

KA5M0765RQC

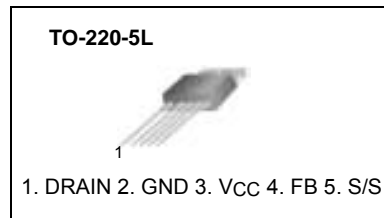
Fairchild Power Switch(FPS)

Features

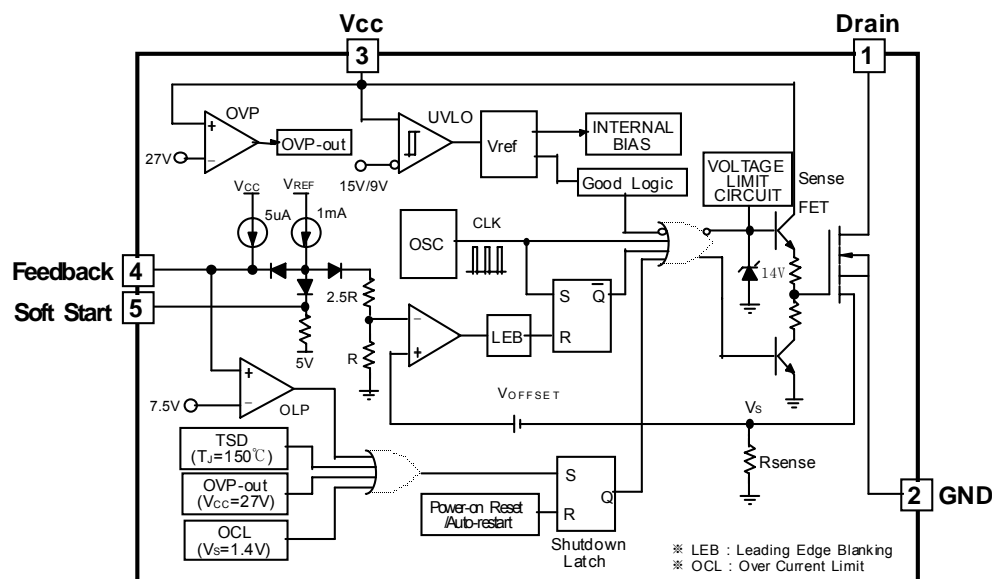
- Precision Fixed Operating Frequency (70kHz)
- Low Start-up Current (Typ. 100µA)
- Pulse by Pulse Current Limiting
- Over Load Protection
- Over Current Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart 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



Rev.1.0.5

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Gate Voltage (R _{GS} =1MΩ)	V _{DGR}	650	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽²⁾	I _{DM}	28.0	ADC
Single Pulsed Avalanche Energy ⁽³⁾	E _{AS}	570	mJ
Continuous Drain Current (T _C =25°C)	I _D	7.0	ADC
Continuous Drain Current (T _C =100°C)	I _D	5.6	ADC
Maximum Supply Voltage	V _{CC,MAX}	30	V
Input Voltage Range	V _{FB}	-0.3 to V _{SD}	V
Total Power Dissipation	P _D	140	W
	Darting	1.11	W/°C
Operating Ambient Temperature	T _A	-25 to +85	°C
Storage Temperature	T _{STG}	-55 to +150	°C

Note:

