KA5L0565R

Fairchild Power Switch(FPS™)

Features

- Precision Fixed Operating Frequency (50kHz)
- Low Start-up Current(Typ. 100uA)
- Pulse by Pulse Current Limiting
- Over Current Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart Mode

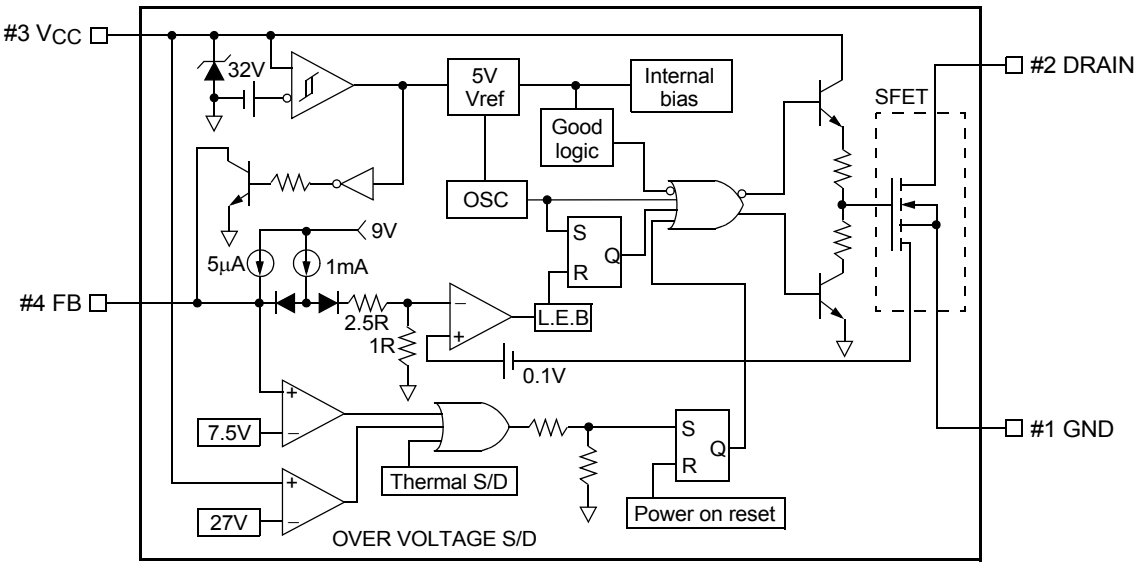
Description

The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consists of a high voltage power SenseFET and a current mode PWM IC. Included PWM controller integrates the fixed frequency oscillator, the under voltage lock-out, the leading edge blanking, the optimized gate turn-on/turn-off driver, the thermal shutdown protection, the over voltage protection, and the temperature compensated precision current sources for the loop compensation and the fault protection circuitry. Compared to a discrete MOSFET and a PWM controller or an RCCsolution, a Fairchild Power Switch(FPS) can reduce the total component count, design size and weight and at the same time increase efficiency, productivity, and system reliability. It has a basic platform well suited for the cost effective design in a flyback converter.

TO-220F-4L

1. GND 2. DRAIN 3. V_{CC} 4. FB

Internal Block Diagram



Rev.1.0.0

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}	20	A_{DC}
Single Pulsed Avalanche Current (3)(Energy (2))	I_{AS}(E_{AS})	13(400)	A(mJ)
Continuous Drain Current (T_C=25°C)	I_D	5.0	A_{DC}
Continuous Drain Current (T_C=100°C)	I_D	3.5	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	38	W
	Darting	0.3	W/°C
Operating Ambient Temperature	T_A	-25 to +85	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Notes:

1. T_j = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 30mH, V_{DD} = 50V, R_G = 27Ω, starting T_j = 25°C

Electrical Characteristics (SenseFET 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	-	-	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=2.5A	-	1.76	2.2	Ω
Forward Transconductance (Note)	gfs	V_{DS}=50V, I_D=2.5A	2.5	-	-	S
Input Capacitance	Ciss	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	1457	-	pF
Output Capacitance	Coss		-	130	-	
Reverse Transfer Capacitance	Crss		-	38.8	-	
Turn on Delay Time	$t_{d(on)}$	V_{DD}=0.5BV_{DSS}, I_D=5.0A (MOSFET switching time are essentially independent of operating temperature)	-	-	60	nS
Rise Time	tr		-	-	150	
Turn Off Delay Time	$t_{d(off)}$		-	-	300	
Fall Time	tf		-	-	130	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	V_{GS}=10V, I_D=5.0A, V_{DS}=0.5BV_{DSS} (MOSFET switching time are essentially independent of operating temperature)	-	-	56	nC
Gate-Source Charge	Qgs		-	10.3	-	
Gate-Drain (Miller) Charge	Qgd		-	22.3	-	

