

# KA1L0365R

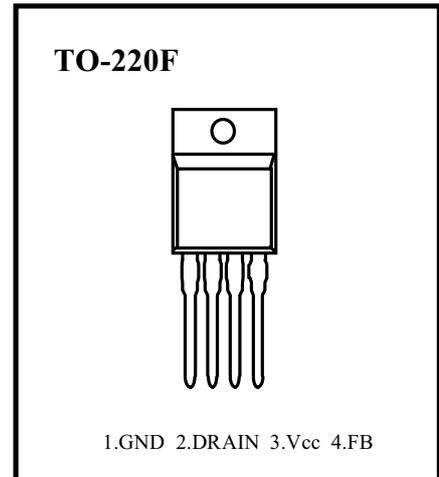
# SAMSUNG POWER SWITCH

## FEATURES

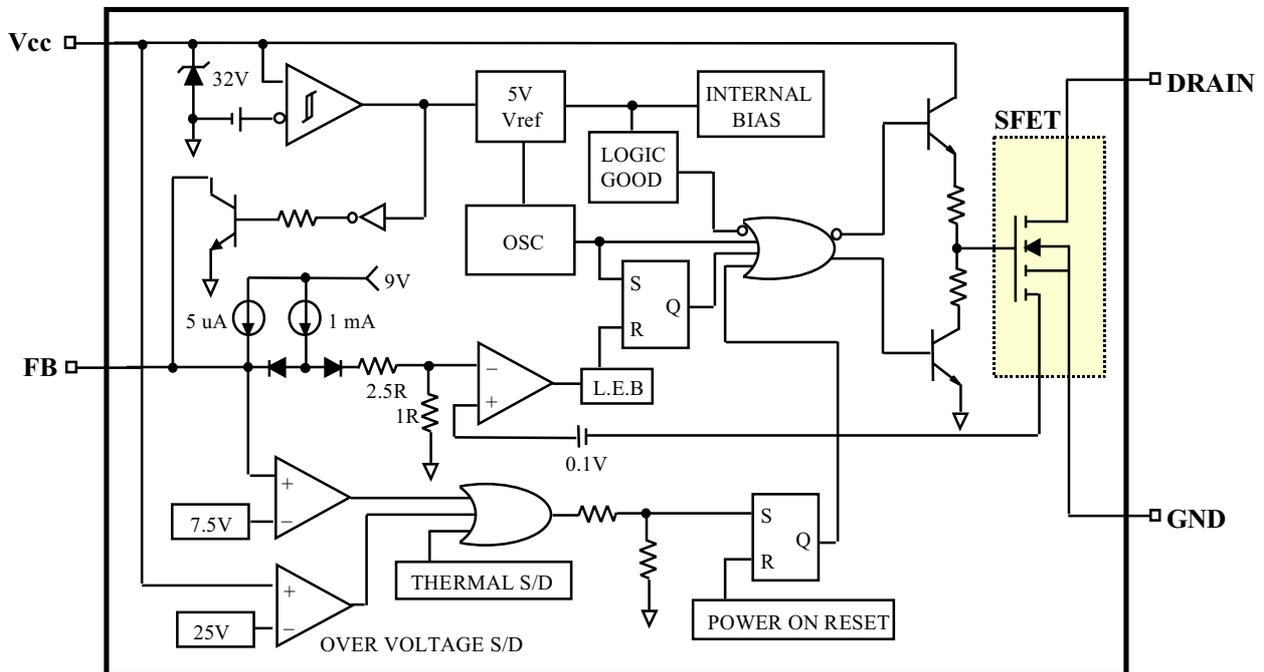
- Precision fixed operating frequency (50KHz)
- Pulse by pulse over current limiting
- Over Current Protection
- Over Voltage Protection(min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Auto restart

## PRODUCT SUMMARY

| Part Number | BVdss | Rds(on) | Id |
|-------------|-------|---------|----|
| KA1L0365R   | 650V  | 4.5Ω    | 3A |



## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Characteristic                                     | Symbol                   | Value                  | Unit            |
|--|--------------------------|------------------------|-----------------|
| Drain - Source(GND) Voltage (1)                    | V <sub>DSS</sub>         | 650                    | V               |
| Drain - Gate Voltage (R <sub>GS</sub> = 1MΩ)       | V <sub>DGR</sub>         | 650                    | V               |
| Gate - Source(GND) Voltage                         | V <sub>GS</sub>          | ±30                    | V               |
| Drain Current Pulsed (2)                           | I <sub>DM</sub>          | 12                     | A <sub>DC</sub> |
| Single Pulsed Avalanche Energy (3)                 | E <sub>AS</sub>          | 358                    | mJ              |
| Avalanche Current                                  | I <sub>AS</sub>          | -                      | A               |
| Continuous Drain Current (T <sub>c</sub> = 25 °C)  | I <sub>D</sub>           | 3.0                    | A <sub>DC</sub> |
| Continuous Drain Current (T <sub>c</sub> = 100 °C) | I <sub>D</sub>           | 2.4                    | A <sub>DC</sub> |
| Supply Voltage                                     | V <sub>CC</sub>          | 30                     | V               |
| Analog Input Voltage Range                         | V <sub>FB</sub>          | -0.3 ~ V <sub>SD</sub> | V               |
| Total Power Dissipation                            | P <sub>D</sub> ( wt H/S) | 75                     | W               |
|  | Derating                 | 0.6                    | W/°C            |
| Operating Temperature                              | T <sub>OPR</sub>         | - 25 ~ + 85            | °C              |
| Storage Temperature                                | T <sub>STG</sub>         | - 55 ~ + 150           | °C              |

Notes: (1) T<sub>J</sub> = 25 °C to 150 °C

(2) Repetitive rating : Pulse width limited by maximum junction temperature

(3) L = 41mH, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, starting T<sub>j</sub> = 25 °C

## ELECTRICAL CHARACTERISTICS ( SFET part )

( T<sub>a</sub> = 25 °C unless otherwise specified )

| Symbol              | Characteristic                       | Min | Typ | Max | Units | Test Conditions   |
|---------------------|--------------------------------------|-----|-----|-----|-------|---|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage       | 650 | -   | -   | V     | V <sub>GS</sub> =0V, I <sub>D</sub> =50uA                         |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current      | -   | -   | 50  | uA    | V <sub>DS</sub> =Max, Rating, V <sub>GS</sub> =0V                 |
|                     |                                      | -   | -   | 200 | uA    | V <sub>DS</sub> =0.8Max, Rating, V <sub>GS</sub> =0V<br>TC=125 °C |
| R <sub>DS(on)</sub> | Static Drain-Source On Resistance(4) | -   | 3.6 | 4.5 | Ω     | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A                      |

**ELECTRICAL CHARACTERISTICS ( SFET part continued)**

( Ta = 25 °C unless otherwise specified )

| Symbol       | Characteristic                                    | Min | Typ  | Max | Units | Test Conditions   |
|--------------|---|-----|------|-----|-------|---|
| $g_{fs}$     | Forward Transconductance(4)                       | 2.0 | -    | -   | mho   | $V_{DS}=15V, I_D=1.5A$  |
| $C_{iss}$    | Input Capacitance                                 | -   | 720  | -   | pF    | $V_{GS} = 0V, V_{DS} = 25V,$<br>$f = 1MHz$  |
| $C_{oss}$    | Output Capacitance                                | -   | 40   | -   |       |   |
| $C_{rss}$    | Reverse Transfer Capacitance                      | -   | 40   | -   |       |   |
| $t_{d(on)}$  | Turn On Delay Time                                | -   | 150  | -   | nS    | $V_{DD} = 0.5BV_{DSS}, I_D = 3.0A$<br>(MOSFET switching time<br>are essentially independent<br>of operating temperature )                   |
| $t_r$        | Rise Time   | -   | 100  | -   |       |   |
| $t_{d(off)}$ | Turn Off Delay Time                               | -   | 150  | -   |       |   |
| $t_f$        | Fall Time   | -   | 42   | -   |       |   |
| $Q_g$        | Total Gate Charge<br>( Gate-Source + Gate-Drain ) | -   | -    | 34  | nC    | $V_{GS} = 10V, I_D = 3.0A$<br>$V_{DS} = 0.5BV_{DSS}$<br>(MOSFET switching time<br>are essentially independent<br>of operating temperature ) |
| $Q_{gs}$     | Gate-Source Charge                                | -   | 7.3  | -   |       |   |
| $Q_{gd}$     | Gate-Drain(Miller) Charge                         | -   | 13.3 | -   |       |   |

