

FS6M12653RTC

Fairchild Power Switch(FPS)

Features

- Fixed Frequency
- Internal Burst Mode Controller for Stand-by Mode
- Pulse By Pulse Over Current Limiting
- Over Current Protection(Auto Restart Mode)
- Over Voltage Protection (Auto Restart Mode)
- Over Load Protection(Auto Restart Mode)
- Internal Thermal Shutdown Function(Latch Mode)
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Soft Start

Description

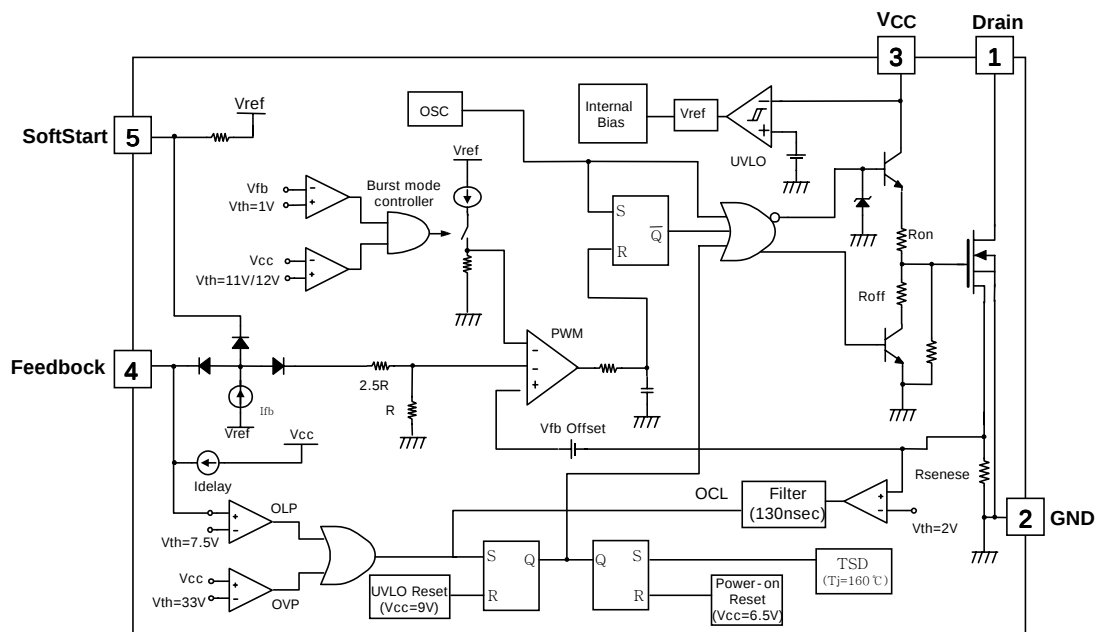
The Fairchild Power Switch(FPS) product family is specially designed for an off line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry. compared to discrete MOSFET and controller or RCC switching converter solution, a Fairchild Power Switch(FPS) can reduce 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 cost effective LCD monitor power supply.

TO-220F-5L



1. Drain 2. GND 3. VCC
4. Feedback 5. SoftStart

Internal Block Diagram



Rev.1.0.2

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Maximum Drain Voltage	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 ⁽¹⁾	I _{DM}	21.2	ADC
Continuous Drain Current (T _c = 25°C)	I _D	5.3	ADC
Continuous Drain Current (T _C =100°C)	I _D	3.4	ADC
Single Pulsed Avalanche Current ⁽³⁾ (Energy ⁽²⁾)	I _{AS} (EAS)	27(960)	A(mJ)
Maximum Supply Voltage	V _{CC, MAX}	35	V
Input Voltage Range	V _{FB}	−0.3 to V _{CC}	V
	V _{SS}	−0.3 to 10	V
Total Power Dissipation	P _D (Watt H/S)	50	W
	Darting	0.4	W/°C
Operating Junction Temperature	T _j	+150	°C
Operating Ambient Temperature	T _A	−25 to +85	°C
Storage Temperature Range	T _{STG}	−55 to +150	°C