1. T_j = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 24mH, 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	BVDSS	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 =3.5A	-	1.25	1.6	Ω
Forward Transconductance ^(Note)	g _{fs}	V _{DS} =50V, I _D =3.5A	3.0	-	-	S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	1120	-	pF
Output Capacitance	C _{oss}		-	125	-	
Reverse Transfer Capacitance	C _{rss}		-	25	-	
Turn on Delay Time	t _{d(on)}	V _{DD} =0.5BVDSS, I _D =7.0A (MOSFET switching time are essentially independent of operating temperature)	-	25	60	nS
Rise Time	t _r		-	70	150	
Turn Off Delay Time	t _{d(off)}		-	105	220	
Fall Time	t _f		-	65	140	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =7.0A, V _{DS} =0.8BVDSS	-	38	50	nC
Gate-Source Charge	Q _{gs}		-	6.5	-	
Gate-Drain (Miller) Charge	Q _{gd}		-	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
UVLO SECTION						
Start Threshold Voltage	VSTART	-	14	15	16	V
Stop Threshold Voltage	VSTOP	After turn on	8.4	9	9.6	V
OSCILLATOR SECTION						
Initial Accuracy	FOSC	Ta=25°C	61	67	73	kHz
Frequency Change With Temperature ⁽²⁾	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	Dmax	-	74	77	80	%
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	VFB = 2V	4.7	5.0	5.3	V
Soft Start Current	ISS	Sync & S/S=GND	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}	Max. inductor current	4.40	5.00	5.60	A
PROTECTION SECTION						
Thermal Shutdown Temperature (Tj) ⁽¹⁾	TSD	-	140	160	-	°C
Over Voltage Protection	VOVP	-	25	27	29	V
TOTAL DEVICE SECTION						
Start Up Current	ISTART	VCC=14V	-	0.1	0.17	mA
Operating Supply Current (Control Part Only)	IOP	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 (SFET part)

