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ON Semiconductor®

# FDC3535

## P-Channel Power Trench® MOSFET -80 V, -2.1 A, 183 mΩ

### Features

- Max  $r_{DS(on)}$  = 183 mΩ at  $V_{GS} = -10$  V,  $I_D = -2.1$  A
- Max  $r_{DS(on)}$  = 233 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -1.9$  A
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- Fast switching speed
- 100% UIL Tested
- RoHS Compliant

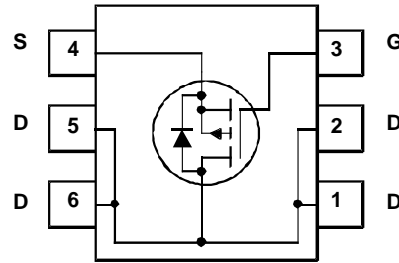
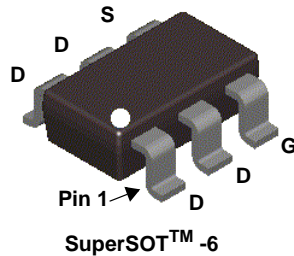


### General Description

This P-Channel MOSFET is produced using ON Semiconductor's advanced Power Trench® process that has been optimized for  $r_{DS(on)}$ , switching performance and ruggedness.

### Applications

- Load Switch
- Synchronous Rectifier



### MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	-80	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous (Note 1a)	-2.1	A
	-Pulsed	-10	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	37	mJ
$P_D$	Power Dissipation (Note 1a)	1.6	W
	Power Dissipation (Note 1b)	0.7	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

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

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.535	FDC3535	SSOT-6	7"	8 mm	3000 units

FDC3535 P-Channel Power Trench® MOSFET

## Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	-80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-64		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -64\text{ V}$ , $V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\text{ }\mu\text{A}$	-1	-1.6	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\text{ V}$ , $I_D = -2.1\text{ A}$		147	183	m $\Omega$
		$V_{GS} = -4.5\text{ V}$ , $I_D = -1.9\text{ A}$		176	233	
		$V_{GS} = -10\text{ V}$ , $I_D = -2.1\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		246	307	
$g_{FS}$	Forward Transconductance	$V_{DD} = -10\text{ V}$ , $I_D = -2.1\text{ A}$		6.3		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		659	880	pF
$C_{oss}$	Output Capacitance			49	65	pF
$C_{rss}$	Reverse Transfer Capacitance			24	40	pF
$R_g$	Gate Resistance			5.7		$\Omega$

### Switching Characteristics

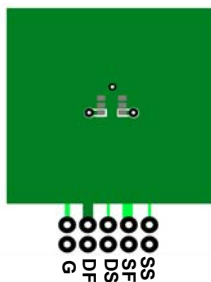
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -40\text{ V}$ , $I_D = -2.1\text{ A}$ , $V_{GS} = -10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		6.5	13	ns
$t_r$	Rise Time			3.1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			23	38	ns
$t_f$	Fall Time			2.9	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to } -10\text{ V}$		14	20
	Total Gate Charge	$V_{GS} = 0\text{ V to } -4.5\text{ V}$	$V_{DD} = -40\text{ V}$ $I_D = -2.1\text{ A}$	6.8	10	nC
$Q_{gs}$	Total Gate Charge			1.6		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.7		nC

### Drain-Source Diode Characteristics

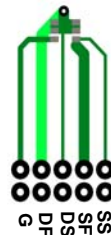
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = -2.1\text{ A}$ (Note 2)		-0.81	-1.3	V
$t_{rr}$	Reverse Recovery Time	$I_F = -2.1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		25	40	ns
$Q_{rr}$	Reverse Recovery Charge			23	38	nC

#### NOTES:

- $R_{\theta JA}$  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.