Notes:

1. Repetitive rating: Pulse width limited by maximum junction temperature
2. L=81mH, starting T_j=25°C
3. L=13uH, 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 =250μA	650	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V	-	-	200	μA
		V _{DS} =520V V _{GS} =0V, T _C =125°C	-	-	300	μA
Static Drain-source On Resistance ⁽¹⁾	R _{DS(ON)}	V _{GS} =10V, I _D =1.8A	-	0.73	0.9	Ω
Forward Trans Conductance ⁽²⁾	g _{fs}	V _{DS} =50V, I _D =1.8A	-	-	-	S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f = 1MHz	-	1820	-	pF
Output Capacitance	C _{oss}		-	185	-	
Reverse Transfer Capacitance	C _{rss}		-	32	-	
Turn On Delay Time	t _{d(on)}	V _{DD} =325V, I _D =6.5A (MOSFET switching time are essentially independent of operating temperature)	-	38	-	nS
Rise Time	t _r		-	120	-	
Turn Off Delay Time	t _{d(off)}		-	200	-	
Fall Time	t _f		-	100	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =6.5A, V _{DS} =520V (MOSFET Switching time are Essentially independent of Operating temperature)	-	60	-	nC
Gate Source Charge	Q _{gs}		-	10	-	
Gate Drain (Miller) Charge	Q _{gd}		-	30	-	

Note:

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

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

Electrical Characteristics (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	VSTART	VFB = GND	14	15	16	V
Stop Threshold Voltage	VSTOP	VFB = GND	8	9	10	V
OSCILLATOR SECTION						
Initial Frequency	FOSC	-	63	70	77	kHz
Voltage Stability	FSTABLE	12V ≤ VCC ≤ 23V	0	1	3	%
Temperature Stability (2)	ΔFOSC	-25°C ≤ Ta ≤ 85°C	0	±5	±10	%
Maximum Duty Cycle	DMAX	-	75	80	85	%
Minimum Duty Cycle	DMIN	-	-	-	0	%
FEEDBACK SECTION						
Feedback Source Current	IFB	VFB = GND	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	VSD	VFB ≥ 6.9V	6.9	7.5	8.1	V
Shutdown Delay Current	IDELAY	VFB = 5V	3.2	4.0	4.8	μA
SOFTSTART SECTION						
Softstart Voltage	VSS	VFB = 2	4.7	5.0	5.3	V
Softstart Current	ISS	VSS = V	0.8	1.0	1.2	mA
BURST MODE SECTION						
Burst Mode Low Threshold Voltage	VBURL	VFB = 0V	10.4	11.0	11.6	V
Burst Mode High Threshold Voltage	VBURH	VFB = 0V	11.4	12.0	12.6	V
Burst Mode Enable Feedback Voltage	VBEN	VCC = 10.5V	0.7	1.0	1.3	V
Burst Mode Peak Current Limit (4)	IBURPK	VCC = 10.5V, VFB = 0V	0.46	0.6	0.74	A
Burst Mode Frequency	FBUR	VCC = 10.5V, VFB = 0V	63	70	77	KHz
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit (4)	I _{OVER}	-	2.82	3.2	3.58	A
PROTECTION SECTION						
Over Voltage Protection	VOVP	VCC ≥ 29V	29	33	37	V
Over Current Latch Voltage (3)	VOCL	-	1.8	2.0	2.2	V
Thermal Shutdown Temp (2)	TSD	-	140	160	-	°C
TOTAL DEVICE SECTION						
Start Up Current	ISTART	VFB = GND, VCC = 14V	-	0.1	0.17	mA
Operating Supply Current (1)	IOP	VFB = GND, VCC = 16V	-	10	15	mA
	IOP(MIN)	VFB = GND, VCC = 12V				
	IOP(MAX)	VFB = GND, VCC = 30V				

Notes:

1. These parameters are the current flowing in the Control IC.
2. These parameters, although guaranteed at the design, are not 100% tested in production.
3. These parameters, although guaranteed, are tested in EDS(wafer test) process.
4. These parameters indicate Inductor current.

