

Silicon Carbide MOSFET
750V, 300mΩ SiC MOSFET – Falcon M2 Series



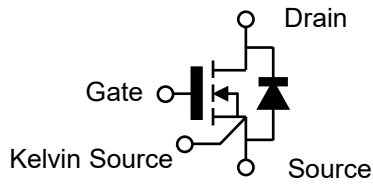
Features

- 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

Potential Applications


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

Product Information:



Benefits

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

Product Information	Packaging Type
	TO-220FP-3L
	 1 2 3
Gate	1
Drain	2
Source	3
Kelvin Source	--
Part Number	FF07300D
Marking	FF07300
Continuous Drain Current	8A
Power Dissipation	45W

Key Performance Parameters

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS @ T_{j(max)}}$	750	V
Recommended Gate-Source Turn-On Voltage	V_{GS}	12~15	
Drain-Source On-State Resistance	$R_{DS(on)}$	300	mΩ
Pulse Drain Current	$I_{D, pulse}$	12	A
Avalanche Energy	E_{AS}	40	mJ
Gate Charge	Q_G	10.6	nC
Output Capacitive Charge	Q_{oss}	9.9	
Junction & Storage Temperature	T_j, T_{stg}	-55 to 175	°C

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}	750	--	--	V	$V_{GS}=0V, I_D=1mA$
Continuous Drain Current	I_D	--	--	8 6	A	By package type ¹ $V_{GS}=15V, T_C=25°C$ $V_{GS}=15V, T_C=100°C$ $V_{GS}=0V, T_C=25°C$
Continuous Body Diode Current	I_S	--	--	6		
Pulse Drain Current	$I_{D,pulse}$	--	--	12		
Avalanche Energy, Single Pulse	E_{AS}	--	--	40	mJ	$L=25mH$
Operate Gate Source Voltage	$V_{GS,op}$	-8	--	12~15	V	Recommended operating values
Transient Gate Source Voltage	$V_{GS,tran.}$	-9	--	19		Transient operating limit (AC f > 1Hz, pulse width < 100ns)
Junction Temperature	T_j	-55	--	175	°C	
Storage Temperature	T_{stg}	-55	--	175		
Soldering Temperature	T_L	--	--	260		

¹ Per figure section 2~6

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
DC Characteristics (at T_j = 25°C, unless otherwise specified)						
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	750	--	--	V	$V_{GS}=0V, I_D=1mA, T_j=25°C$
Drain-Source On-State Resistance	$R_{DS(on)}$	--	300	--	mΩ	$V_{GS}=15V, I_D=2A, T_j=25°C$
		--	433	--		$V_{GS}=15V, I_D=2A, T_j=175°C$
		--	390	--		$V_{GS}=12V, I_D=2A, T_j=25°C$
		--	472	--		$V_{GS}=12V, I_D=2A, T_j=175°C$
Gate-Source Threshold Voltage	V_{th}	--	2.5	--	V	$V_{GS}=V_{DS}, I_D=1mA$
Zero Gate Voltage Drain Current	I_{DSS}	--	<1	1000	μA	$V_{DS}=750V, V_{GS}=0V, T_j=25°C$
Gate-Source Leakage Current	I_{GSS}	--	--	100	nA	$V_{GS}=15V, V_{DS}=0V$
Body Diode Forward Voltage	V_{SD}	--	2.8	--	V	$V_{GS}=0V, I_S=1A, T_j=25°C$
		--	4.1	--		$V_{GS}=0V, I_S=1A, T_j=175°C$

AC Characteristics (at T_j = 25°C, unless otherwise specified)