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	V_{START}	-	14	15	16	V
Stop Threshold Voltage	V_{STOP}	After turn on	8.4	9	9.6	V
OSCILLATOR SECTION						
Initial Accuracy	F_{OSC}	**KA5L0565R**	45	50	55	kHz
Frequency Change With Temperature (2)	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	Dmax	**KA5L0565R**	72	77	82	%
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}	-	6.9	7.5	8.1	V
Shutdown Delay Current	I_{delay}	Ta=25°C, 5V ≤ Vfb ≤ V_{SD}	4.0	5.0	6.0	μA
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	1.76	2.00	2.24	A
PROTECTION SECTION						
Thermal Shutdown Temperature (Tj) (1)	T_{SD}	-	140	160	-	°C
Over Voltage Protection Voltage	V_{OVP}	-	25	27	29	V
TOTAL DEVICE SECTION						
Start Up Current	I_{START}	V_{CC}=14V	-	100	170	uA
Operating Supply Current (Control Part Only)	I_{OP}	Ta=25°C	-	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

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

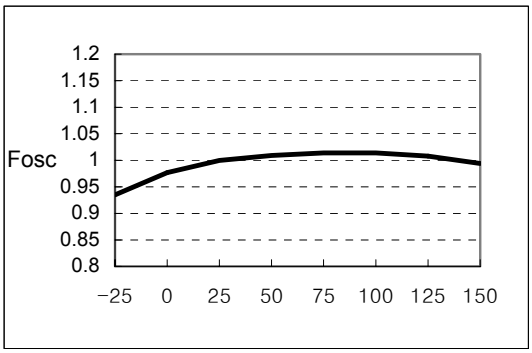


Figure 1. Operating Frequency

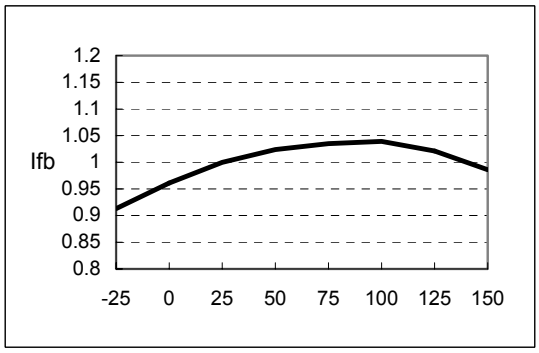


Figure 2. Feedback Source Current

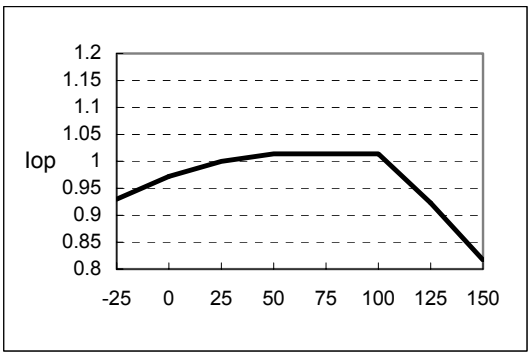


Figure 3. Operating Supply Current

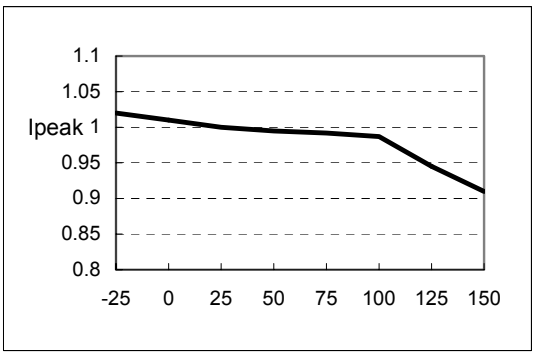


Figure 4. Peak Current Limit

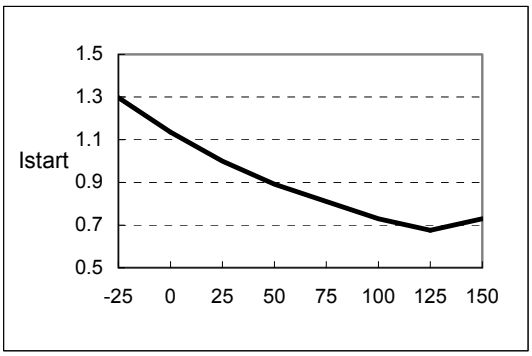


Figure 5. Start up Current

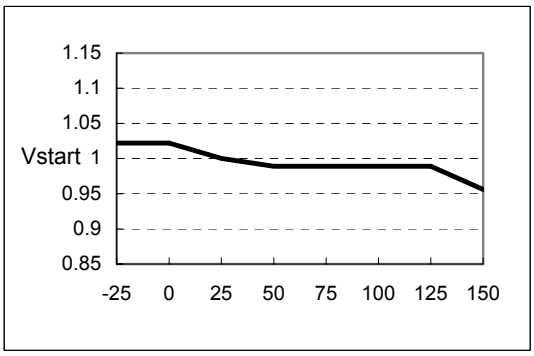


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