Typical Performance Characteristics

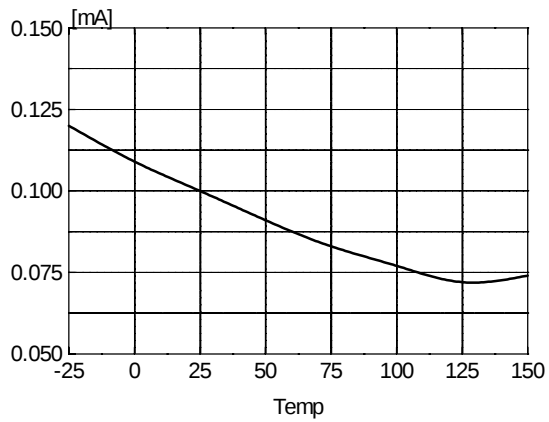


Figure 1. Start Up Current vs. Temp

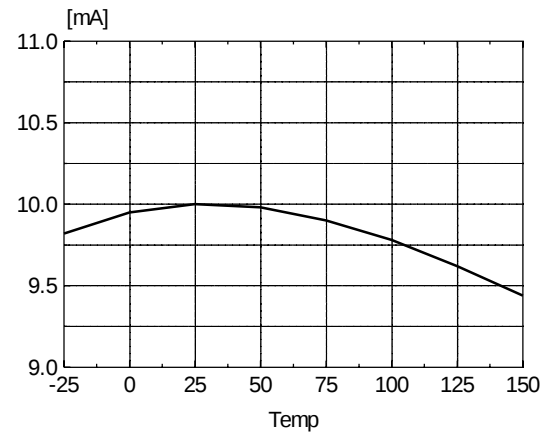


Figure 2. Operating Current vs. Temp

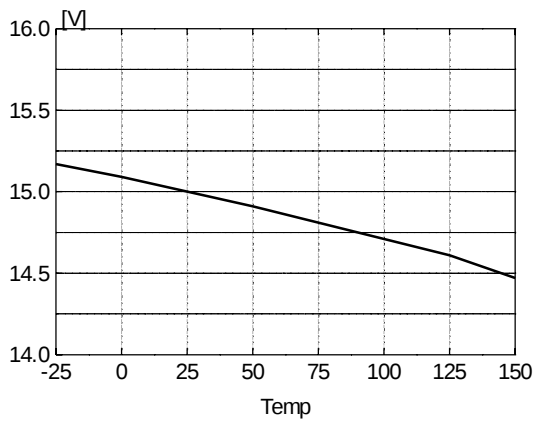


Figure 3. Start Threshold Voltage vs. Temp

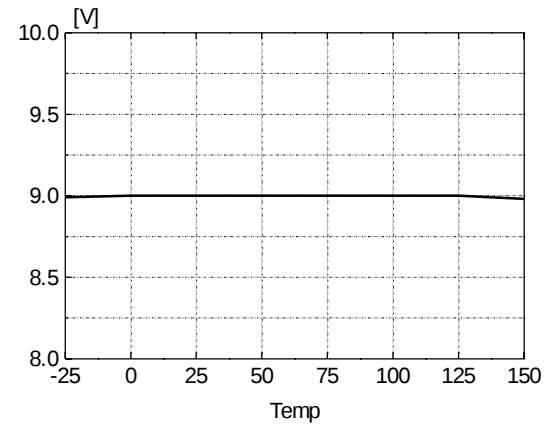


Figure 4. Stop Threshold Voltage vs. Temp

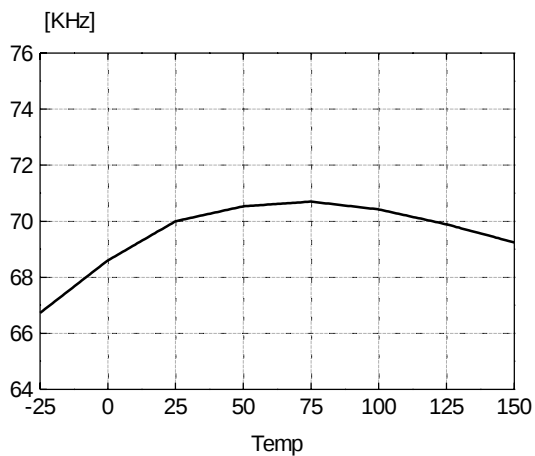


Figure 5. Initial Frequency vs. Temp

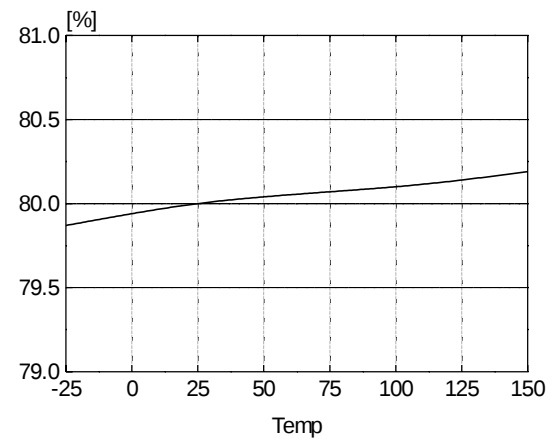


Figure 6. Maximum Duty vs. Temp

Typical Performance Characteristics (Continued)