Input Capacitance	C_{iss}	--	284.3	--	pF	$V_{DS}=400V, V_{GS}=0V,$ $f=250kHz, V_{AC}=25mV$	
Output Capacitance	C_{oss}	--	13.5	--			
Reverse Capacitance	C_{rss}	--	1.4	--			
Effective Output Capacitance, energy related	$C_{o(er)}$ ¹	--	17.2	--			
Effective Output Capacitance, time related	$C_{o(tr)}$ ²	--	24.8	--			
C_{oss} Stored Energy	E_{oss}	--	1.4	--			μJ
Output Capacitive Charge	Q_{oss}	--	9.9	--			nC
Internal Gate Resistance	$R_{G,int.}$	--	7.0	--	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}	--	2.2	--	nC	$V_{DS}=400V, V_{GS}=0V/+15V, I_D=2A$
Gate to Drain Charge	Q_{GD}	--	4.2	--		
Total Gate Charge	Q_G	--	10.6	--		
Inductive Load						
Turn On Delay Time	$t_{d(on)}$	--	TBD	--	nC	
Rise Time	t_r	--	TBD	--		
Turn Off Delay Time	$t_{d(off)}$	--	TBD	--		
Fall Time	t_f	--	TBD	--		
Turn On Switching Energy	E_{on}	--	TBD	--		
Turn Off Switching Energy	E_{off}	--	TBD	--		
Body Diode Characteristics						
Forward Recovery Charge	Q_{fr}	--	TBD	--	nC	
Forward Recovery Time	t_{fr}	--	TBD	--	ns	
Peak Forward Recovery Current	I_{frm}	--	TBD	--	A	

¹ Test are based on TO-220-3L PKG

Thermal Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Thermal Impedance, junction-case	R_{th-jc}	--	3.29	--	K/W	TO-220FP-3L
Thermal Impedance, junction-ambient	R_{th-ja}	--	40	--		Device on PCB, with 6 cm ² of cooling area

