P-Channel 20V (D-S) MOSFET With Schottky Diode

General Description

This miniature surface mount MOSFET uses advanced Trench process,low $R_{DS(ON)}$ assures minimal power loss and energy conversion, which makes this device ideal for use in power management circuit.

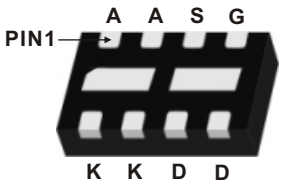
Applications

Charging Switch For Portable Devices

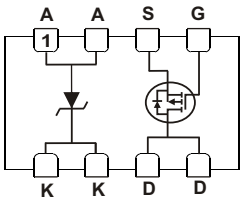
Features

MOSFET
- V_{DS} (V) = −20V
- I_D(A) = −3. 9A (V_{GS} = −4. 5V)
- $R_{DS(on)}$ = 110 mΩ@ V_{GS} = −4. 5V
- $R_{DS(on)}$ = 145 mΩ@ V_{GS} = −2. 5V
- $R_{DS(on)}$ = 175 mΩ@ V_{GS} = −1. 8V

Schottky Diode
- V_R (V) = 20V
- I_F(A) = 1. 5A
- $V_{F(TYP)}$ = 0.41 V@ 0. 5A



DFN 2×3×0. 75(mm)



Schottky Diode P-channel Mosfet

Absolute Maximum Ratings (T_A = 25℃ Unless Otherwise Noted)

Parameter		Value	Units
Drain-Source Voltage (MOSFET)		−20	V
Reverse Voltage (Schottky)		20	
Gate-Source Voltage (MOSFET)		±8	
Continuous Drain Current(T_J=150°C)(MOSFET)[a]	T_A=25°C	−3. 9	A
	T_A=70°C	−3. 1	
Pulsed Drain Current (MOSFET)		−16	
Continuous Source Current (MOSFET Diode Conduction)[a]		−3. 0	
Average Foward Current (Schottky)[a]		1. 5	
Pulsed Foward Current (Schottky)[a]		6. 0	
Maximum Power Dissipation (MOSFET)[a] Power dissipation for single operation	T_A=25°C	2. 3	W
	T_A=70°C	1. 45	
Maximum Power Dissipation (Schottky)[a] Power dissipation for single operation	T_A=25°C	1.4	
	T_A=70°C	0.9	
Operating Junction and Storage Temperature Range		−55 to 150	°C
Soldering Recommendations (PeakTemperature)[b, c]		260	

Notes
a.Surface Mounted on 1″x1″ FR4 Board.
b.The SlimFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the regulation processin manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
c.Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

Package Outlines and Ordering Information

Device	Device Marking	Reel Size	Tape Width	Quantity
MF5853	D801 . XXXX	7''	8mm	3000 units

Thermal Resistance Ratings

Parameter		Device	Symbol	Typical	Maximum	Units
Junction-to-Ambient [a]	T ≤ 10 sec	MOSFET	$R_{\theta JA}$	45	55	°C/W
		Schottky		70	88	
	Steady State	MOSFET		80	89	
		Schottky		100	125	
Junction-to-Foot	Steady State	MOSFET	$R_{\theta JF}$	30	40	
		Schottky		33	40	