**Notes:** (1)  $T_J = 25^\circ C$  to  $150^\circ C$ 

(2) Repetitive rating : Pulse width limited by maximum junction temperature

(3)  $L = 41mH, V_{DD} = 50V, R_G = 25\Omega$ , starting  $T_j = 25^\circ C$ (4) Pulse Test : Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$

**ELECTRICAL CHARACTERISTICS ( Control part )**

( Ta = 25°C unless otherwise specified )

| Symbol                                 | Characteristics                            | Min  | Typ  | Max  | Unit  | Test Conditions               |
|--|--|------|------|------|-------|-------------------------------|
| <b>REFERENCE SECTION</b>               |  |      |      |      |       |                               |
| Vref                                   | Output Voltage (Note 1)                    | 4.80 | 5.00 | 5.20 | V     | Ta = 25°C                     |
| Vref/ ΔT                               | Temperature Stability (Note 1&2)           | -    | 0.3  | 0.6  | mV/°C | -25°C ≤ Ta ≤ +85°C            |
| <b>OSCILLATOR SECTION</b>              |  |      |      |      |       |                               |
| FOSC                                   | Initial Accuracy                           | 45   | 50   | 55   | KHz   | Ta = 25°C                     |
| ΔF / ΔT                                | Frequency Change with Temperature (Note 2) | -    | ±5   | ±10  | %     | -25°C ≤ Ta ≤ +85°C            |
| <b>PWM SECTION</b>                     |  |      |      |      |       |                               |
| DMAX                                   | Maximum Duty Cycle                         | 74   | 77   | 80   | %     |                               |
| <b>FEEDBACK SECTION</b>                |  |      |      |      |       |                               |
| I FB                                   | Feedback Source Current                    | 0.7  | 0.9  | 1.1  | mA    | Ta = 25°C,<br>0 V ≤ Vfb ≤ 3V  |
| Idelay                                 | Shutdown Delay Current                     | 4.0  | 5.0  | 6.0  | uA    | Ta = 25°C,<br>5 V ≤ Vfb ≤ VSD |
| <b>OVER CURRENT PROTECTION SECTION</b> |  |      |      |      |       |                               |
| IL(MAX)                                | Over Current Protection                    | 1.89 | 2.15 | 2.41 | A     | Max. Inductor Current         |
| <b>UVLO SECTION</b>                    |  |      |      |      |       |                               |
| Vth(H)                                 | Start Threshold Voltage                    | 14   | 15   | 16   | V     |                               |
| Vth(L)                                 | Minimum Operating Voltage                  | 9    | 10   | 11   | V     | After turn on                 |