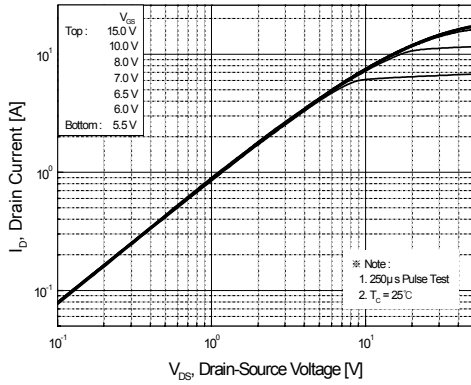


Figure 1. Output Characteristics

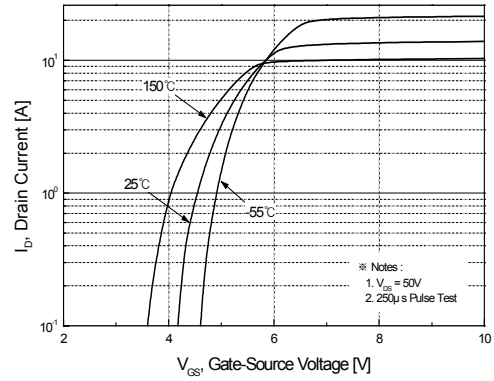


Figure 2. Transfer Characteristics

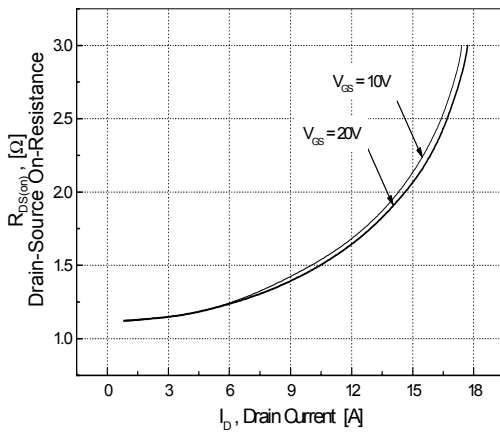


Figure 3. On-Resistance vs. Drain Current

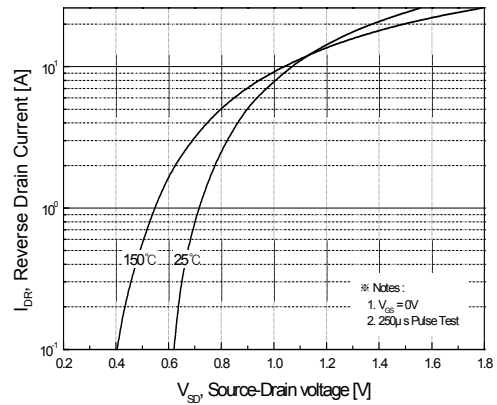


Figure 4. Source-Drain Diode Forward Voltage

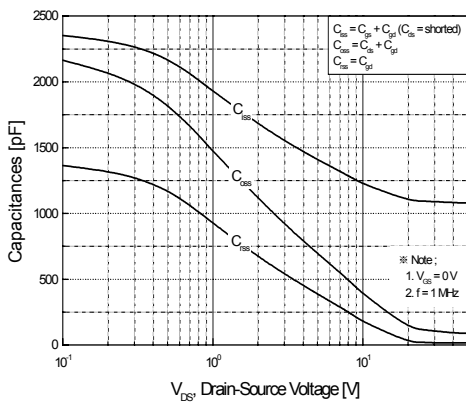


Figure 5. Capacitance vs. Drain-Source Voltage

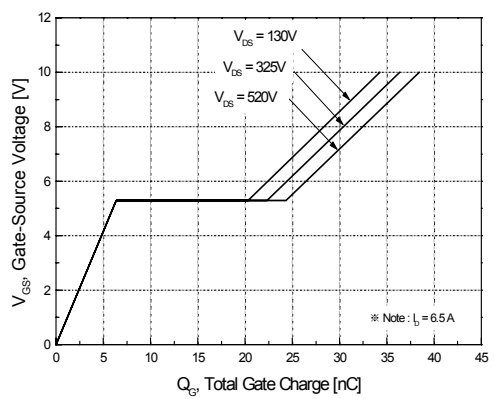


Figure 6. Gate Charge vs. Gate-Source Voltage

Typical Performance Characteristics (SFET part) (Continued)