MOSFET Specifications (T_J=25°C Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=-250uA	-20			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D = -250 μ A	-0.45	-0.60	-0.9	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS}= ±8V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} =-16 V, V_{GS} = 0 V			-1.0	uA
		V_{DS} =-16 V, V_{GS} = 0 V, T_J= 55°C			-10	
On-State Drain Current [d]	$I_{D(on)}$	V_{DS} = -5.0V, V_{GS} =-4.5 V	-16			A
Drain-Source On-State Resistance [d]	$R_{DS(on)}$	V_{GS} =-4.5 V, I_D=-3.6 A		100	110	mΩ
		V_{GS} =-2.5 V, I_D=-2.0 A		130	145	
		V_{GS} =-1.8 V, I_D=-1.0 A		160	175	
Forward Transconductance [d]	g_{fs}	V_{DS} =-5 V, I_D =-3.6 A		7		S
Diode Forward Voltage [d]	V_{SD}	I_S =-1.0 A, V_{GS} = 0 V			-1.2	V
Dynamic [e]						
Total Gate Charge	Q_g	V_{DS} = -10 V, V_{GS} =-4.5 V, I_D=-3.6 A		6.0		nC
Gate-Source Charge	Q_{gs}			0.8		
Gate-Drain Charge	Q_{gd}			1.3		
Turn-On Delay Time	$t_{d(on)}$	V_{DD} =-10V ,R $_G$= 6 ohm I_D = -1 A, V_{GEN}= -4.5 V		6.5	25	ns
Rise Time	t_r			20	60	
Turn-Off Delay Time	$t_{d(off)}$			31	70	
Fall Time	t_f			21	60	
Source-Drain Reverse Recovery Time	t_{rr}	I_F =-0.9 A, di/dt = 100 A/s		20	40	

Notes
d.Pulse test; pulse width ≤ 300us, duty cycle ≤ 2%.
e.Guaranteed by design, not subject to production testing.

SCHOTTKY Specifications (T_J=25°C Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Forward Voltage Drop	V_F	I_F = 0.1 A		220	320	mV
		I_F = 0.5 A		410	430	
Reverse Breakdown Voltage	V_{BR}	Ir = 250uA	23			V
Maximum Reverse Leakage Current	I_R	V_r = 10 V			10	uA
		V_r = 20 V			50	
Junction Capacitance	C_T	V_r = 10 V		31		pF

Typical Electrical and Thermal Characteristics

Typical P-Channel Performance Curves

(T_J= 25°C unless otherwise noted)