1. Electrical Characteristics Diagrams

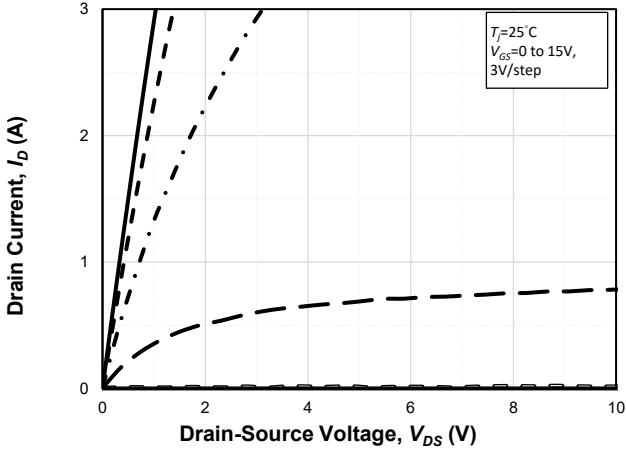


Fig. 1-1 Typical Output Characteristics at $T_j=25^\circ\text{C}$

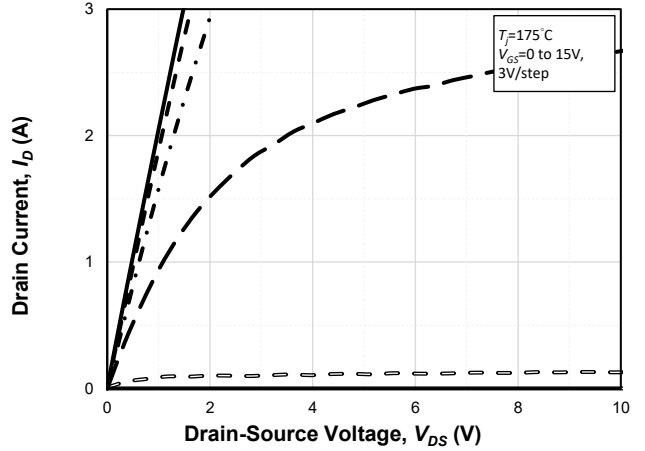


Fig. 1-2 Typical Output Characteristics at $T_j=175^\circ\text{C}$

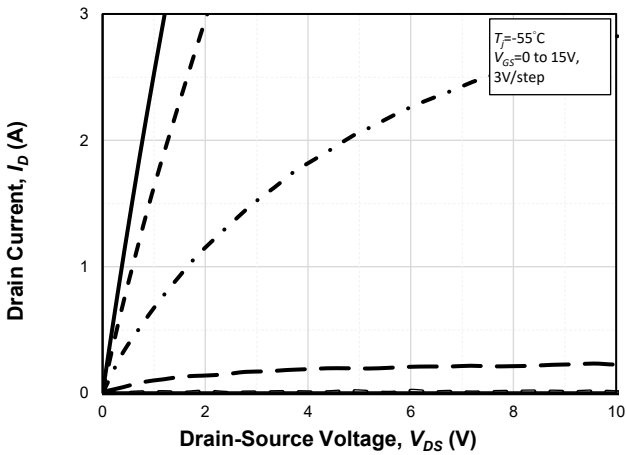


Fig. 1-3 Typical Output Characteristics at $T_j=-55^\circ\text{C}$

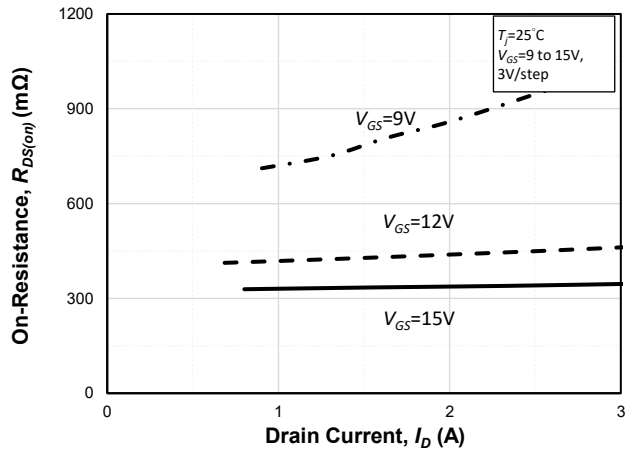


Fig. 1-4 Typ. $R_{DS(on)}$ vs. I_D with Various V_{GS}

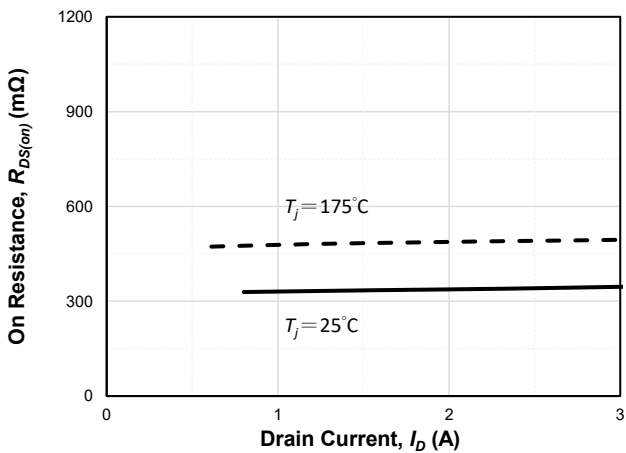


Fig. 1-5 Typ. $R_{DS(on)}$ vs. I_D with Various T_j , $V_{GS}=15\text{V}$