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

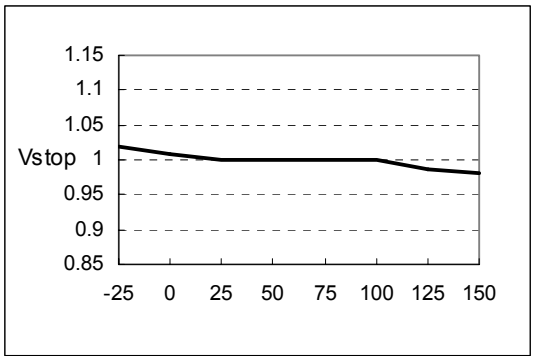


Figure 7. Stop Threshold Voltage

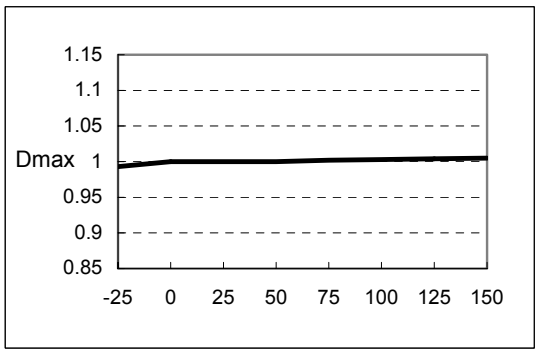


Figure 8. Maximum Duty Cycle

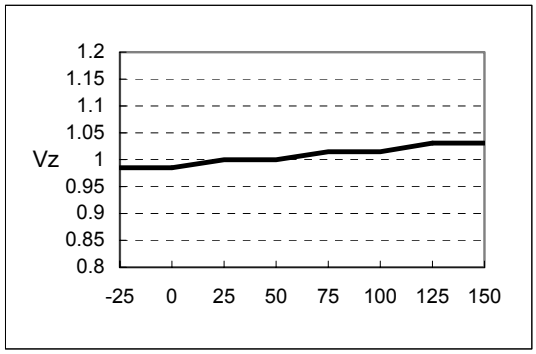


Figure 9. V_{CC} Zener Voltage

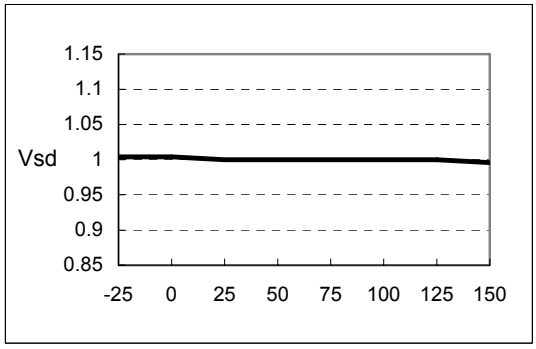


Figure 10. Shutdown Feedback Voltage

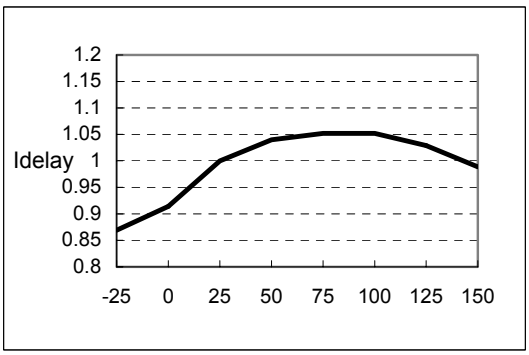


Figure 11. Shutdown Delay Current

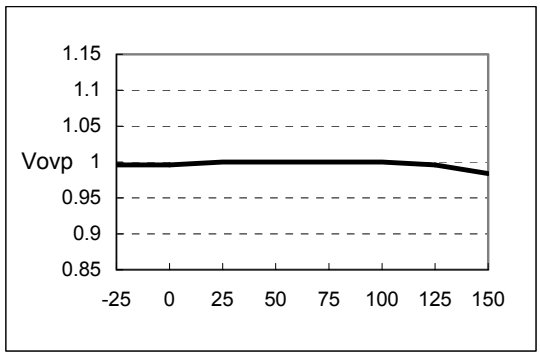


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

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

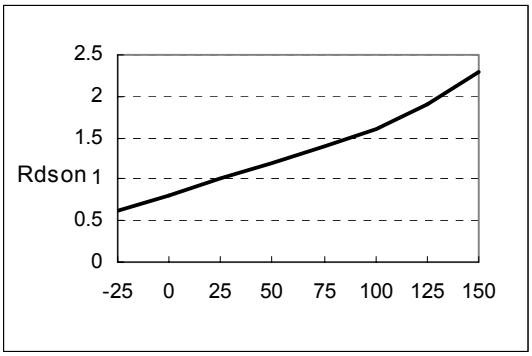
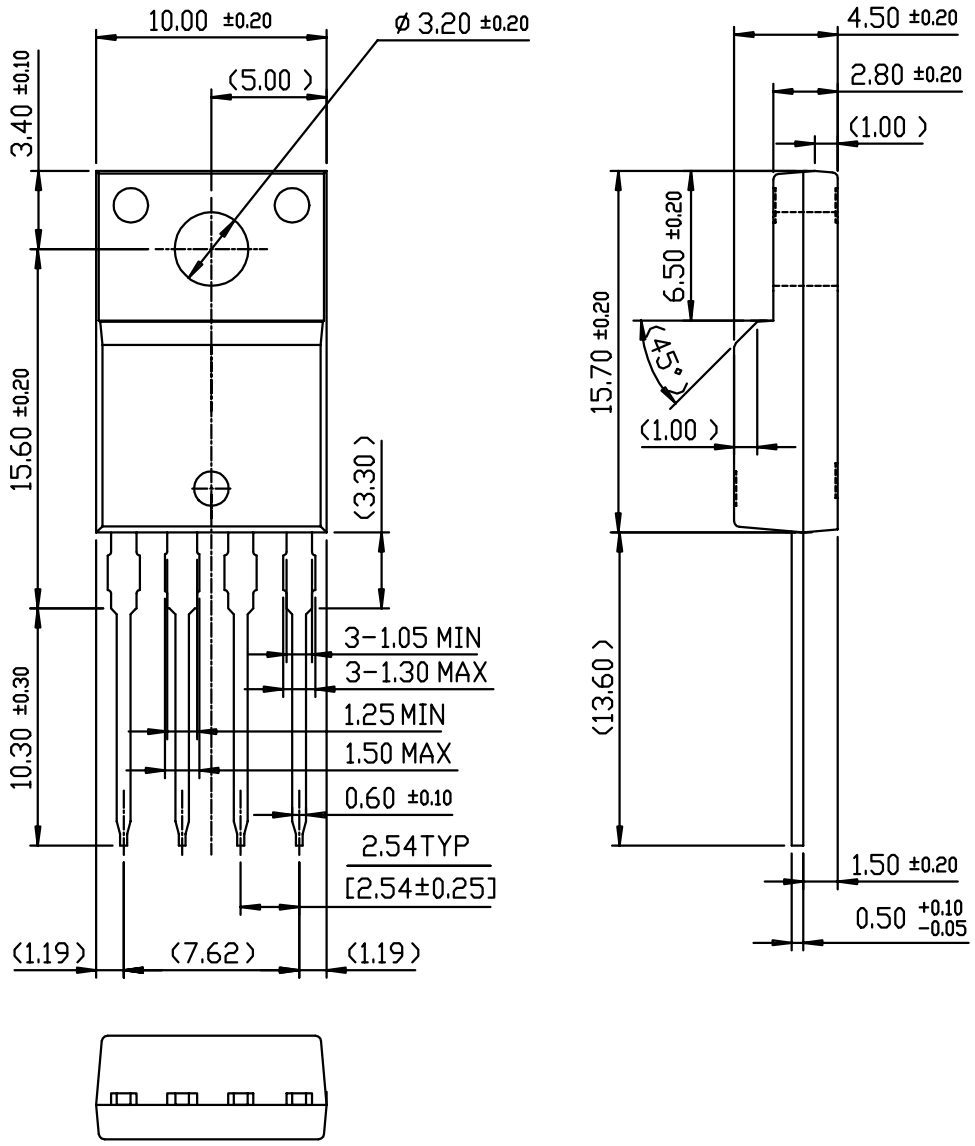