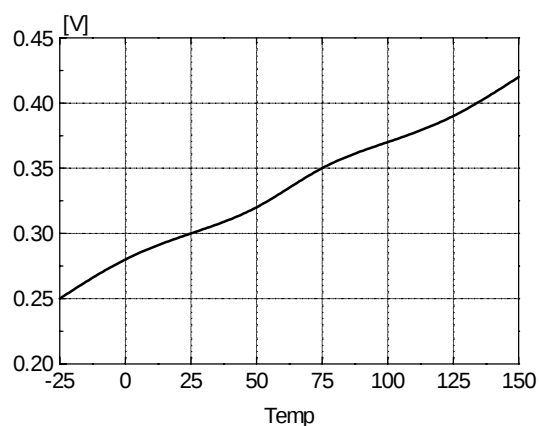


Figure 7. Feedback Offset Voltage vs. Temp

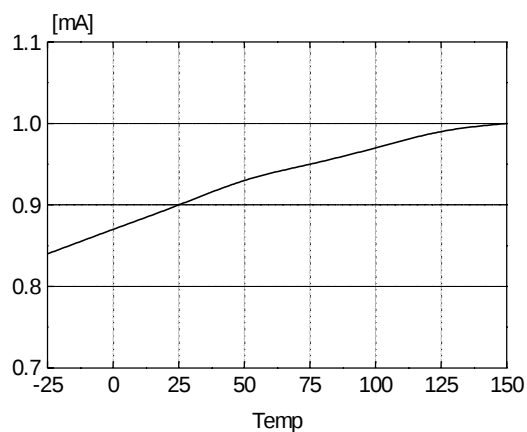


Figure 8. Feedback Source Current vs. Temp

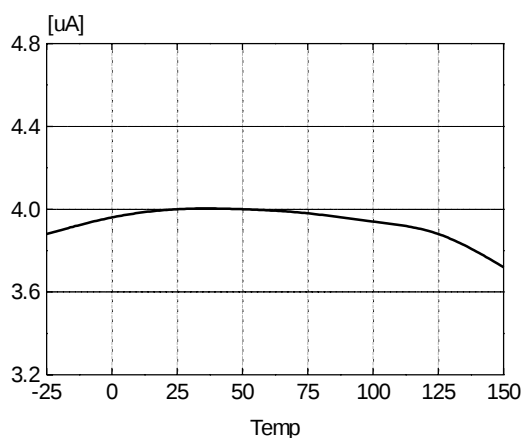


Figure 9. ShutDown Delay Current vs. Temp

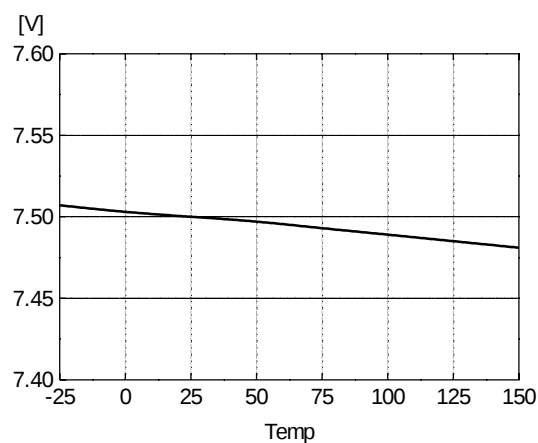


Figure 10. ShutDown Feedback Voltage vs. Temp

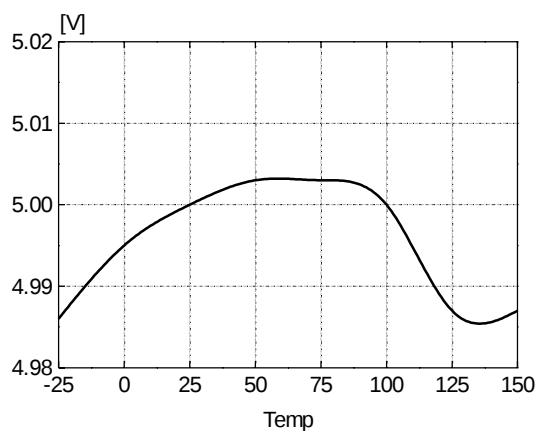


Figure 11. Softstart Voltage vs. Temp

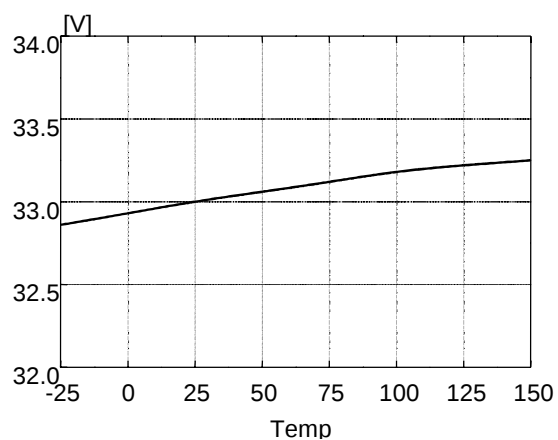


Figure 12. Over Voltage Protection vs. Temp

Typical Performance Characteristics (Continued)