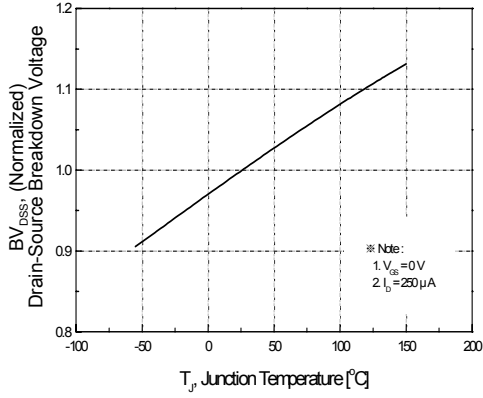


Figure 7. Breakdown Voltage vs. Temperature

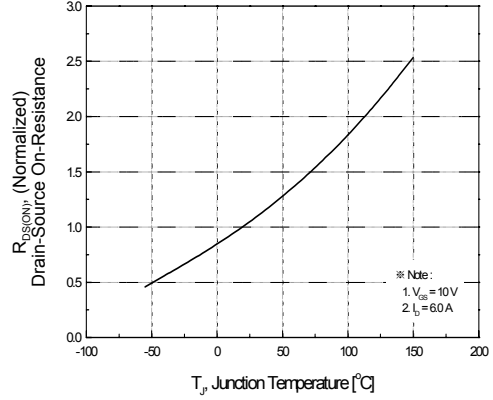


Figure 8. On-Resistance vs. Temperature

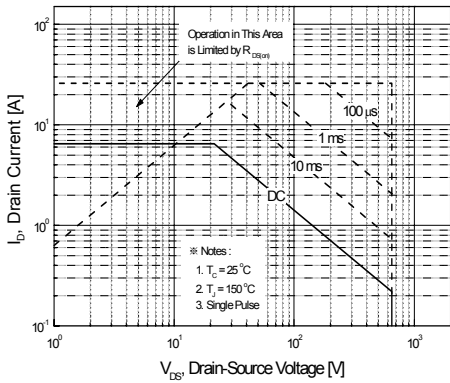


Figure 9. Max. Safe Operating Area

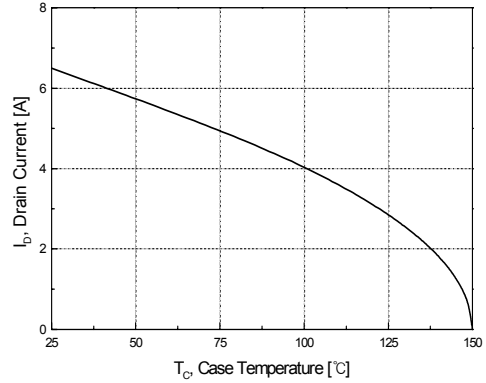


Figure 10. Max. Drain Current vs. Case Temperature

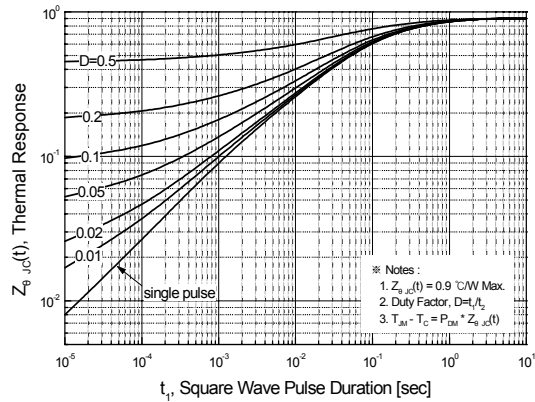


Figure 11. Thermal Response

Typical Performance Characteristics (Control part) (Continued)

