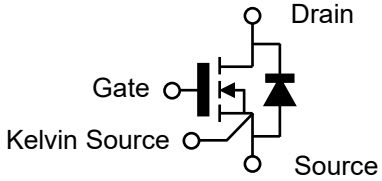
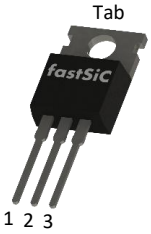
Silicon Carbide MOSFET

650V, 65mΩ SiC MOSFET – Falcon Series

Product Information:





TO-220-3L

TO-220FP-3L

Features

- Optimized $R_{DS(on)}$ with Rapid Switching Behavior
- Compatible with Standard Gate Drivers
- High Avalanche Endurance Capability
- Optimized for High Power Density Applications
- RoHS Compliant and Halogen Free

Terminal	Packaging Type	
	TO-220-3L	TO-220FP-3L
Gate	1	1
Drain	2, Tab	2
Source	3	3
Kelvin Source	--	--

Benefits

- Higher System Efficiency
- Increase Parallel Device Convenience
- Enable High Temperature Application
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems
- High Reliability

Potential Applications

- Switching Mode Power Supply
- PFC & DC/DC Converter
- Portable Adaptor
- EV On Board Charger
- Renewable Energy
- Power Inverter & Motor Driver

Key Performance Parameters

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS} @$T_{j(max)}$	700	V
Recommended Gate-Source Turn-On Voltage	V_{GS}	12~18	
Drain-Source On-State Resistance	$R_{DS(on)}$	65	mΩ
Continuous Drain Current	I_D	20	A
Pulse Drain Current	$I_{D,\ pulse}$		
Power Dissipation – TO-220-3L	P_{tot}	175	W
Power Dissipation – TO-220FP-3L	P_{tot}	65	
Avalanche Energy	E_{AS}	250	mJ
Gate Charge	Q_G	27.8	nC
Output Capacitive Charge	Q_{oss}	30.4	
Junction & Storage Temperature	T_j, T_{stg}	-55 to 175	°C

Part Number	Package	Marking
FF06080M2C	TO-220-3L	FF06080M2
FF06080M2D	TO-220FP-3L	FF06080M2

For further information about comparable products, please contact (www.fastsic.com).

Maximum Ratings: (T_j = 25°C, unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Drain-Source Voltage	V_{DSS}	650	--	--	V	V_{GS}=0V, I_D=100μA
Continuous Drain Current	I_D	--	20 10	--	A	V_{GS}=15V, T_C=25°C, TO-220-3L V_{GS}=15V, T_C=100°C, TO-220-3L
Continuous Drain Current	I_D	--	12 5	--		V_{GS}=15V, T_C=25°C, TO-220FP-3L V_{GS}=15V, T_C=100°C, TO-220FP-3L
Pulse Drain Current	$I_{D,\ pulse}$	--	TBD	--		Per SOA
Continuous Body Diode Current	I_S	--	15	--		V_{GS}=0V, T_C=25°C
Avalanche Energy, Single Pulse	E_{AS}	--	--	250	mJ	L=25mH
Operate Gate Source Voltage	$V_{GS,\ op}$	-8~0	--	12~18	V	Recommended operating values
Transient Gate Source Voltage	$V_{GS,\ tran.}$	-9	--	19		Transient operating limit (AC f > 1Hz, pulse width < 100ns)
Power Dissipation	P_{tot}	--	175	--	W	T_c=25°C, TO-220-3L
Power Dissipation	P_{tot}	--	65	--		T_c=25°C, TO-220FP-3L
Junction Temperature	T_j	-55	--	175	°C	--
Storage Temperature	T_{stg}	-55	--	175		
Soldering Temperature	T_L	--	--	260		

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
DC Characteristics (at T_j = 25°C, unless otherwise specified)						
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	650	--	--	V	V_{GS}=0V, I_D=1mA, T_j=25°C
Drain-Source On-State Resistance	$R_{DS(on)}$	-- -- --	94 75 65	-- -- --	mΩ	V_{GS}=12V, I_D=8A, T_j=25°C V_{GS}=15V, I_D=8A, T_j=25°C V_{GS}=18V, I_D=8A, T_j=25°C
Gate-Source Threshold Voltage	V_{th}	--	2.5	--	V	V_{GS}=V_{DS}, I_D=8mA
Zero Gate Voltage Drain Current	I_{DSS}	--	1	1000	μA	V_{DS}=650V, V_{GS}=0V, T_j=25°C
Gate-Source Leakage Current	I_{GSS}	--	--	100	nA	V_{GS}=15V, V_{DS}=0V
Body Diode Forward Voltage	V_{SD}	-- --	2.65 2.45	-- --	V	V_{GS}=0V, I_S=4A, T_j=25°C V_{GS}=0V, I_S=4A, T_j=175°C
AC Characteristics (at T_j = 25°C, unless otherwise specified)						
Input Capacitance	C_{iss}	--	1030	--	pF	V_{DS}=400V, V_{GS}=0V, f=250kHz, V_{AC}=25mV
Output Capacitance	C_{oss}	--	48	--		
Reverse Capacitance	C_{rss}	--	3.2	--		
Effective Output Capacitance, energy related	$C_{o(er)}$[1]	--	65	--		
Effective Output Capacitance, time related	$C_{o(tr)}$[2]	--	85	--		
C_{oss} Stored Energy	E_{oss}	--	4	--	μJ	
Output Capacitive Charge	Q_{oss}	--	30.4	--	nC	
Internal Gate Resistance	$R_{G,\ int.}$	--	5.5	--	Ω	f=1MHz, V_{AC}=25mV

[1] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V.
[2] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V.

Switching Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Gate Characteristics						
Gate to Source Charge	Q_{GS}	--	7.4	--	nC	V_{DS}=400V, V_{GS}=0V/15V, I_D=8A
Gate to Drain Charge	Q_{GD}	--	8.3	--		
Total Gate Charge	Q_G	--	27.8	--		
Turn On Delay Time	$t_{d(on)}$	--		--	ns	V_{DS}=400V, I_D=8A, V_{GS}=-3/+15V, $R_{G,\ ext.}$= 4.7Ω FWD=Self
Rise Time	t_r	--		--		
Turn Off Delay Time	$t_{d(off)}$	--		--		
Fall Time	t_f	--		--		
Turn On Switching Energy	E_{on}	--	40	--	µJ	
Turn Off Switching Energy	E_{off}	--	6	--		
Body Diode Characteristics						
Reverse Recovery Charge	Q_{rr}	--	46.2	--	nC	V_{GS}=0V, I_S=8A, V_{DS}=400V, di/dt=--A/µs *Q_{rr} herein excluded the Q_{oss} value.
Reverse Recovery Time	t_{rr}	--		--	ns	
Peak Reverse Recovery Current	I_{rrm}	--		--	A	

Thermal Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Thermal Impedance, junction-case	$R_{th\text{-}jc}$	--	0.85	--	K/W	TO-220-3L
Thermal Impedance, junction-case	$R_{th\text{-}jc}$	--	2.30	--		TO-220FP-3L
Thermal Impedance, junction-ambient	$R_{th\text{-}ja}$	--	40	--		Device on PCB, with 6 cm² of cooling area

Revision History

Date	Revision	Changes
2026.02	Tentative	First issue. All data is the target spec.

Important Note (Disclaimer)

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