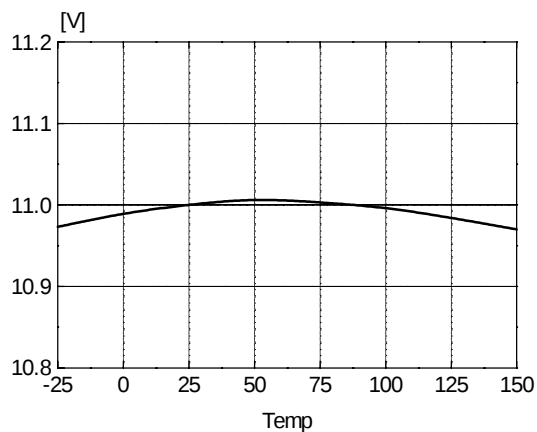


Figure 13. Burst Mode Low Voltage vs. Temp

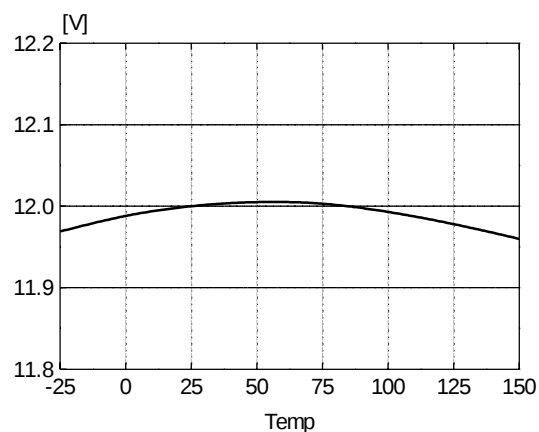


Figure 14. Burst Mode High Voltage vs. Temp

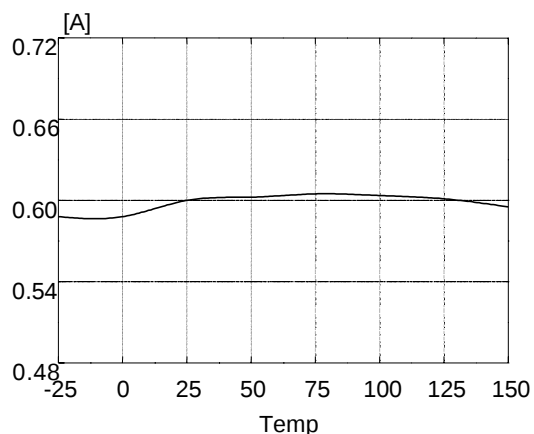


Figure 15. Burst Mode Peak Current vs. Temp

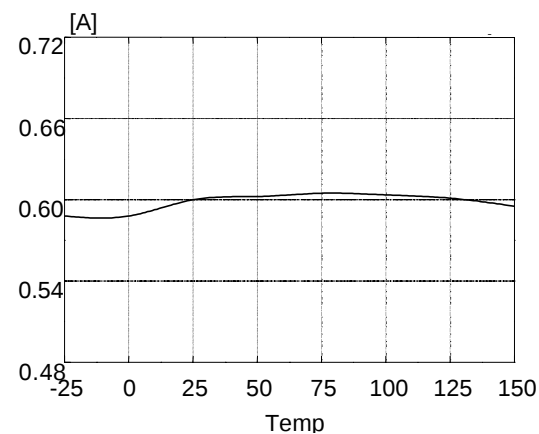


Figure 16. Burst Mode Peak Current vs. Temp

Technical drawing of a mechanical part showing three views: front, side, and top.

Front View Dimensions:

- Overall width: 10.16 ± 0.20
- Overall height: 16.04 ± 0.20
- Top flange width: 7.00
- Top flange height: 5.40
- Central circular feature diameter: $\phi 3.18 \pm 0.10$
- Four smaller circular features: $(2-\phi 1.00)$
- Distance from top flange to center of circular features: 6.50
- Distance from top flange to center of circular features: 1.80
- Distance from top flange to center of circular features: 1.50
- Distance from top flange to center of circular features: 1.01
- Distance from top flange to center of circular features: 0.80 TYP
- Distance from top flange to center of circular features: 1.10 TYP
- Distance from top flange to center of circular features: $2-1.30$ MAX
- Distance from top flange to center of circular features: $3-1.00$ MAX
- Distance from top flange to center of circular features: $5-0.60 \pm 0.10$
- Distance from top flange to center of circular features: 30°
- Distance from top flange to center of circular features: $\#1$
- Distance from top flange to center of circular features: (0.35)
- Distance from top flange to center of circular features: 2.54 ± 0.20
- Distance from top flange to center of circular features: $3-1.50 \pm 0.20$

Side View Dimensions:

- Overall height: 15.87 ± 0.20
- Distance from top flange to center of circular features: 6.68 ± 0.20
- Distance from top flange to center of circular features: 2.54 ± 0.20
- Distance from top flange to center of circular features: (0.70)
- Distance from top flange to center of circular features: $(1.00 \times 45^\circ)$
- Distance from top flange to center of circular features: $0.50^{+0.10}_{-0.05}$
- Distance from top flange to center of circular features: 2.76 ± 0.20

Top View Dimensions:

- Overall width: 9.40 ± 0.20
- Overall height: 4.70 ± 0.20

Ordering Information

Product Number	Package	Marking Code	BVdss	Rds(on)
FS6M12653RTC-TU	TO-220F-5L	6M12653R C	650V	0.7
FS6M12653RTC-YDT	TO-220F-5L(Forming)			

TU : Non Forming Type

YDT : 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.