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

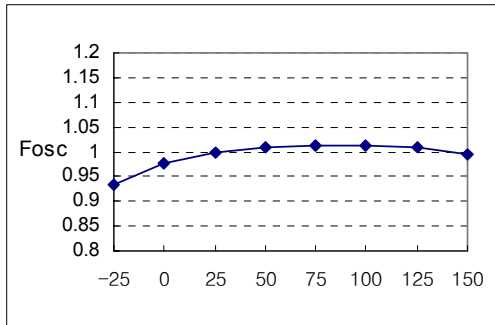


Figure 1. Operating Frequency

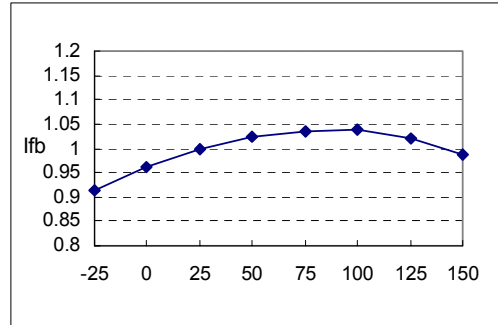


Figure 2. Feedback Source Current

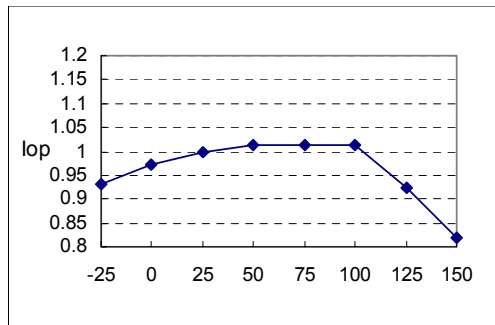


Figure 3. Operating Supply Current

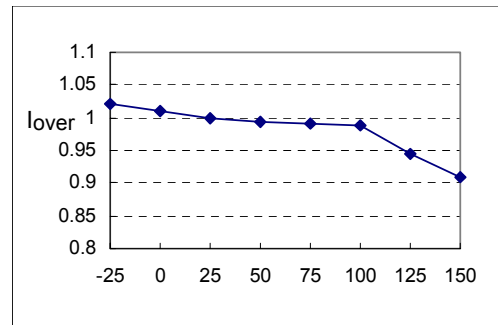


Figure 4. Peak Current Limit

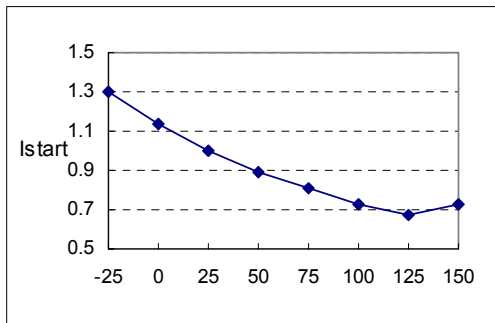


Figure 5. Start up Current

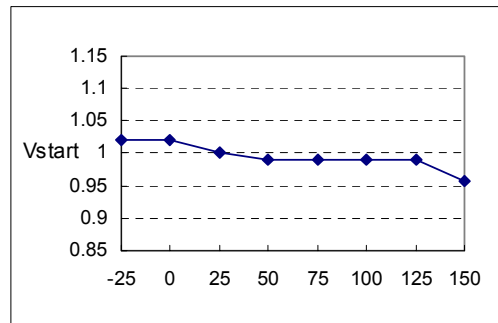


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

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

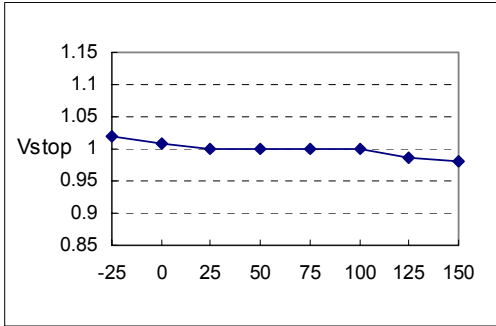


