



ON Semiconductor®

# FDC655BN

## Single N-Channel, Logic Level, PowerTrench® MOSFET 30 V, 6.3 A, 25 mΩ

### Features

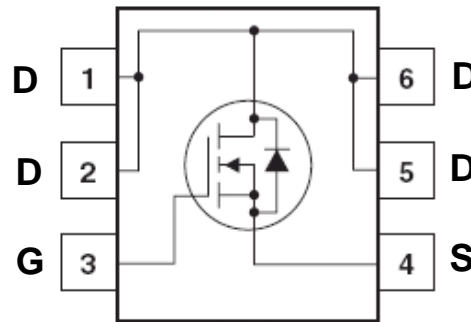
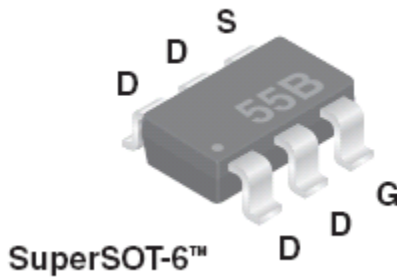
- Max  $r_{DS(on)}$  = 25 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 6.3\text{ A}$
- Max  $r_{DS(on)}$  = 33 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 5.5\text{ A}$
- Fast switching
- Low gate charge
- High performance technology for extremely low  $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant



### General Description

This N-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 superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	6.3	A
	-Pulsed	20	
$P_D$	Power Dissipation (Note 1a)	1.6	W
	Power Dissipation (Note 1b)	0.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to + 150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	$^\circ\text{C/W}$
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### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.55B	FDC655BN	SSOT-6™	7"	8 mm	3000 units

FDC655BN Single N-Channel, Logic Level, PowerTrench® MOSFET

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		25		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, V_{GS} = 0 \text{ V}$			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	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 6.3 \text{ A}$		21	25	m $\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 5.5 \text{ A}$		26	33	
		$V_{GS} = 10 \text{ V}, I_D = 6.3 \text{ A}, T_J = 125^\circ\text{C}$		30	36	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 6.3 \text{ A}$		35		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1\text{MHz}$		470	620	pF
$C_{oss}$	Output Capacitance			100	130	pF
$C_{rss}$	Reverse Transfer Capacitance			60	90	pF
$R_g$	Gate Resistance			3.0		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15 \text{ V}, I_D = 1 \text{ A},$ $V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$		6	11	ns	
$t_r$	Rise Time			2	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			15	26	ns	
$t_f$	Fall Time			2	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0 \text{ V to } 10 \text{ V}$	$V_{DD} = 15 \text{ V},$ $I_D = 6.3 \text{ A}$	9	13	nC
$Q_g$	Total Gate Charge		$V_{GS} = 0 \text{ V to } 5 \text{ V}$		5	7	nC
$Q_{gs}$	Gate to Source Charge		1.4			nC	
$Q_{gd}$	Gate to Drain "Miller" Charge		1.6			nC	

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain-Source Diode Forward Current			1.3	A	
$V_{SD}$	Source-Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 1.3 \text{ A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 6.3 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		15	26	ns
$Q_{rr}$	Reverse Recovery Charge			4	10	nC

#### 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.  $78 \text{ }^\circ\text{C/W}$  when mounted on a  $1 \text{ in}^2$  pad of 2 oz copper on FR-4 board.
- b.  $156 \text{ }^\circ\text{C/W}$  when mounted on a minimum pad.