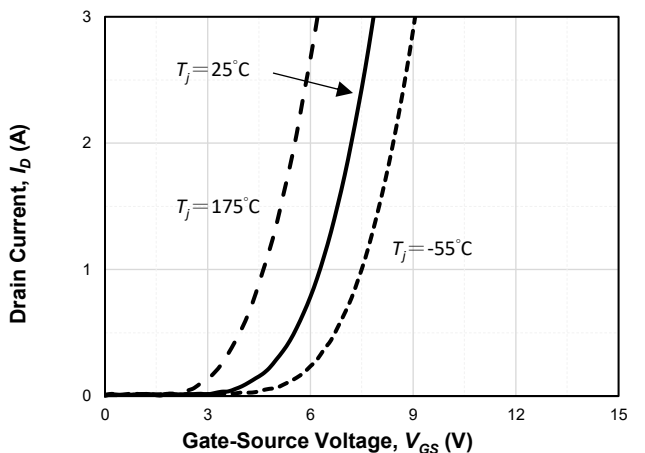


Fig. 1-6 Typ. I_D vs. V_{GS} with Various T_j , $V_{DS}=10\text{V}$

1. Electrical Characteristics Diagrams

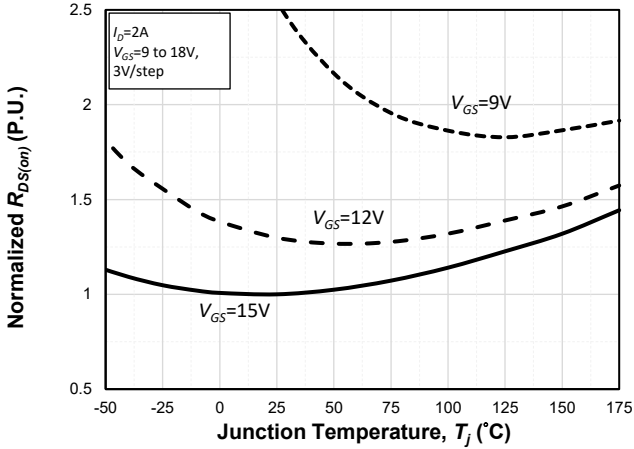


Fig. 1-7 Normalized $R_{DS(on)}$ vs. T_j with Various V_{GS}

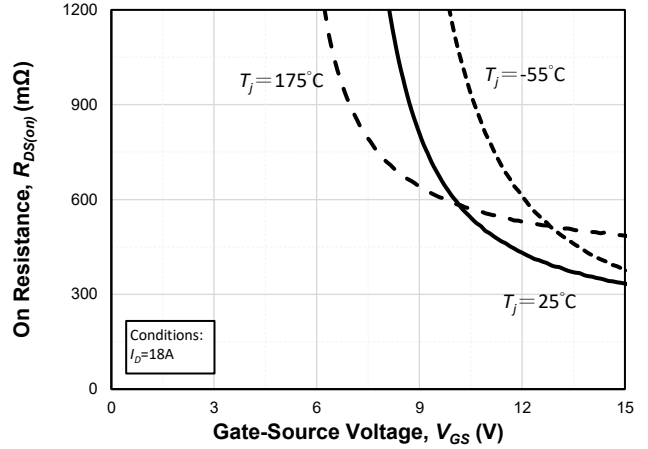


Fig. 1-8 Typ. $R_{DS(on)}$ vs. V_{GS} with Various T_j

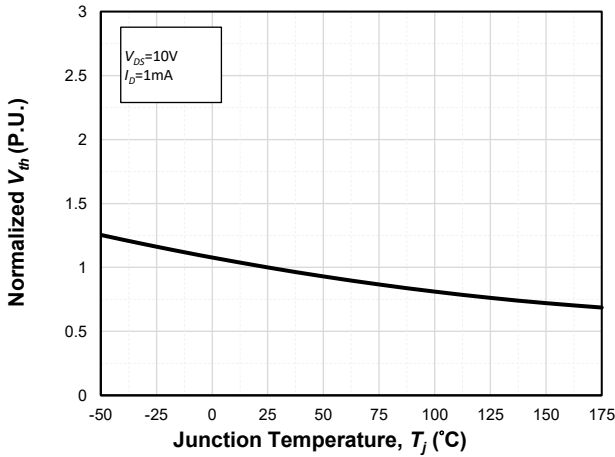


Fig. 1-9 Normalized V_{th} vs. T_j

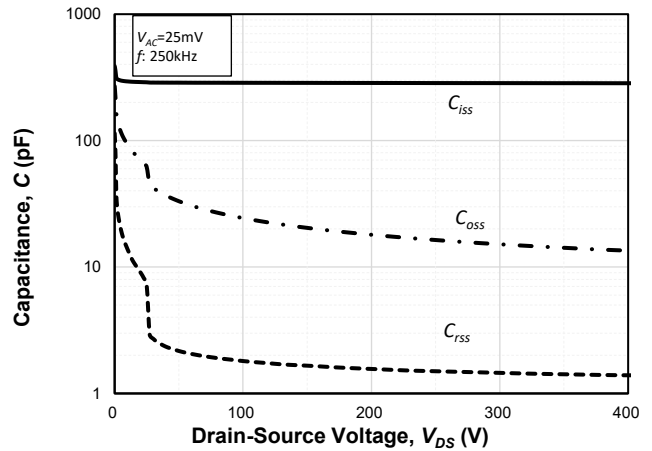


Fig. 1-10 Typ. Capacitance vs. V_{DS} at $f_{sw}=250kHz$

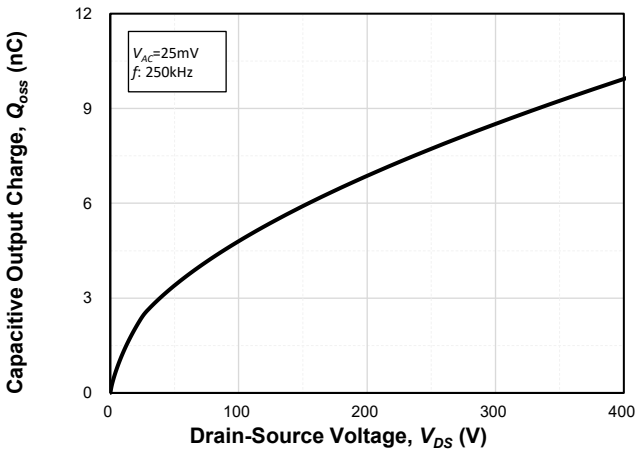