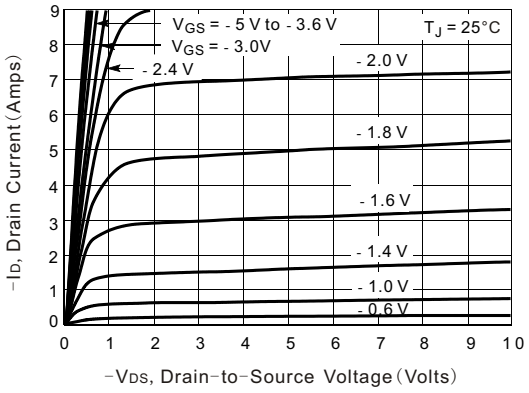


Figure 1. On- Region Characteristics

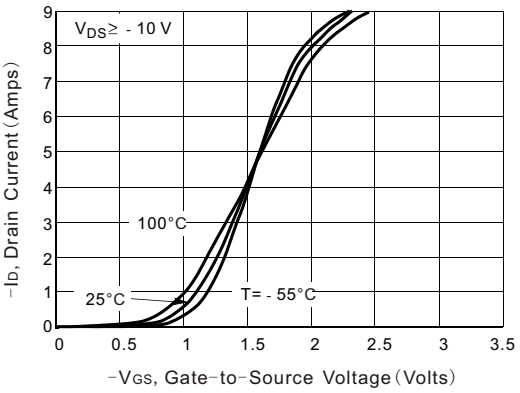


Figure 2. Transfer Characteristics

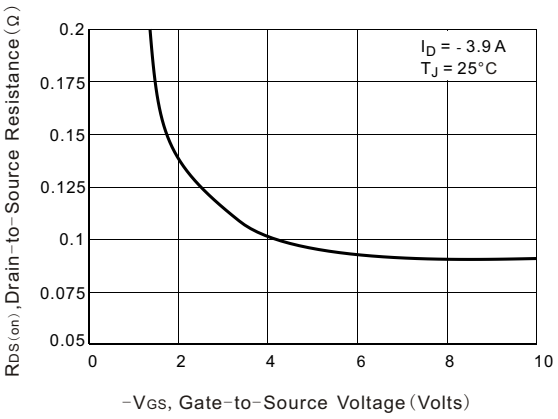


Figure 3. On- Resistance vs. Gate- to- Source Voltage

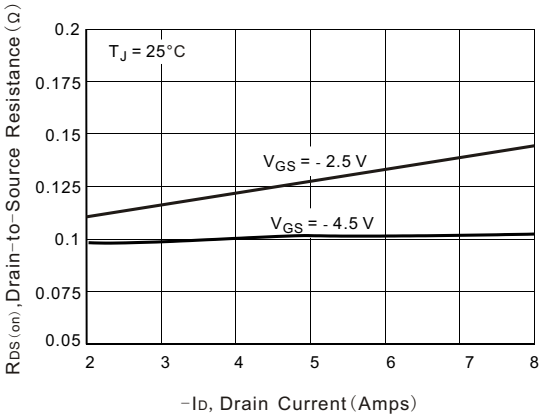


Figure 4. On- Resistance vs. Drain Current and Gate Voltage

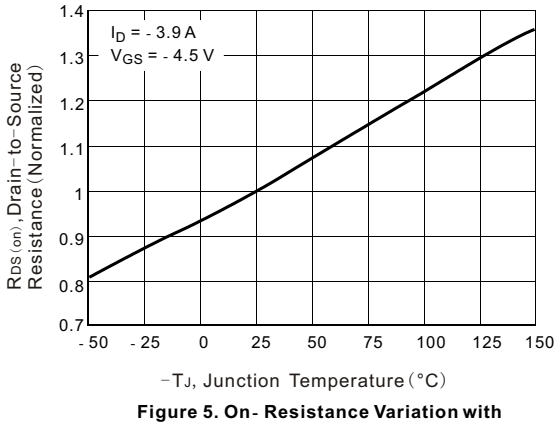


Figure 5. On- Resistance Variation with Temperature

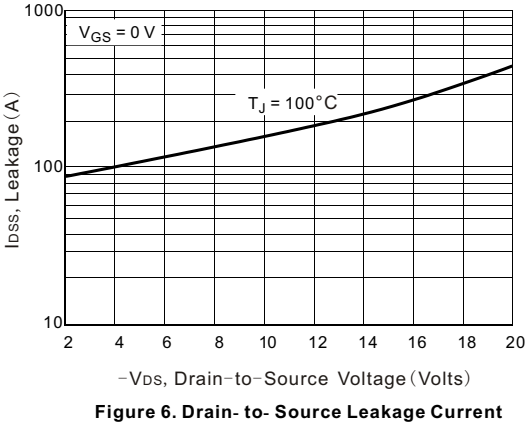


Figure 6. Drain- to- Source Leakage Current vs. Voltage

Typical Electrical and Thermal Characteristics

Typical P-Channel Performance Curves

(T_J= 25°C unless otherwise noted)