Figure 13. Static Drain-Source on Resistance

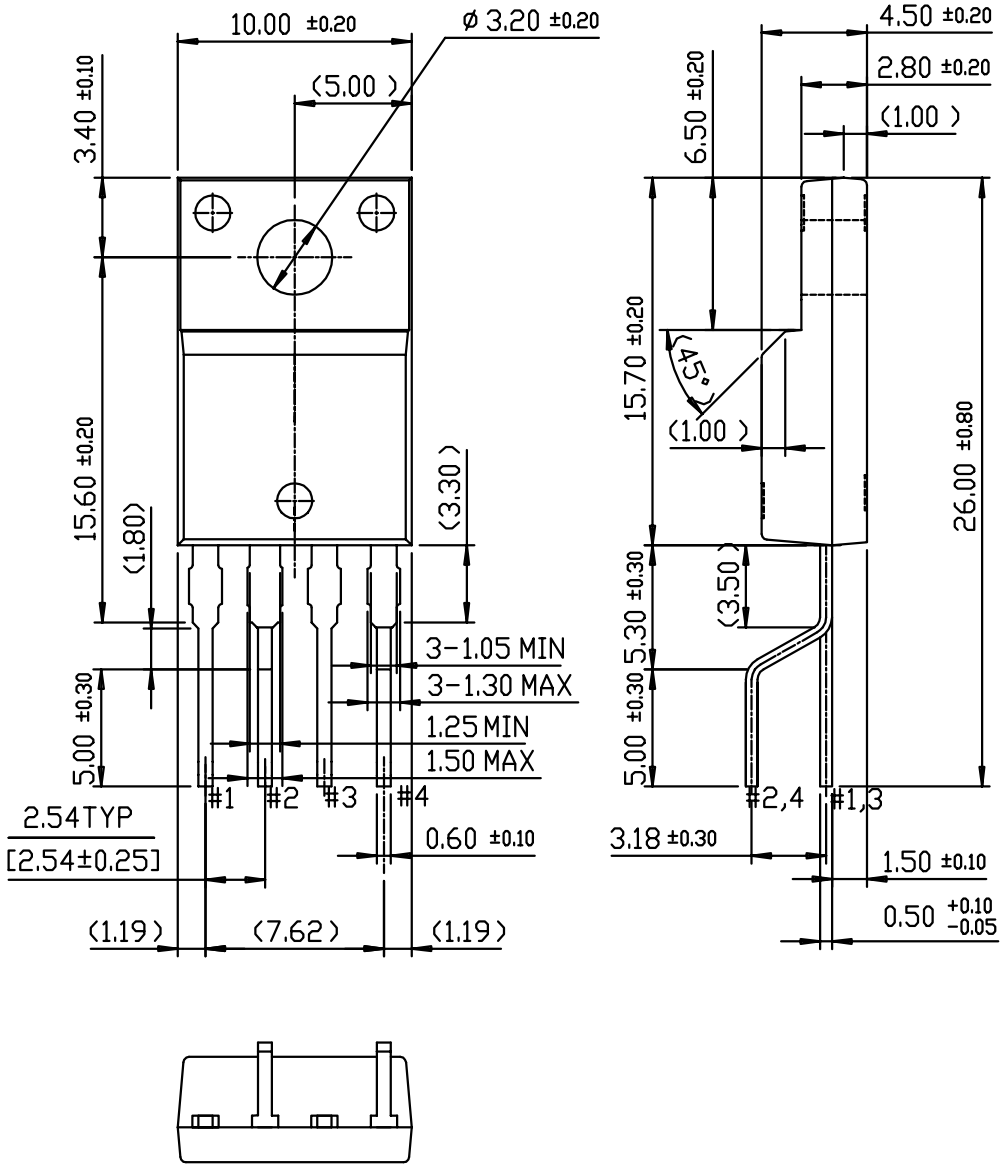
Package Dimensions

TO-220F-4L



Package Dimensions (Continued)

TO-220F-4L(Forming)



Ordering Information

Product Number	Package	Rating	Fosc
KA5L0565RTU	TO-220F-4L	650V, 5A	50kHz
KA5L0565RYDTU	TO-220F-4L(Forming)		

TU : Non Forming Type
YDTU : Forming Type