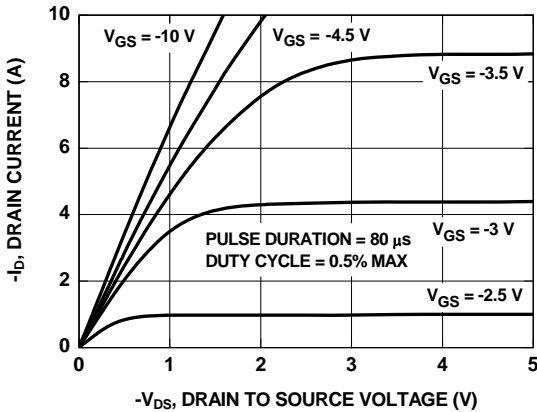
a.  $78\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



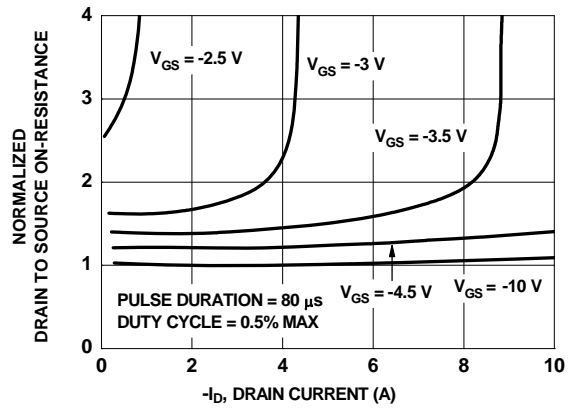
b.  $175\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width <  $300\text{ }\mu\text{s}$ , Duty cycle <  $2.0\%$ .
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = -5\text{ A}$ ,  $V_{DD} = -80\text{ V}$ ,  $V_{GS} = -10\text{ V}$ .

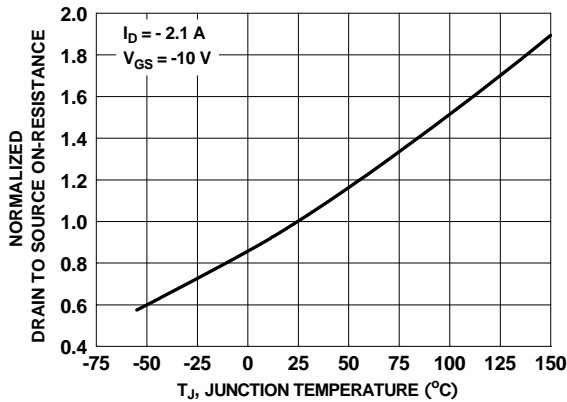
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



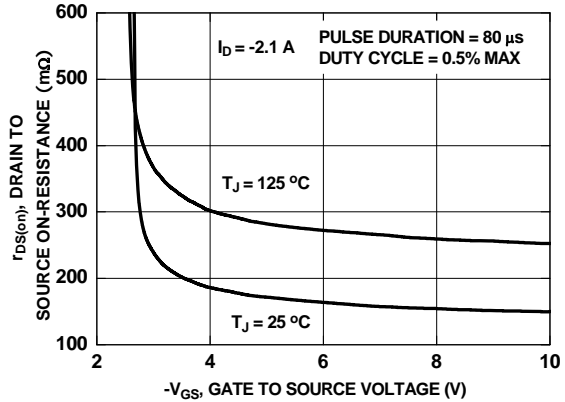
**Figure 1. On-Region Characteristics**



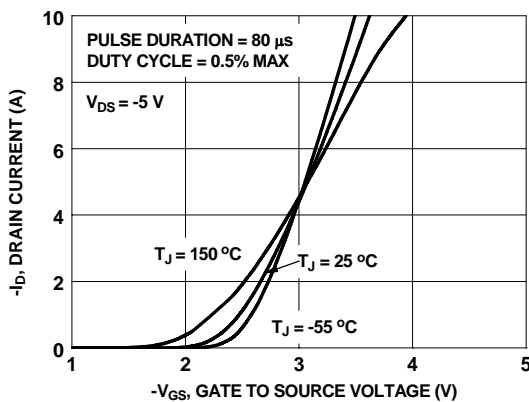
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



