KA5M0965Q

Fairchild Power Switch(SPS)

Features

- Precision fixed operating frequency (70kHz)
- Low start-up current(typ. 100uA)
- Pulse by pulse current limiting
- Over Load protection
- Over current protection
- Over voltage protecton (Min. 25V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Latch mode

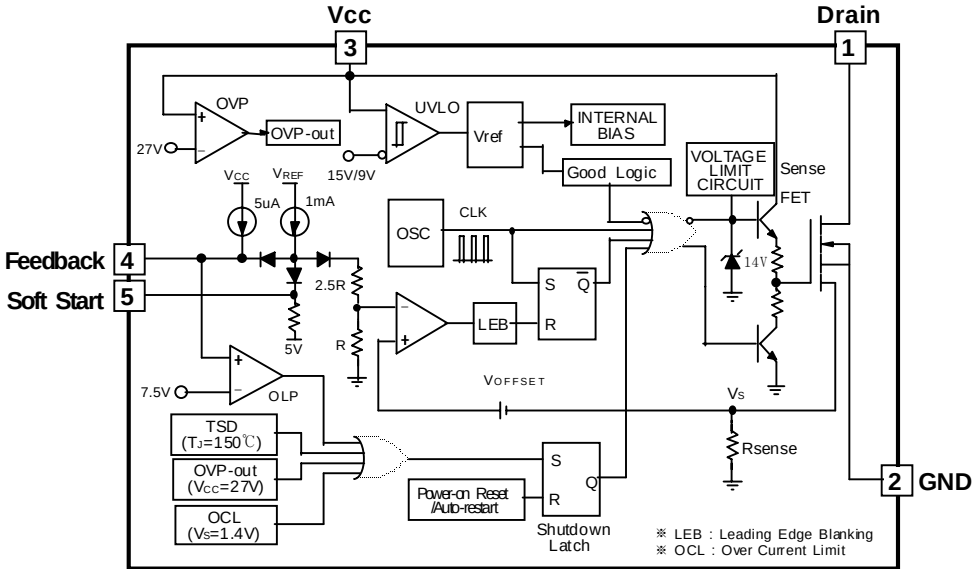
Description

The SPS product family is specially designed for an off-line SMPS with minimal external components. The SPS 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 loopcompensation and fault protection circuitry. Compared to discrete MOSFET and PWM controller or RCC 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 design in either a flyback converter or a forward converter.

TO-3P-5L

1. DRAIN 2. GND 3. VCC 4. FB 5. S/S

Internal Block Diagram



Rev.1.0.1

Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Maximum Drain voltage (1)	$V_{D,MAX}$	650	V
Drain-Gate voltage (R_{GS}=1MΩ)	V_{DGR}	650	V
Gate-source (GND) voltage	V_{GS}	±30	V
Drain current pulsed (2)	I_{DM}	36.0	A_{DC}
Single pulsed avalanche energy (3)	E_{AS}	950	mJ
Continuous drain current (T_C=25°C)	I_D	9.0	A_{DC}
Continuous drain current (T_C=100°C)	I_D	5.8	A_{DC}
Maximum Supply voltage	$V_{CC,MAX}$	30	V
Input voltage range	V_{FB}	–0.3 to V_{SD}	V
Total power dissipation	P_D (watt H/S)	170	W
	Derating	1.33	W/°C
Operating ambient temperature	T_A	–25 to +85	°C
Storage temperature	T_{STG}	–55 to +150	°C

Notes:

1. Tj=25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L=20mH, V_{DD}=50V, R_G=27Ω, starting Tj=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_{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	mA
Static drain-source on resistance (note)	$R_{DS(ON)}$	V_{GS}=10V, I_D=4.5A	-	0.96	1.2	W
Forward transconductance (note)	gfs	V_{DS}=50V, I_D=4.5A	5.0	-	-	S
Input capacitance	Ciss	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	1200	-	pF
Output capacitance	Coss		-	135	-	
Reverse transfer capacitance	Crss		-	25	-	
Turn on delay time	td(on)	V_{DD}=0.5BV_{DSS}, I_D=9.0A (MOSFET switching time are essentially independent of operating temperature)	-	25	60	nS
Rise time	tr		-	75	160	
Turn off delay time	td(off)		-	130	270	
Fall time	tf		-	70	150	
Total gate charge (gate-source+gate-drain)	Qg	V_{GS}=10V, I_D=9.0A, V_{DS}=0.8BV_{DSS}	-	45	60	nC
Gate-source charge	Qgs		-	8	-	
Gate-drain (Miller) charge	Qgd		-	22	-	

Note:

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

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

Electrical Charcteristics (SFET part) (Continued)

(Ta = 25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start threshold voltage	V_{START}	-	8.4	9	9.6	V
Stop threshold voltage	V_{STOP}	After turn on	14	15	16	V
OSCILLATOR SECTION						
Initial accuracy	F_{OSC}	Ta=25°C	61	67	73	kHz
Frequency change with temperature (2)	-	–25°C≤Ta≤+85°C	-	±5	±10	%
Maximum duty cycle	Dmax	-	74	77	80	%
FEEDBACK SECTION						
Feedback source current	I_{FB}	Ta=25°C, 0V≤Vfb≤3V	0.7	0.9	1.1	mA
Shutdown Feedback voltage	V_{SD}	Vfb≥6.5V	6.9	7.5	8.1	V
Shutdown delay current	Idelay	Ta=25°C, 5V≤Vfb≤V_{SD}	4	5	6	µA
SOFT START SECTION						
Soft Start Voltage	V_{SS}	V_{FB} =2V	4.7	5.0	5.3	V
Soft Start Current	I_{SS}	Sync & S/S=GND	0.8	1.0	1.2	mA
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit	I_{OVER}	Max. inductor current	5.28	6.00	6.72	A
PROTECTION SECTION						
Thermal shutdown temperature (Tj) (1)	T_{SD}	-	140	160	-	°C
Over voltage protection voltage	V_{OVP}	V_{CC}≥24V	25	27	29	V
TOTAL DEVICE SECTION						
Start Up current	I_{START}	V_{CC}=14V	-	0.1	0.17	mA
Operating supply current (control part only)	I_{OP}	V_{CC}≤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(water test) process
3. These parameters are indicated Inductor current.