Figure 7. Stop Threshold Voltage

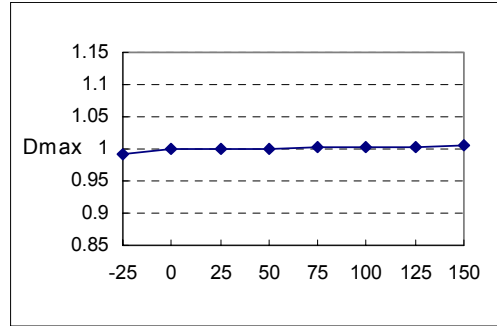


Figure 8. Maximum Duty Cycle

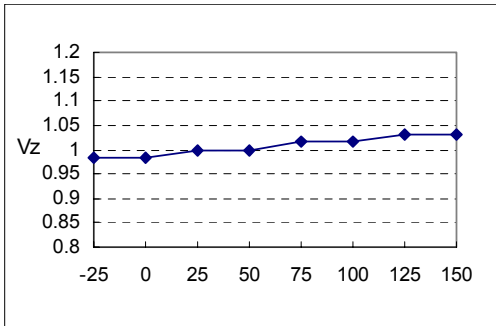


Figure 9. VCC Zener Voltage

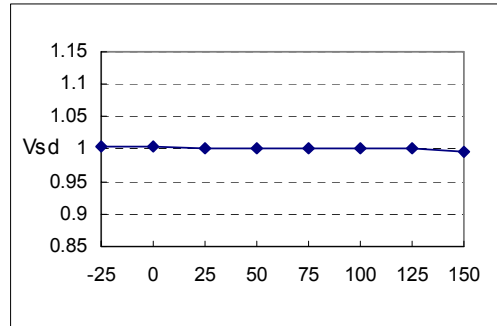


Figure 10. Shutdown Feedback Voltage

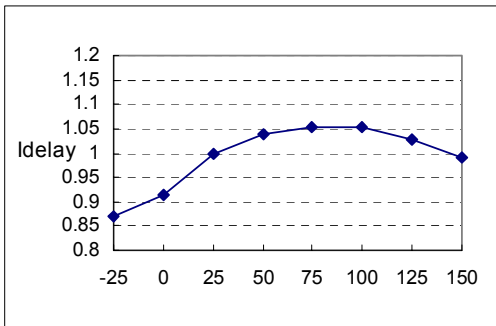


Figure 11. Shutdown Delay Current

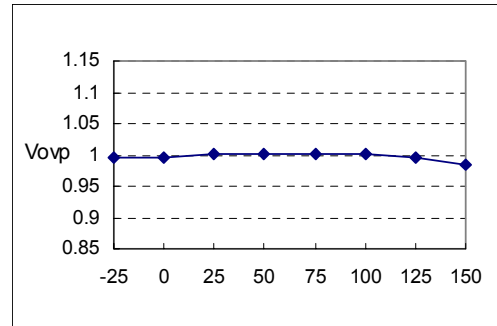


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

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

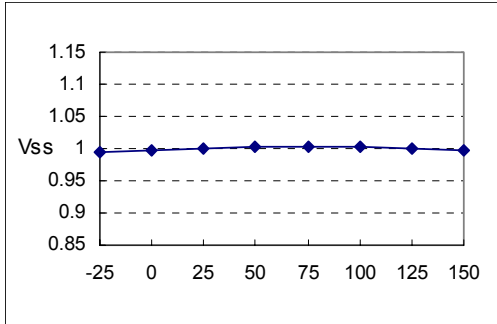


Figure 13. Soft Start Voltage

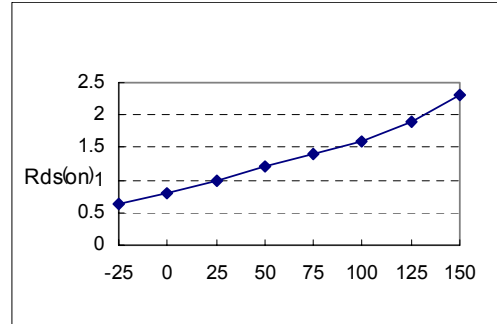
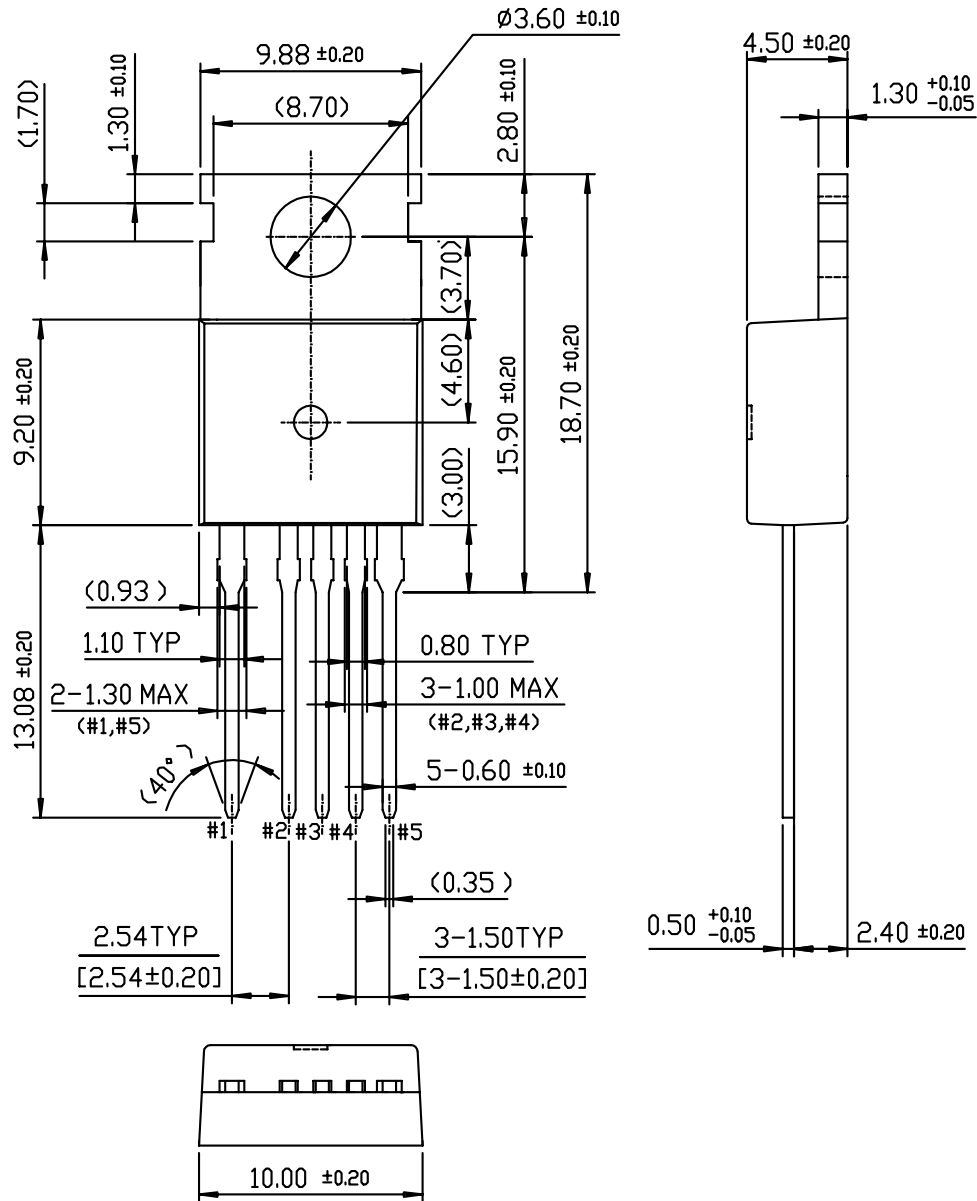