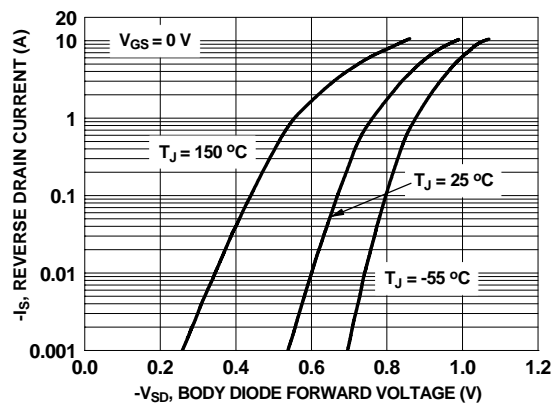
**Figure 3. Normalized On-Resistance vs Junction Temperature**



**Figure 4. On-Resistance vs Gate to Source Voltage**

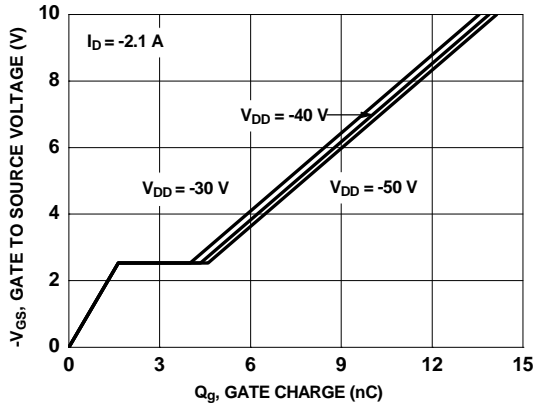


**Figure 5. Transfer Characteristics**

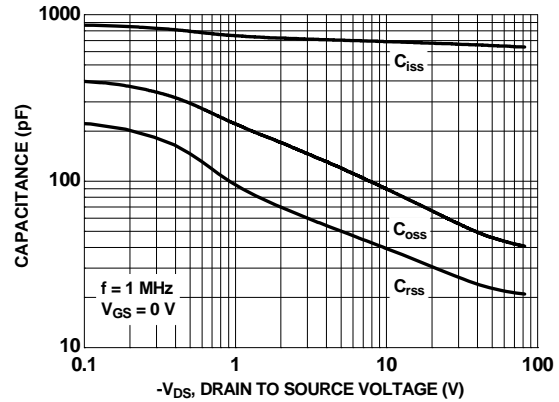


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

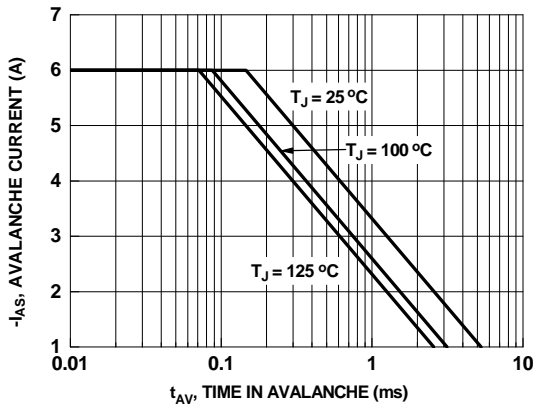
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



