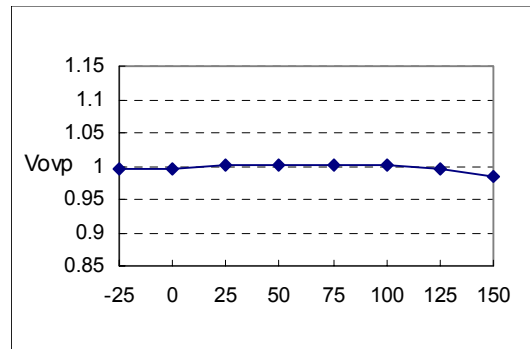
**Figure 9. VCC Zener Voltage**



**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 Ta=25°C)

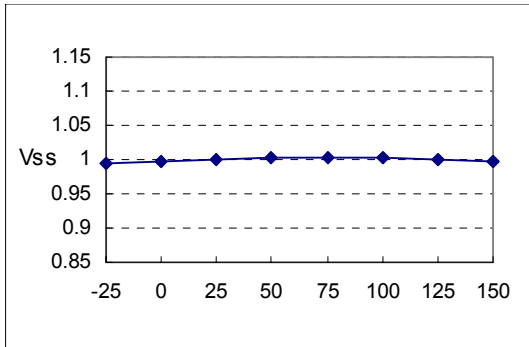


Figure 13. Soft Start Voltage

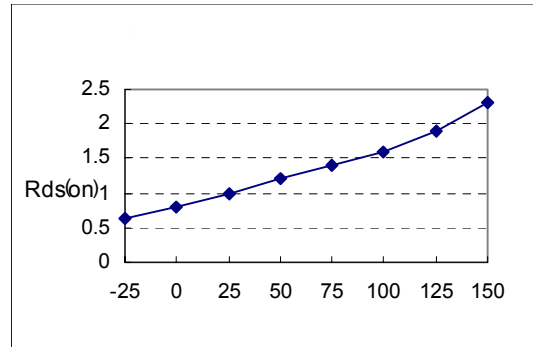
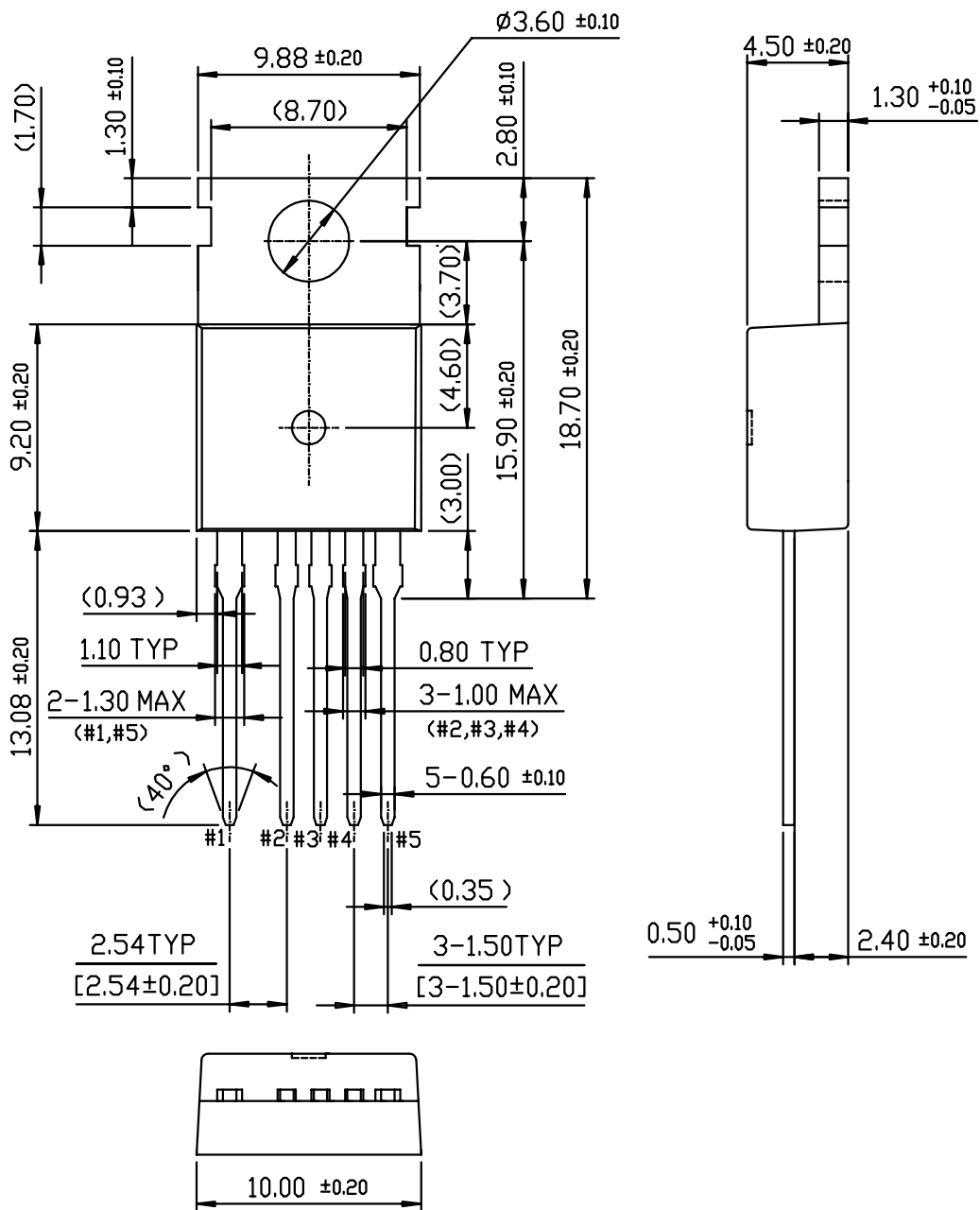