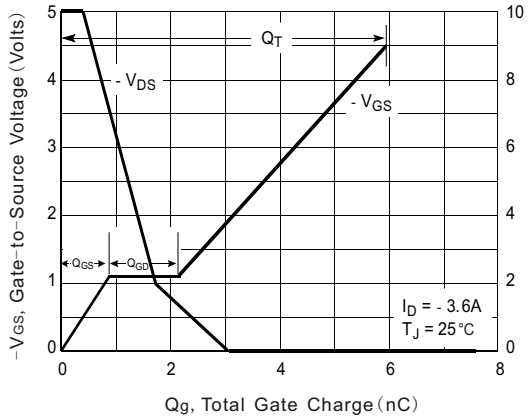


Figure 7. Gate- to- Source and Drain- to- Source Voltage vs. Total Charge

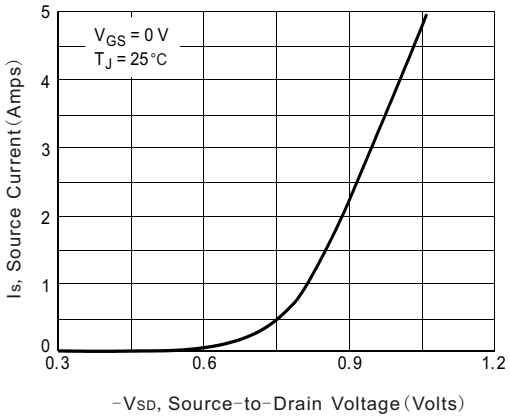


Figure 8. Diode Forward Voltage Vs. Current

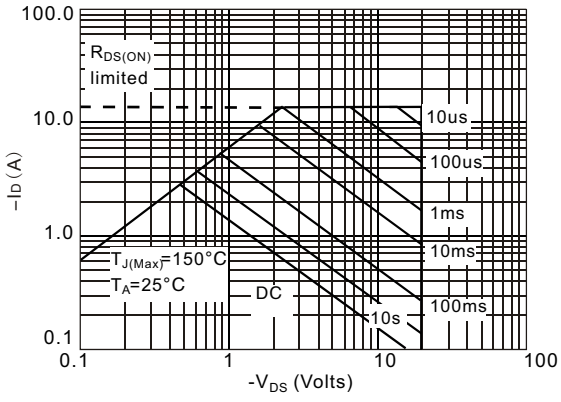


Figure 9: Maximum Forward Biased Safe Operating Area (Note d)

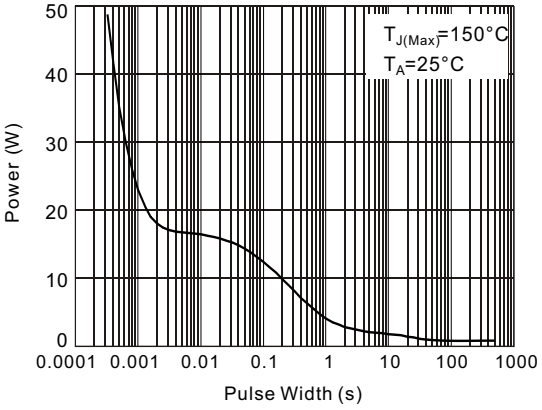


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note d)