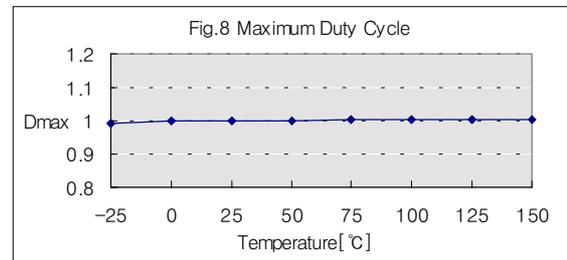
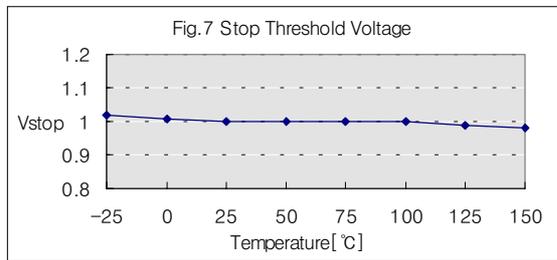
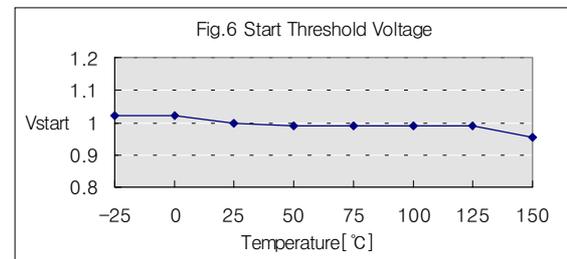
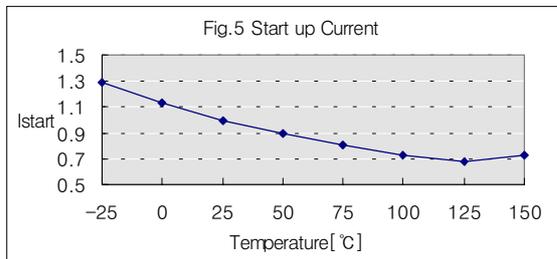
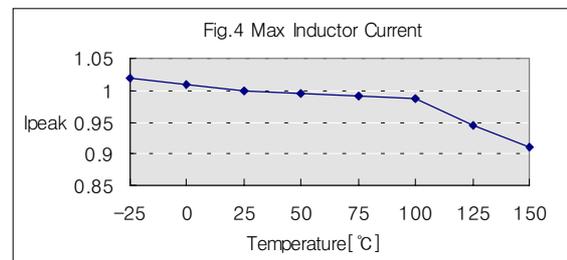
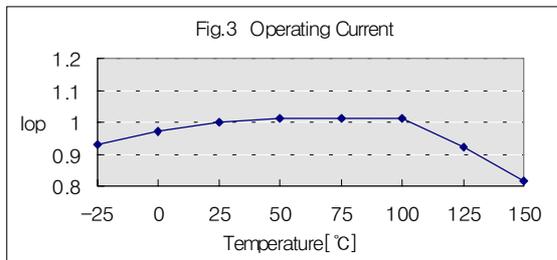
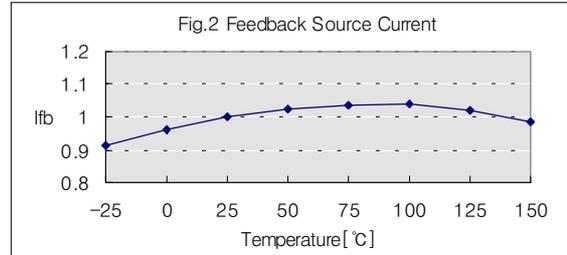
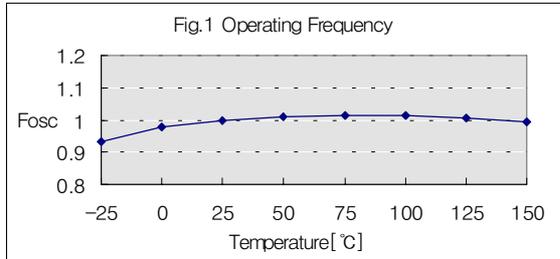
**ELECTRICAL CHARACTERISTICS ( Continued)**

( Ta = 25°C unless otherwise specified )