Fig. 1-11 Typ. Capacitive Output Charge at $f_{sw}=250kHz$

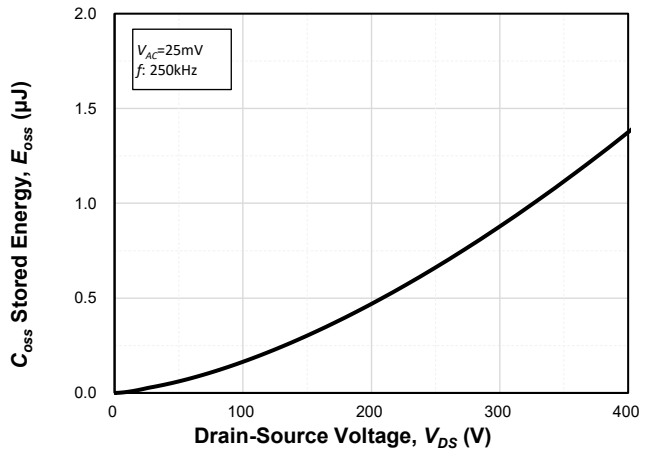


Fig. 1-12 Typ. C_{oss} Stored Energy at $f_{sw}=250kHz$

1. Electrical Characteristics Diagrams

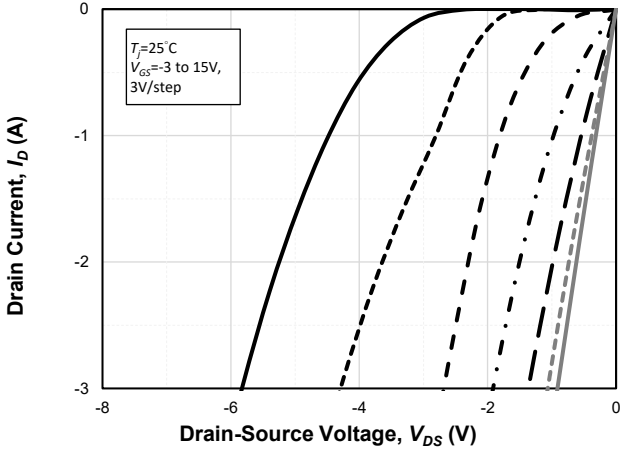


Fig. 1-13 Typical Forward Characteristics of Reverse Conduction at $T_j = 25^\circ\text{C}$

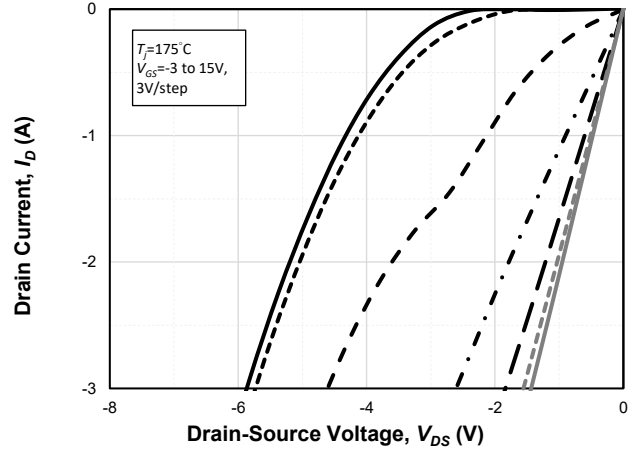


Fig. 1-14 Typical Forward Characteristics of Reverse Conduction at $T_j = 175^\circ\text{C}$

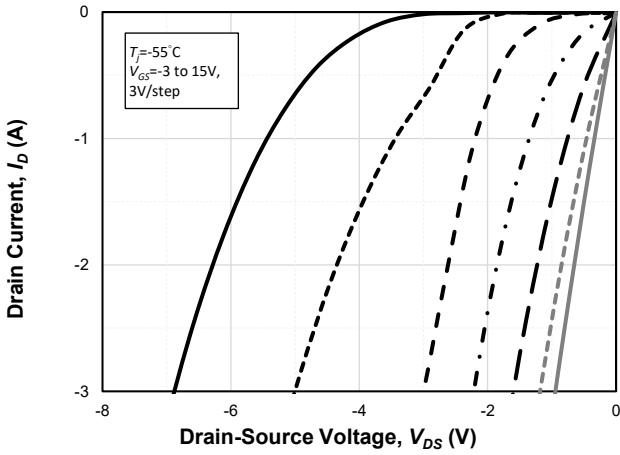


Fig. 1-15 Typical Forward Characteristics of Reverse Conduction at $T_j = -55^\circ\text{C}$