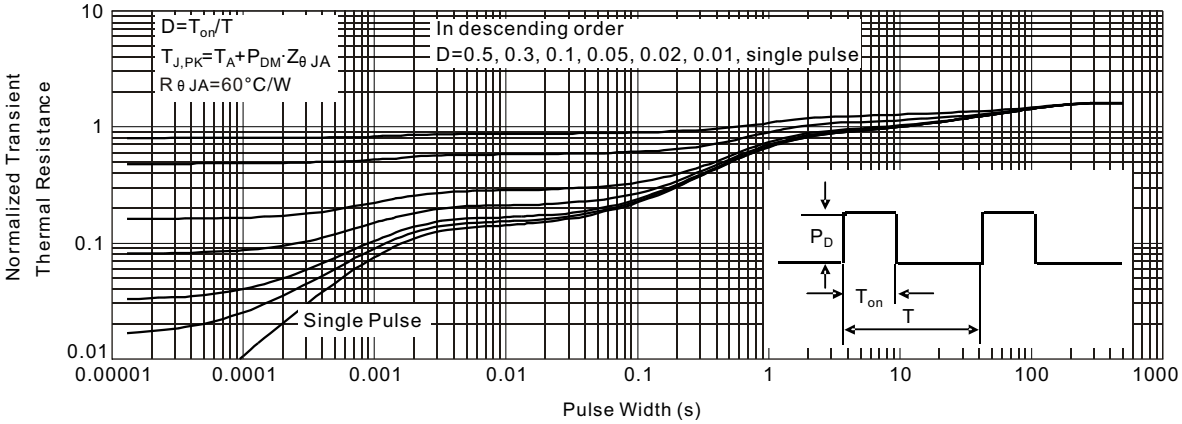


Figure 11: Normalized Maximum Transient Thermal Impedance

Note d: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

Typical Schottky Performance Curves **(T_J = 25°C unless otherwise noted)**

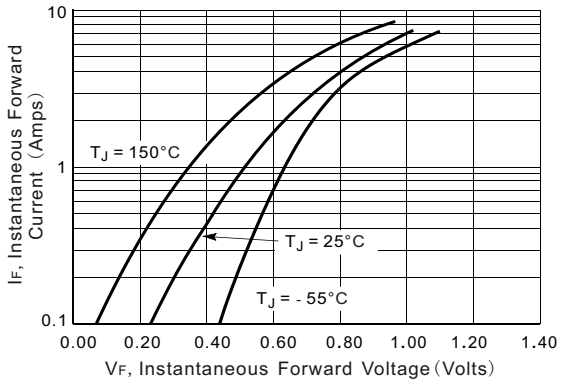


Figure 11.Typical Forward Voltage

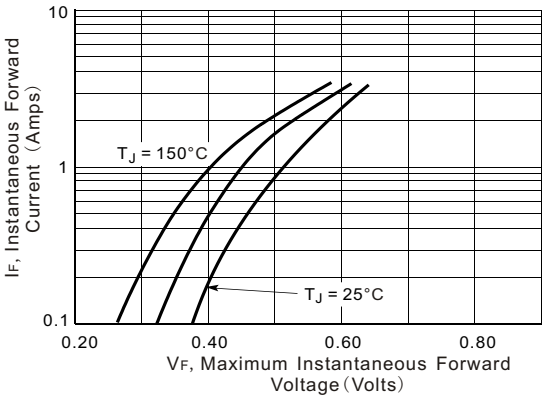


Figure 12. Maximum Forward Voltage

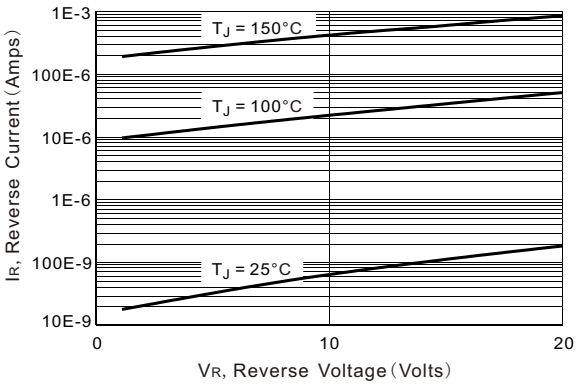


Figure 13. Typical Reverse Current

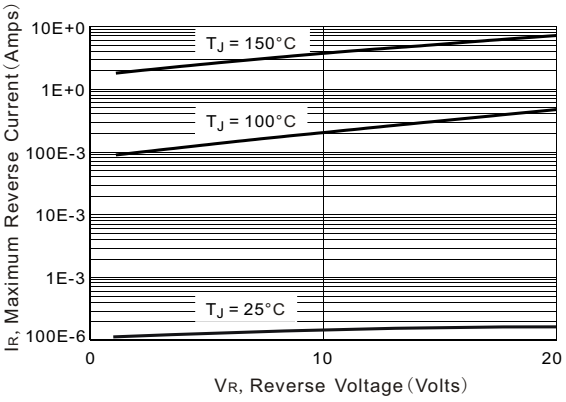


Figure 14. Maximum Reverse Current

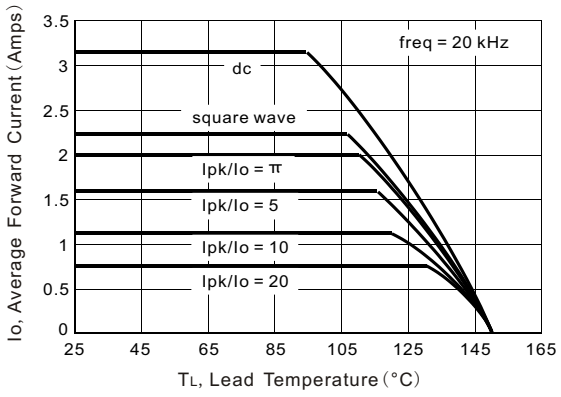