Typical Performance Characteristics

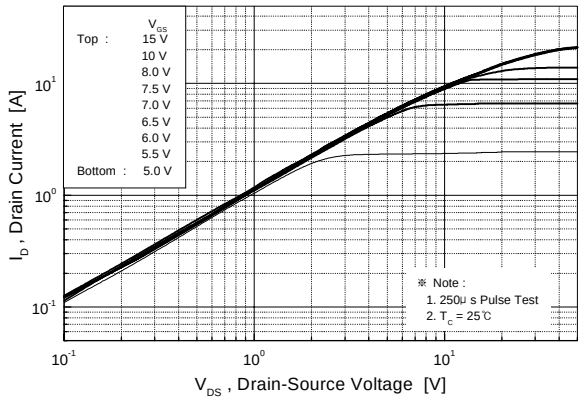


Figure 1. Output Characteristics

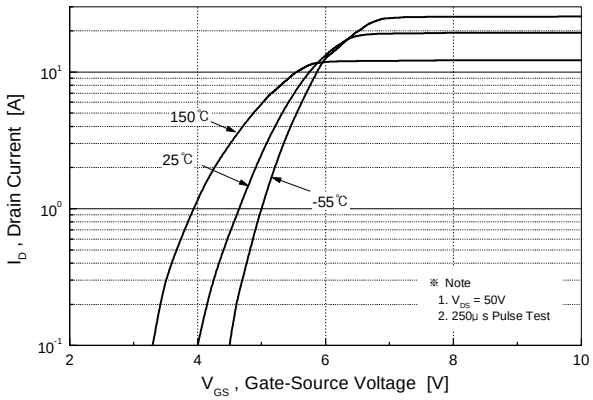


Figure 2. Thansfer Characteristics

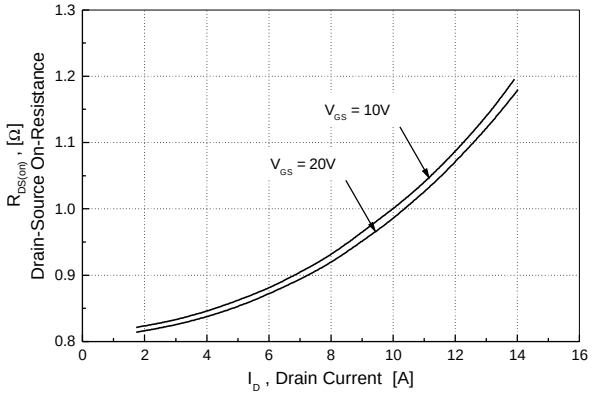


Figure 3. On-Resistance vs. Drain Current

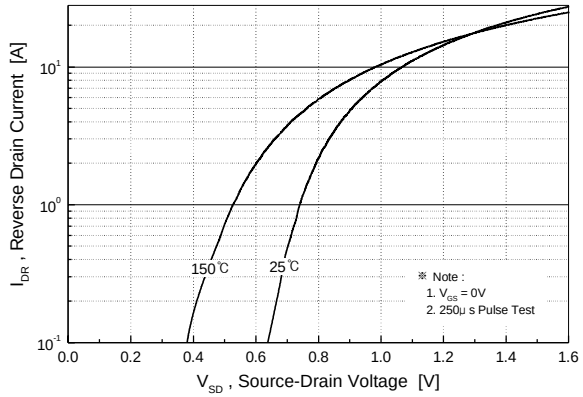


Figure 4. Source-Drain Diode Forward Voltage

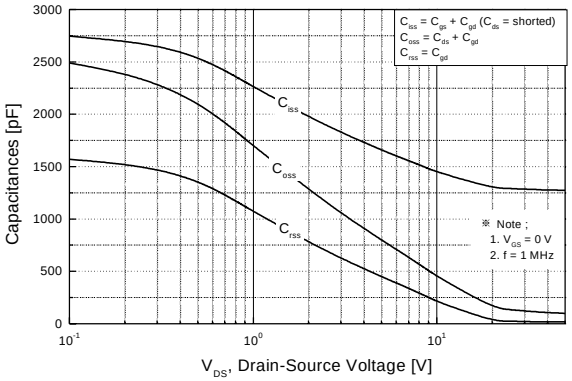


Figure 5. Capacitance vs. Drain-Source Voltage

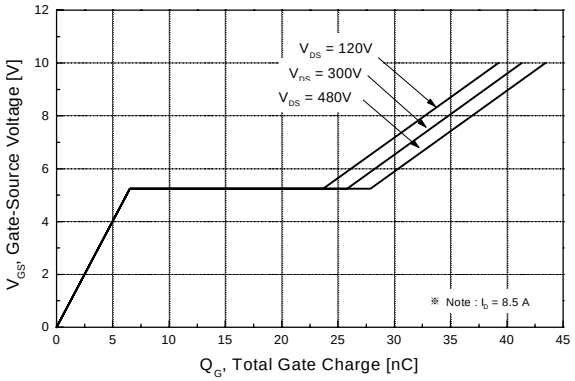


Figure 6. Gate Charge vs. Gate-Source Voltage

Typical Performance Characteristics (Continued)