Figure 14. Static Drain-Source on Resistance

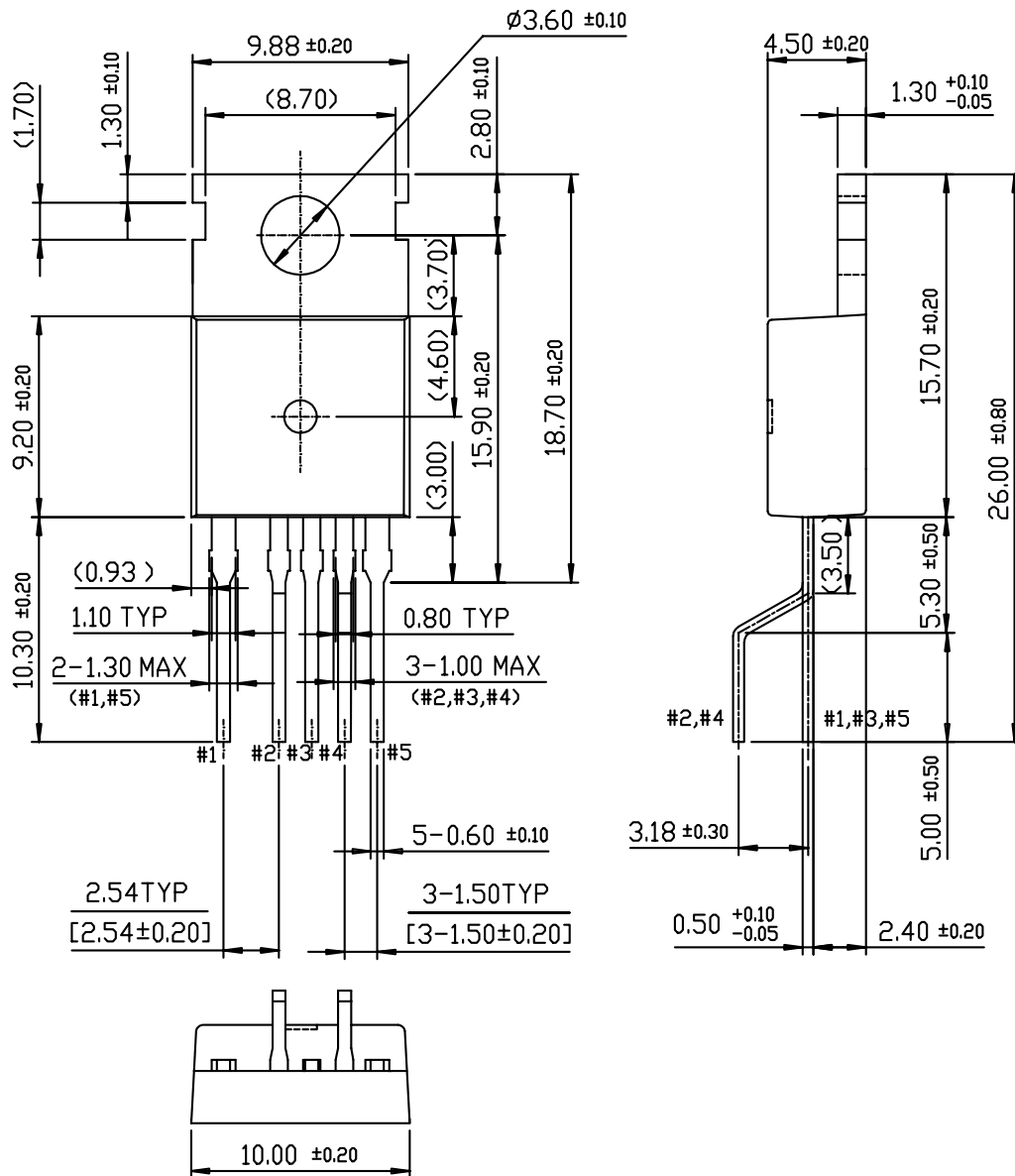
Package Dimensions

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.

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