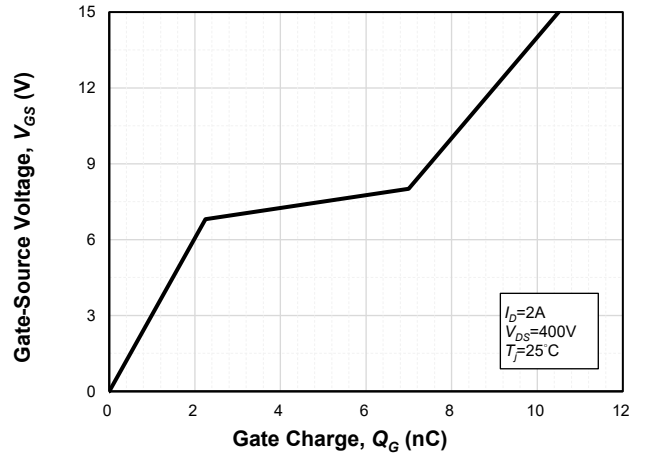


Fig. 1-16 Typ. Gate Charge

2. Drain Power Dissipation

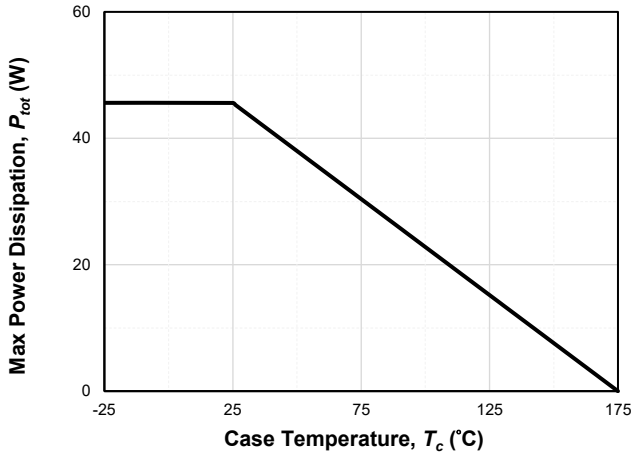


Fig. 2-1 Power Dissipation at $V_{GS}=15V$, $T_j \leq 175^\circ C$
(TO-220FP-3L)

3. Drain Current Dissipation

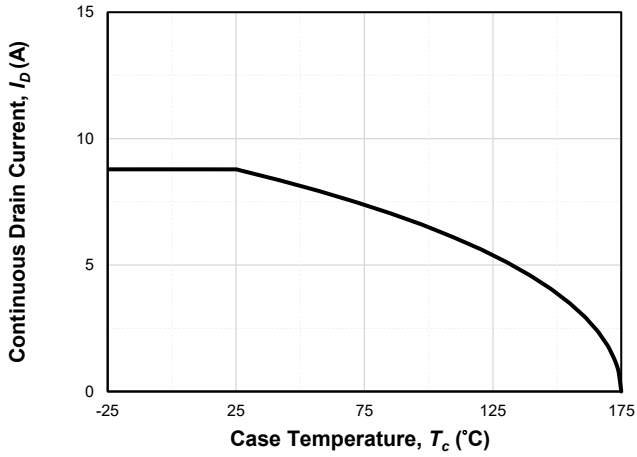


Fig. 3-1 Current Dissipation at $V_{GS}=15V$, $T_j \leq 175^\circ C$
(TO-220FP-3L)