Figure 16. Current Derating

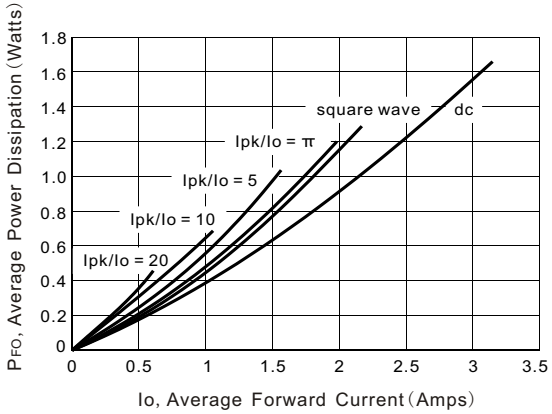
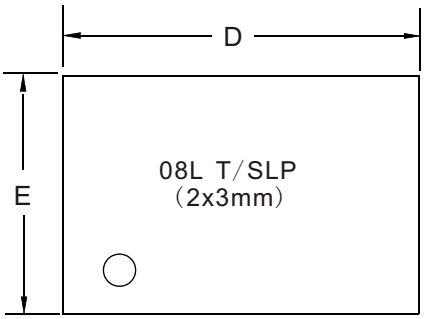
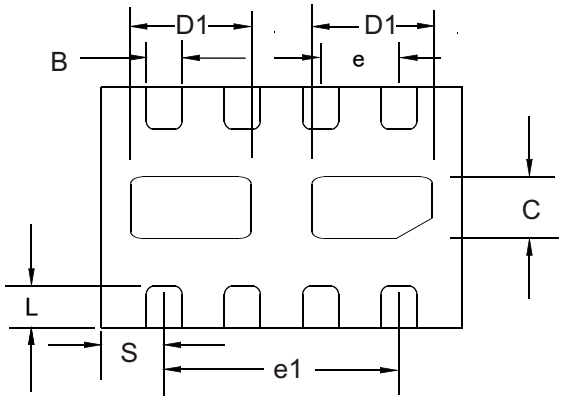


Figure 17. Forward Power Dissipation

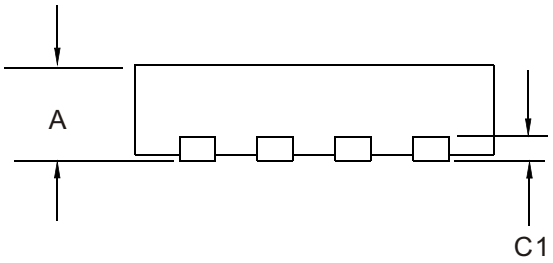
DFN 2x3x0.75(mm) Package



TOP VIEW

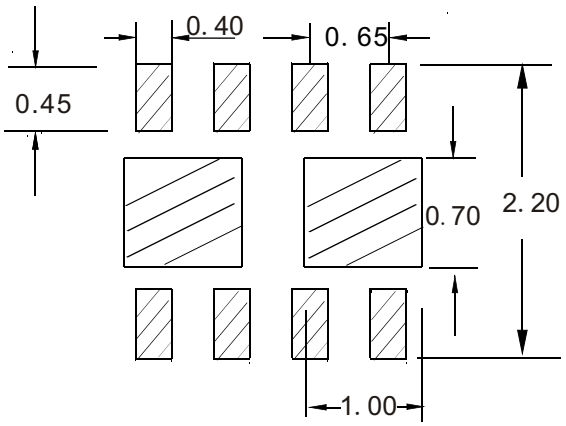


BOTTOM VIEW



SIDE VIEW

RECOMMENDED LAND PATTERN



Dim	MILLIMETERS		
	Min	Nom	Max
A	0.70	0.75	0.90
B	0.25	0.30	0.35
C	0.35	0.40	0.45
C1		0.203Ref	
D	2.95	3.00	3.05
D1	0.75	1.00	1.05
E	1.95	2.00	2.05
e		0.65BSC	
e1		1.95Ref	
L	0.30	--	0.40
S		0.55BSC	

UNIT:mm