



ON Semiconductor®

FDC658P

Single P-Channel, Logic Level, PowerTrench™ MOSFET

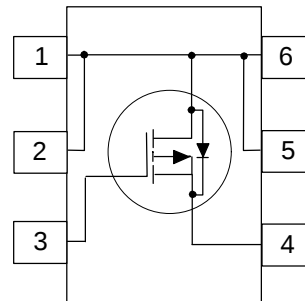
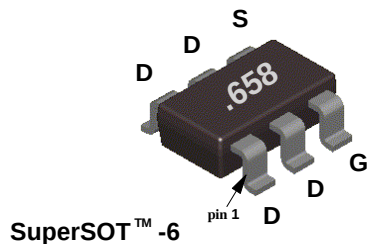
General Description

This P-Channel Logic Level MOSFET is produced using ON Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

These devices are well suited for notebook computer applications: load switching and power management, battery charging circuits, and DC/DC conversion.

Features

- -4 A, -30 V. $R_{DS(ON)} = 0.050 \Omega$ @ $V_{GS} = -10$ V
 $R_{DS(ON)} = 0.075 \Omega$ @ $V_{GS} = -4.5$ V.
- Low gate charge (8nC typical).
- High performance trench technology for extremely low $R_{DS(ON)}$.
- SuperSOT™-6 package: small footprint (72% smaller than standard SO-8); low profile (1mm thick).



Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$ unless otherwise note

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	-30	V
V_{GSS}	Gate-Source Voltage - Continuous	± 20	V
I_D	Drain Current - Continuous (Note 1a) - Pulsed	-4	A
		-20	
P_D	Maximum Power Dissipation (Note 1a) (Note 1b)	1.6	W
		0.8	
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	30	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = -250 μA	-30			V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	I _D = -250 μA, Referenced to 25 °C		-22		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -24 V, V _{GS} = 0 V			-1	μA
		T _J = 55 °C			-10	μA
I _{GSSF}	Gate - Body Leakage, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate - Body Leakage, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note 2)						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250 μA	-1	-1.7	-3	V
ΔV _{GS(th)} /ΔT _J	Gate Threshold VoltageTemp.Coefficient	I _D = -250 μA, Referenced to 25 °C		4.1		mV/°C
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = -10 V, I _D = -4.0 A		0.041	0.05	Ω
		T _J = 125 °C		0.058	0.08	
		V _{GS} = -4.5 V, I _D = -3.4 A		0.06	0.075	
I _{D(on)}	On-State Drain Current	V _{GS} = -10 V, V _{DS} = -5 V	-20			A
g _{FS}	Forward Transconductance	V _{DS} = -5V, I _D = -4 A		9		S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input Capacitance	V _{DS} = -15 V, V _{GS} = 0 V,		750		pF
C _{oss}	Output Capacitance	f = 1.0 MHz		220		
C _{rss}	Reverse Transfer Capacitance			100		
SWITCHING CHARACTERISTICS (Note 2)						
t _{D(on)}	Turn - On Delay Time	V _{DD} = -15 V, I _D = -1 A,		12	22	ns
t _r	Turn - On Rise Time	V _{GS} = -10 V, R _{GEN} = 6 Ω		14	25	
t _{D(off)}	Turn - Off Delay Time			24	38	
t _f	Turn - Off Fall Time			16	27	
Q _g	Total Gate Charge	V _{DS} = -15 V, I _D = -4.0 A,		8	12	nC
Q _{gs}	Gate-Source Charge	V _{GS} = -5 V		1.8		
Q _{gd}	Gate-Drain Charge			3		
DRAIN-SOURCE DIODE CHARACTERISTICS						
I _S	Continuous Source Diode Current				-1.3	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -1.3 A (Note 2)		-0.76	-1.2	V

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

a. 78°C/W when mounted on a 1 in^2 pad of 2oz Cu on FR-4 board.

b. 156°C/W when mounted on a minimum pad of 2oz Cu on FR-4 board.

2. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Typical Electrical Characteristics

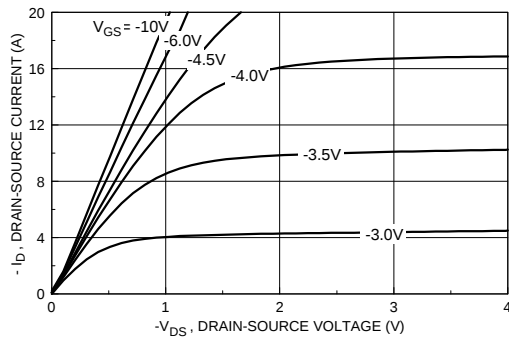


Figure 1. On-Region Characteristics.

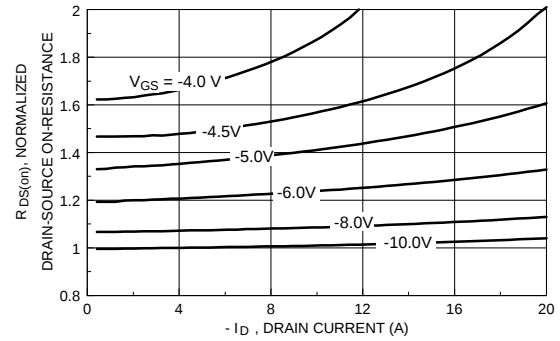


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

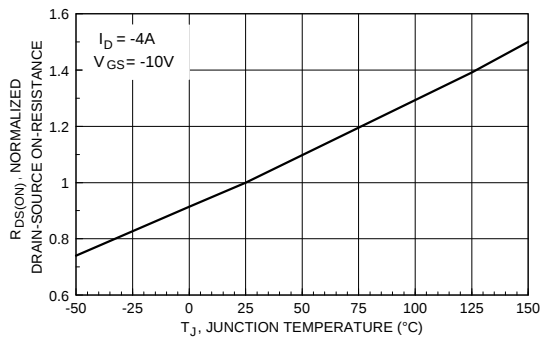


Figure 3. On-Resistance Variation with Temperature.

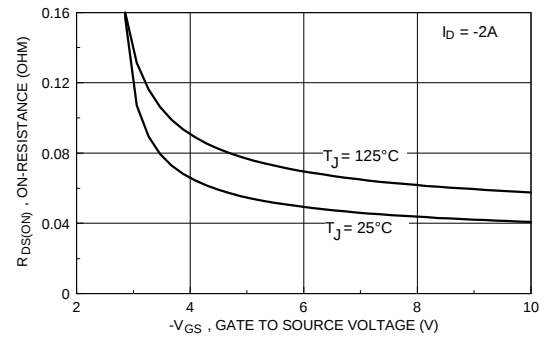


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

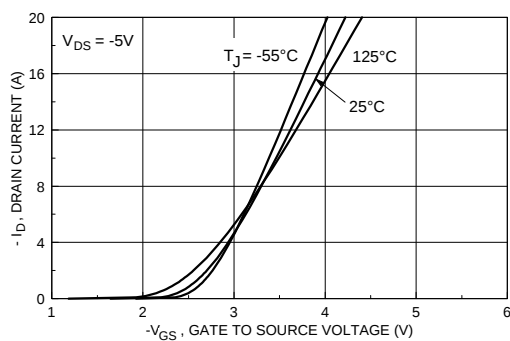


Figure 5. Transfer Characteristics.

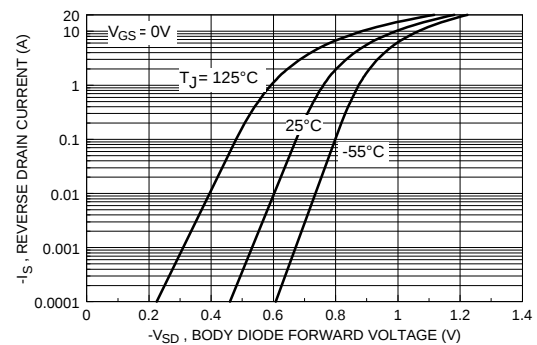


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

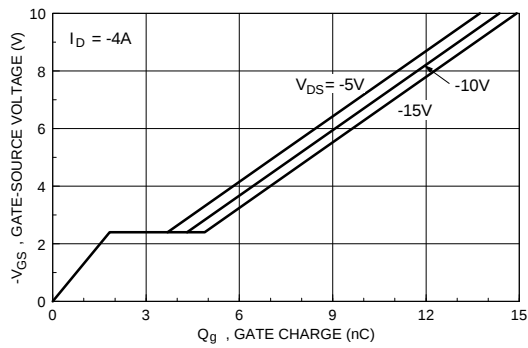


Figure 7. Gate Charge Characteristics.