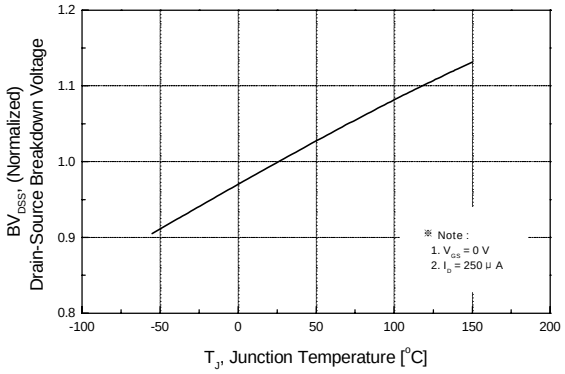


Figure 7. Breakdown Voltage vs. Temperature

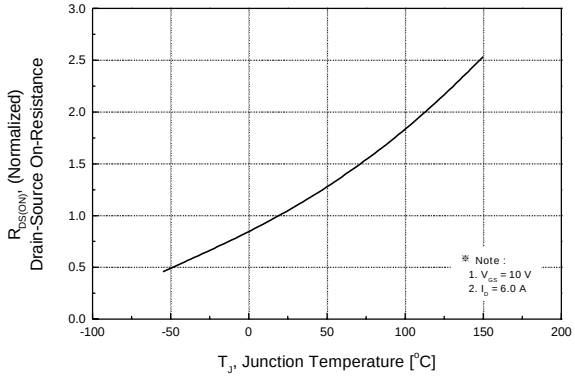


Figure 8. On-Resistance vs. Temperature

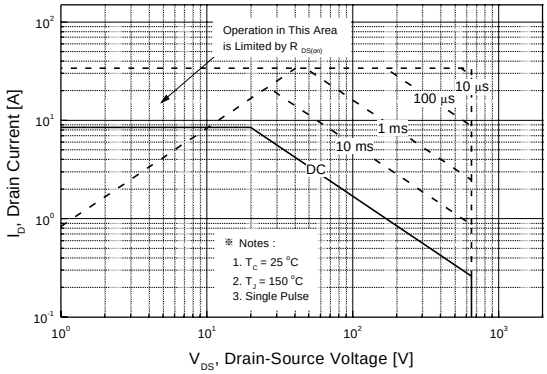


Figure 9. Max. Safe Operating Area

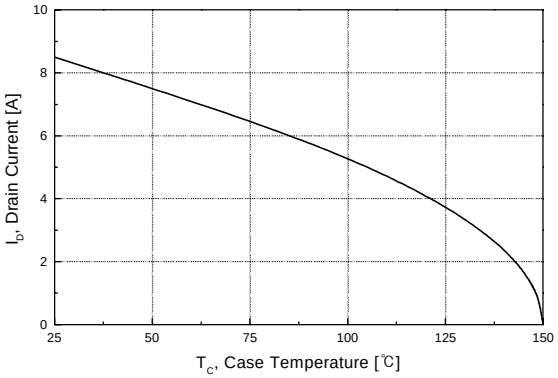


Figure 10. Max. Drain Current vs. Case Temperature

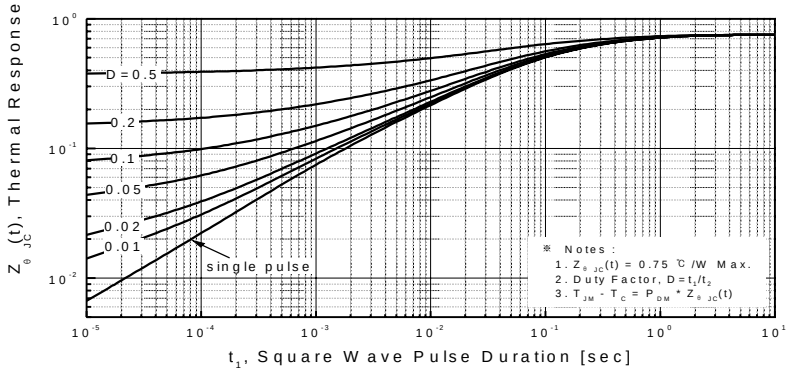


Figure 11. Thermal Response

typical performance characteristics (control part)