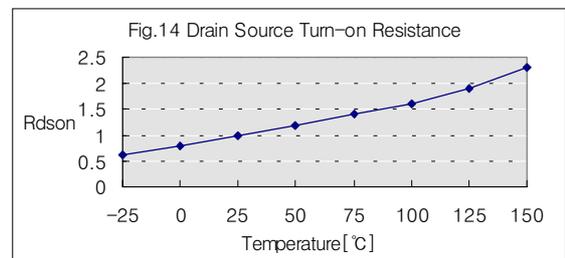
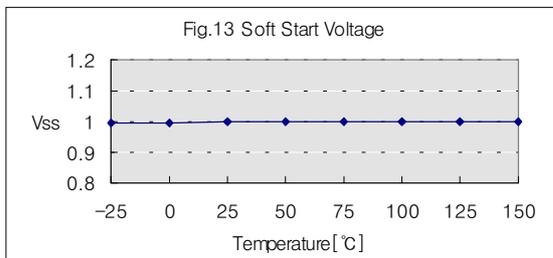
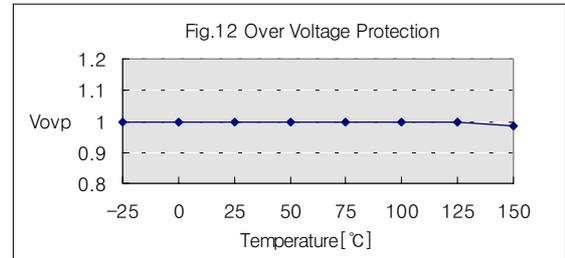
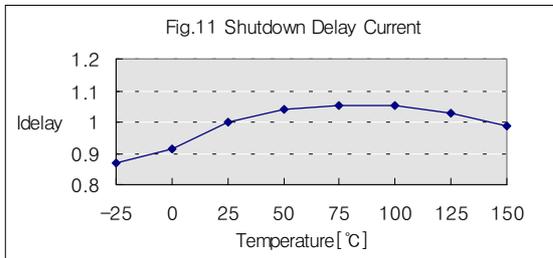
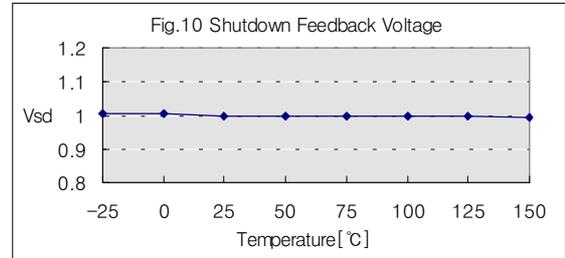
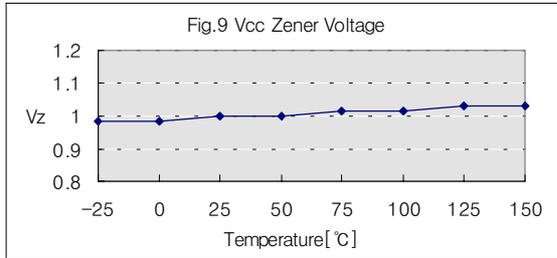
| Symbol                               | Characteristics                                   | Min | Typ  | Max  | Unit | Test Conditions        |
|--------------------------------------|---|-----|------|------|------|------------------------|
| <b>TOTAL STANDBY CURRENT SECTION</b> |   |     |      |      |      |                        |
| I <sub>ST</sub>                      | Start up Current                                  | 0.1 | 0.3  | 0.45 | mA   | V <sub>CC</sub> = 14V  |
| I <sub>OPR</sub>                     | Operating Supply Current<br>( control part only ) | 6   | 12   | 18   | mA   | Ta = 25°C              |
| V <sub>Z</sub>                       | V <sub>CC</sub> Zener Voltage                     | 30  | 32.5 | 35   | V    | I <sub>CC</sub> = 20mA |
| <b>SHUTDOWN SECTION</b>              |   |     |      |      |      |                        |
| V <sub>SD</sub>                      | Shutdown Feedback Voltage                         | 6.9 | 7.5  | 8.1  | V    |                        |
| T <sub>SD</sub>                      | Thermal Shutdown Temperature(T <sub>j</sub> )     | 140 | 160  | -    | °C   | (Note 1)               |
| V <sub>ovp</sub>                     | Over Voltage Protection Voltage                   | 23  | 25   | 28   | V    |                        |