4. Body Diode Current Dissipation

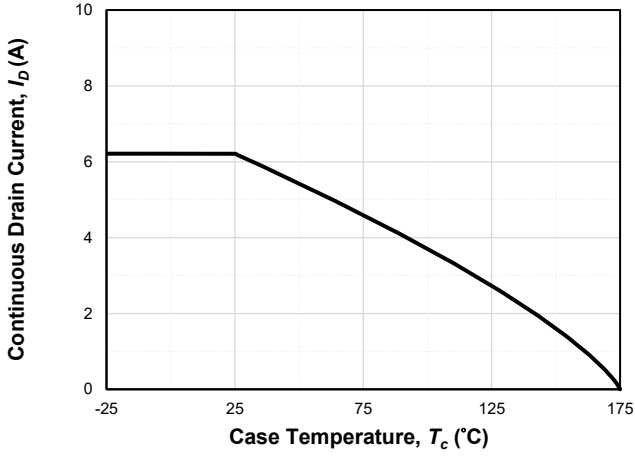


Fig. 4-1 Body Diode Current Dissipation at $V_{GS}=0V$, $T_j \leq 175^\circ C$
(TO-220FP-3L)

5. Thermal Impedance

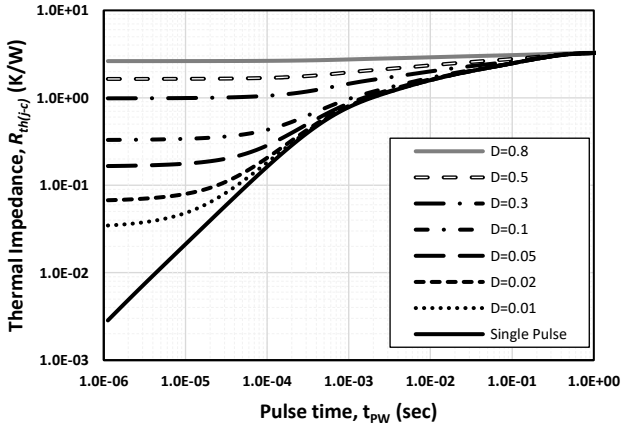


Fig. 5-1 Typ. Transient Thermal Impedance R_{th-jc}
(TO-220FP-3L)

6. Safe Operating Area (25°C)

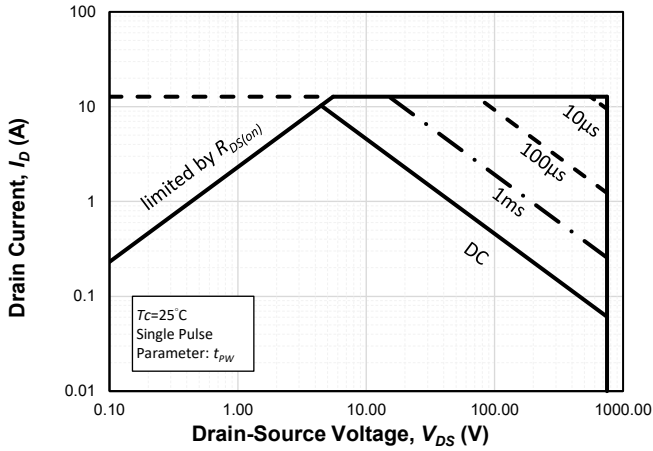


Fig. 6-1 Safe Operating Area at $T_c=25^\circ\text{C}$
(TO-220FP-3L)

7. Safe Operating Area (100°C)

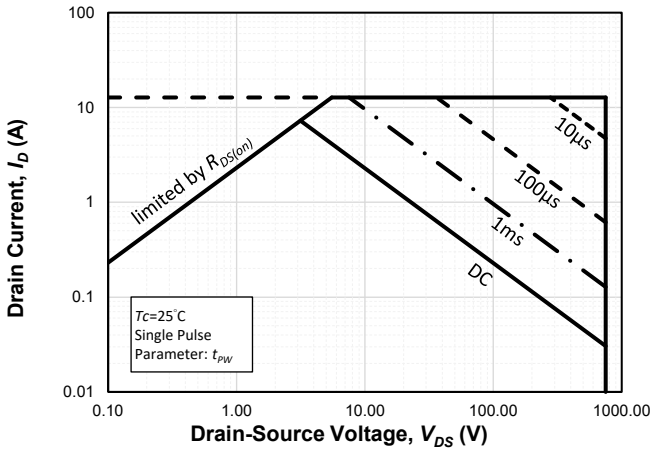


Fig. 7-1 Safe Operating Area at $T_c=100^\circ\text{C}$ (TO-220FP-3L)

Revision History

Date	Revision	Changes
26.02	Tentative	1 st issue

Important Note (Disclaimer)

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