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

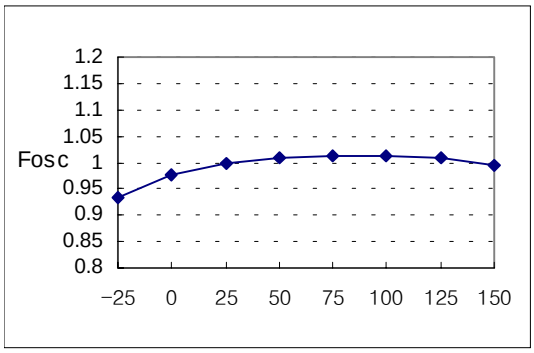


Figure 1. Operating Frequency

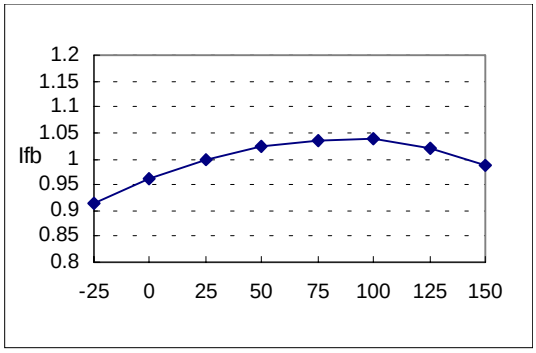


Figure 2. Feedback Source Current

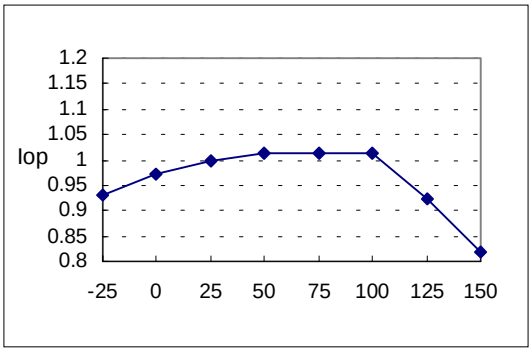


Figure 3. Operating Supply Current

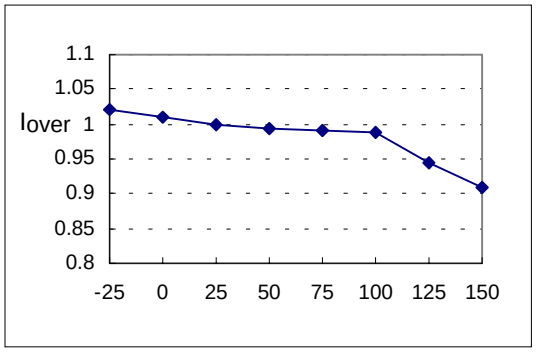


Figure 4. Peak Current Limit

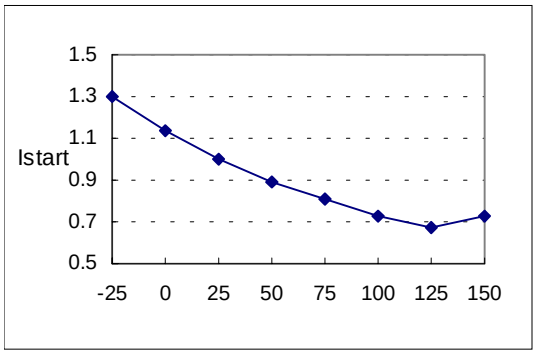


Figure 5. Start up Current

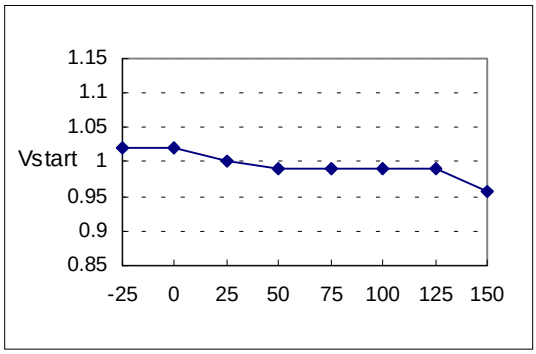


Figure 6. Start Threshold Voltage

typical performance characteristics (continued)