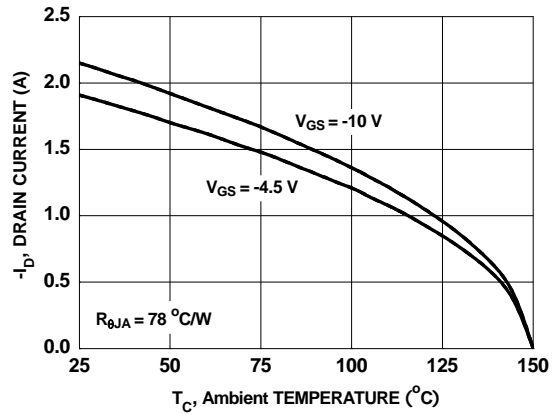
**Figure 7. Gate Charge Characteristics**



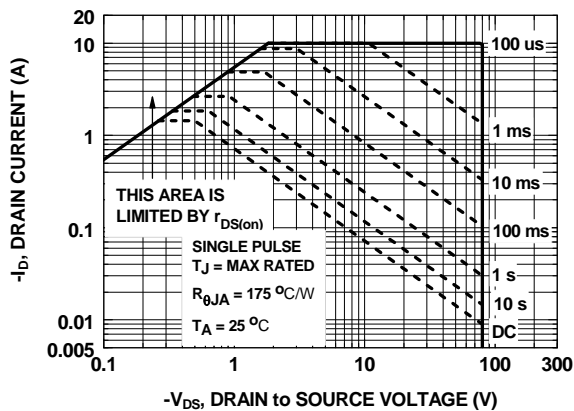
**Figure 8. Capacitance vs Drain to Source Voltage**



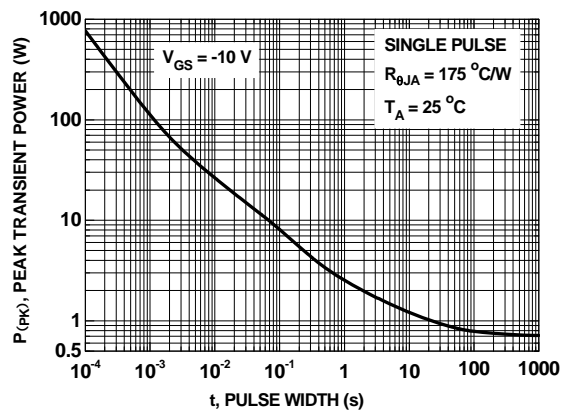
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Ambient Temperature**

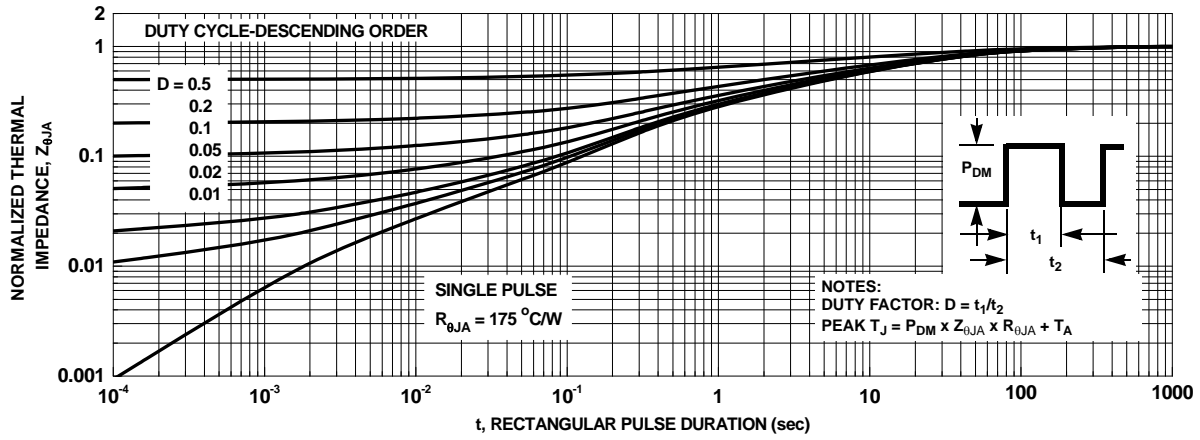


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**

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