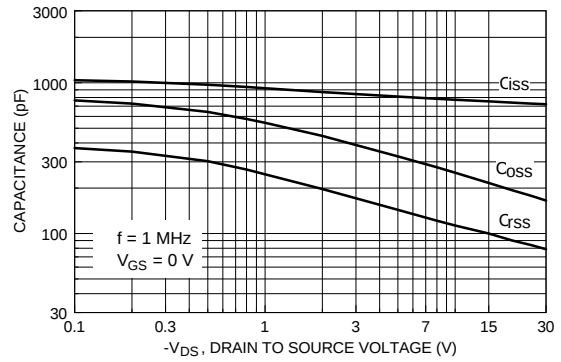


Figure 8. Capacitance Characteristics.

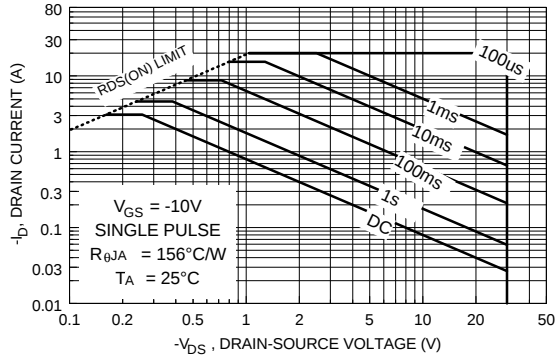


Figure 9. Maximum Safe Operating Area.

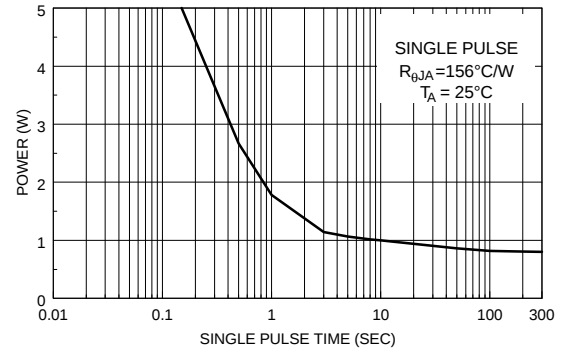


Figure 10. Single Pulse Maximum Power Dissipation.

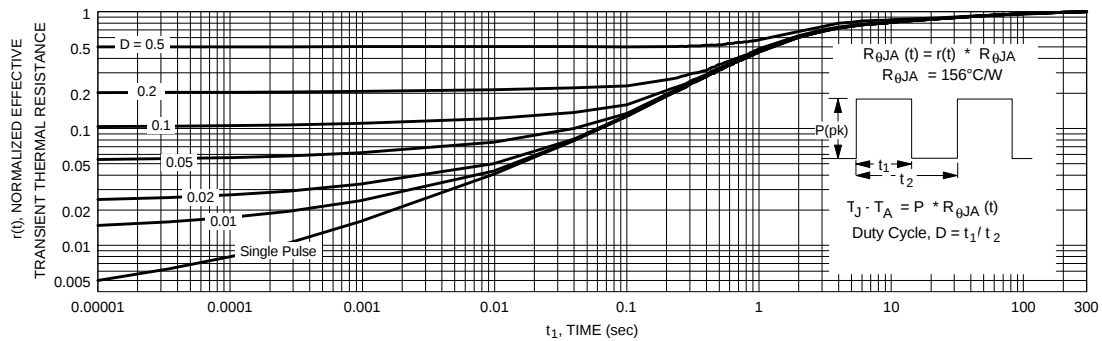


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

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