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

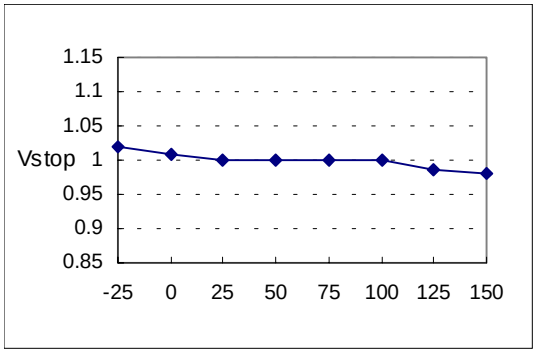


Figure 7. Stop Threshold Voltage

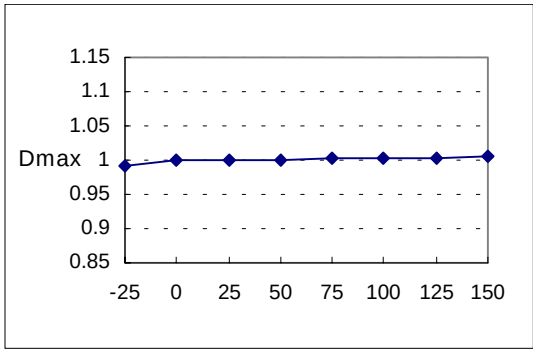


Figure 8. Maximum Duty Cycle

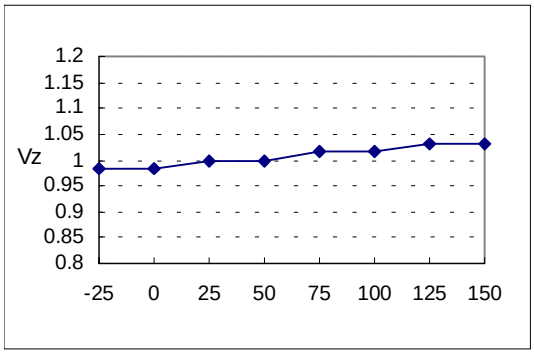


Figure 9. V_{CC} Zener Voltage

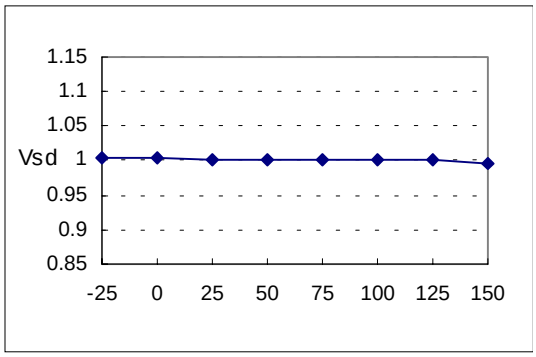


Figure 10. Shutdown Feedback Voltage

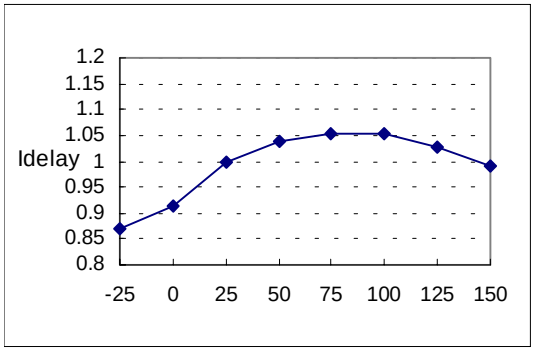