- Notes:** (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

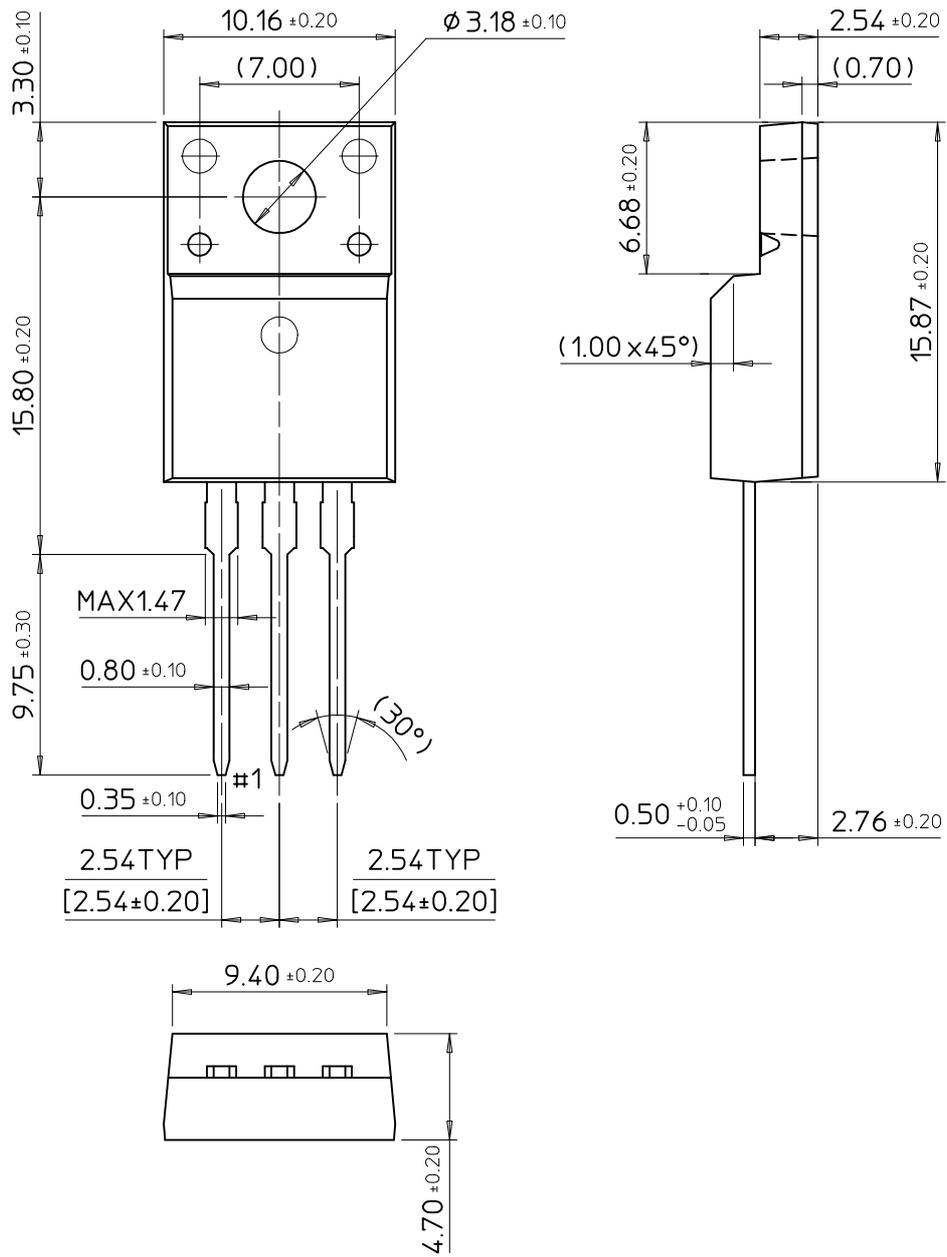


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



# TO-220F

Dimensions in Millimeters



SAMSUNG ELECTRONICS CO.,LTD.