Figure 14. Static Drain-Source on Resistance

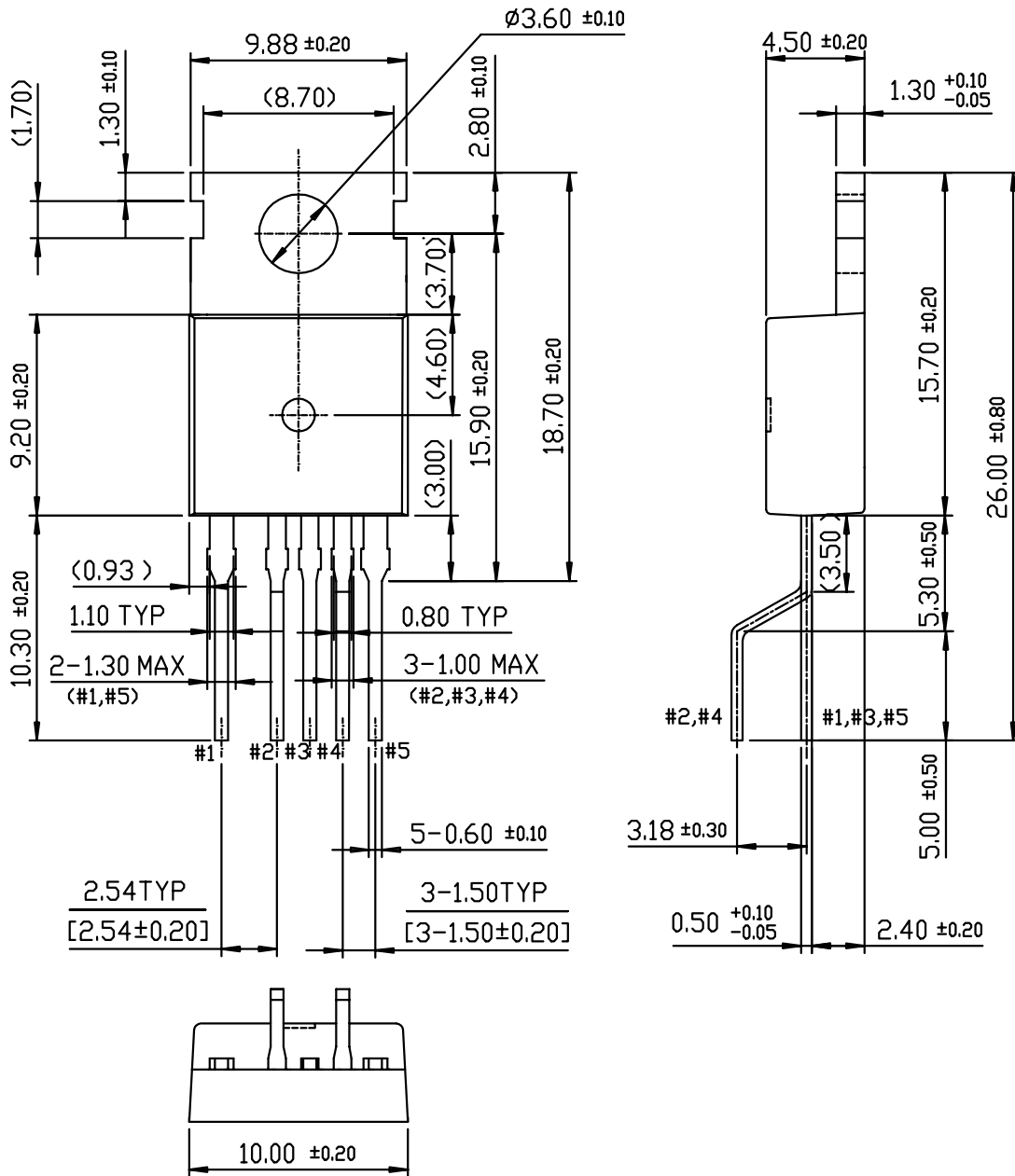
Package Dimensions

TO-220-5L



Package Dimensions (Continued)

TO-220-5L(Forming)



## Ordering Information

Product Number	Package	Rating	Topr (°C)
KA5M0765RQCTU	TO-220F-5L	650V, 7A	-25°C to +85°C
KA5M0765RQCYDTU	TO-220F-5L(Forming)		

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.