Figure 11. Shutdown Delay Current

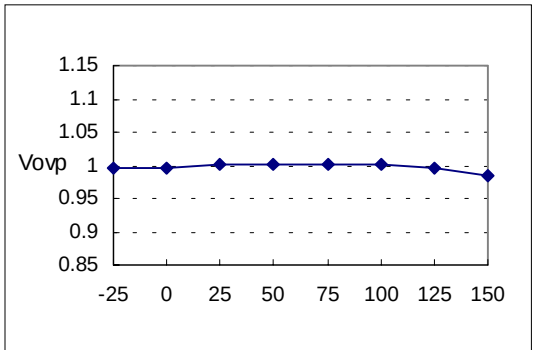


Figure 12. Over Voltage Protection

typical performance characteristics (continued)

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

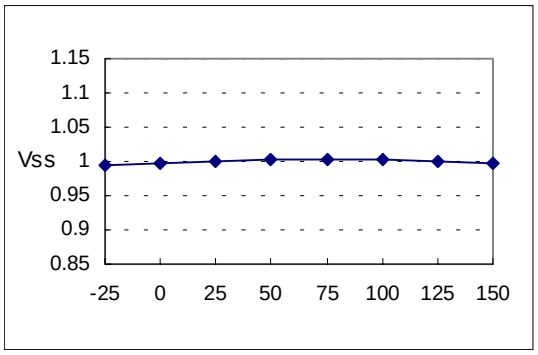


Figure13. Soft Start Voltage

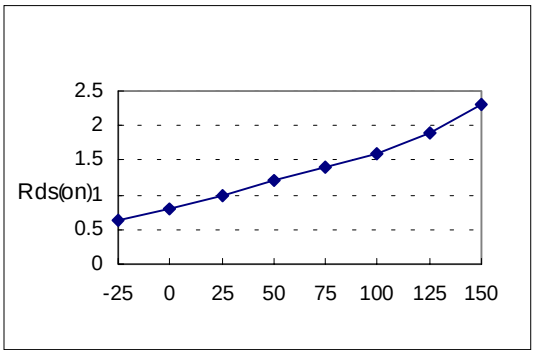
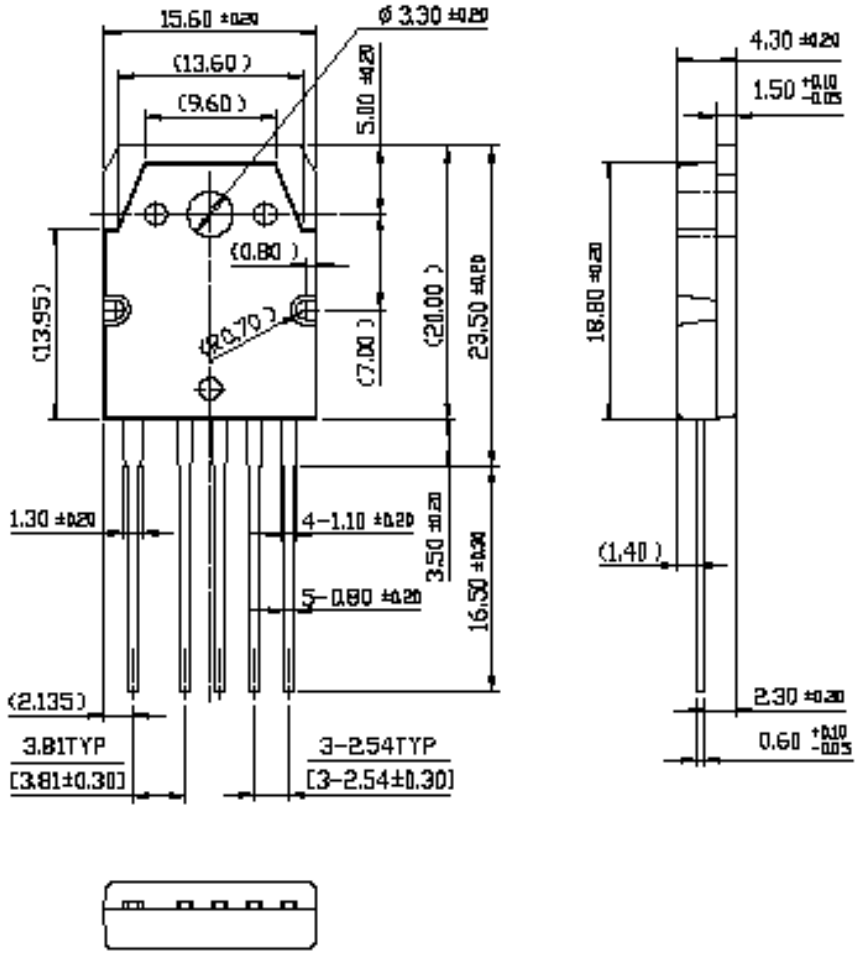


Figure 14. Static Drain-Source on Resistance

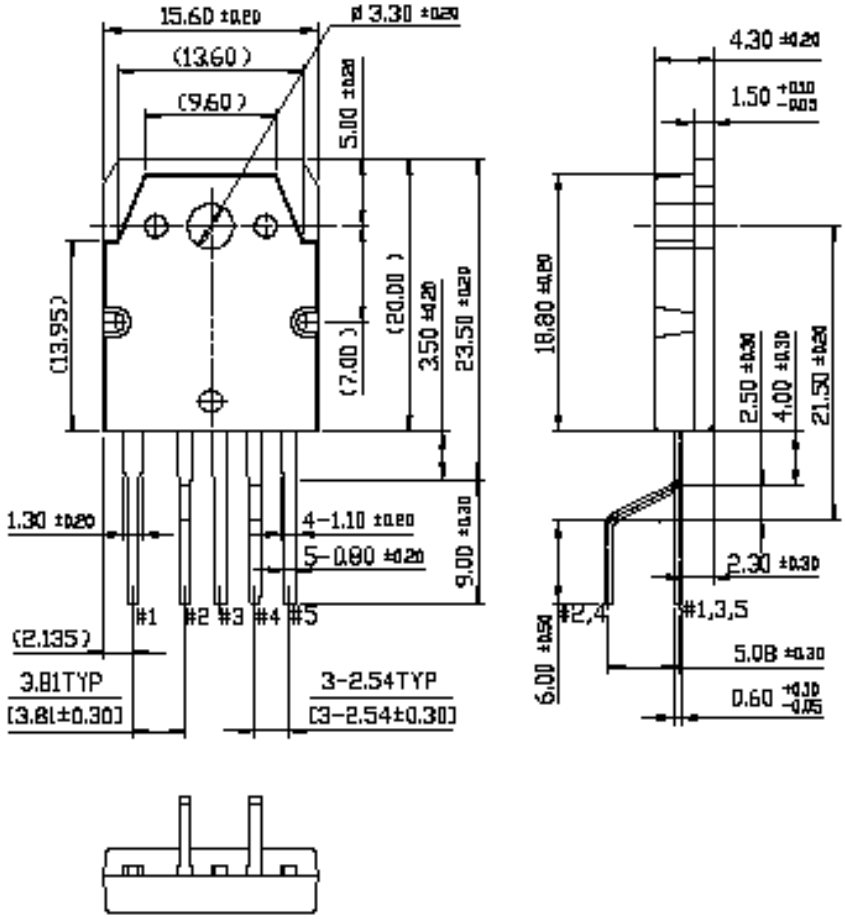
Package Dimensions

TO-3P-5L



Package Dimensions (Continued)

TO-3P-5L (Forming)



Ordering Information

Product Number	Package	Rating	Operating Temperature
KA5M0965Q-TU	TO-3P-5L	650V, 9A	-25°C to +85°C
KA5M0965Q-YDTU	TO-3P-5L(Forming)		

TU : Non Forming Type
YDTU : Forming Type