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

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

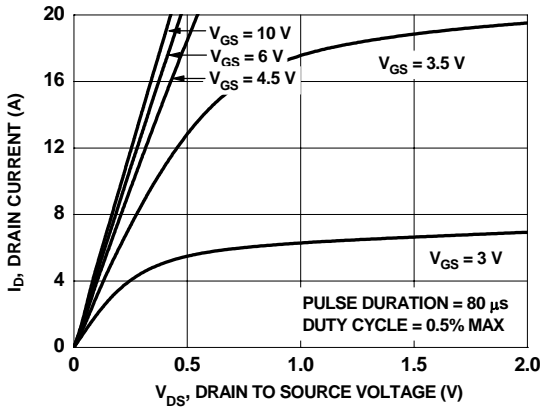


Figure 1. On Region Characteristics

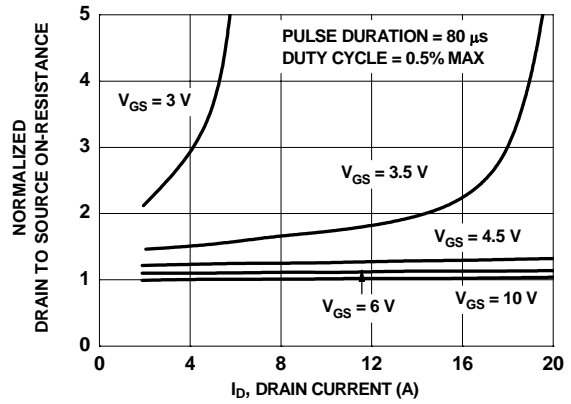


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

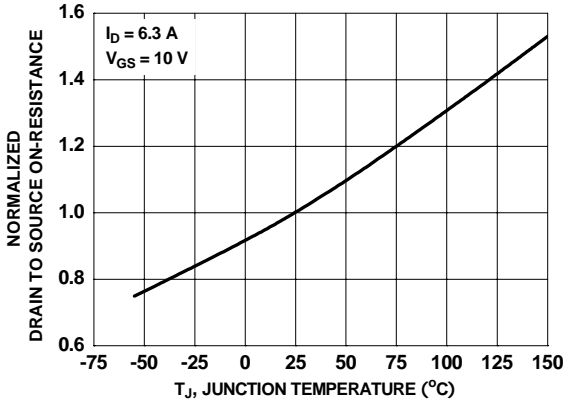


Figure 3. Normalized On Resistance vs Junction Temperature

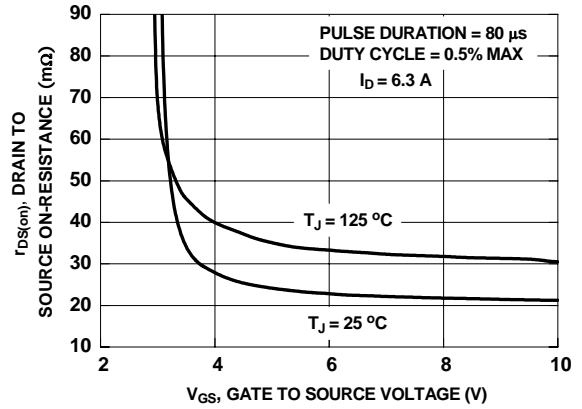


Figure 4. On-Resistance vs Gate to Source Voltage

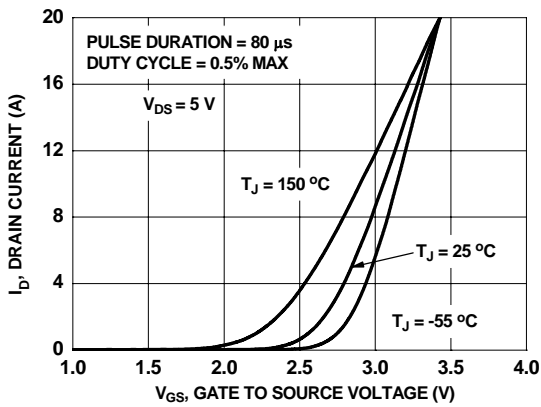


Figure 5. Transfer Characteristics

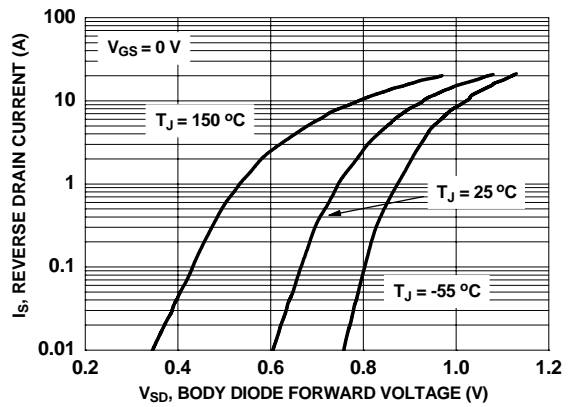
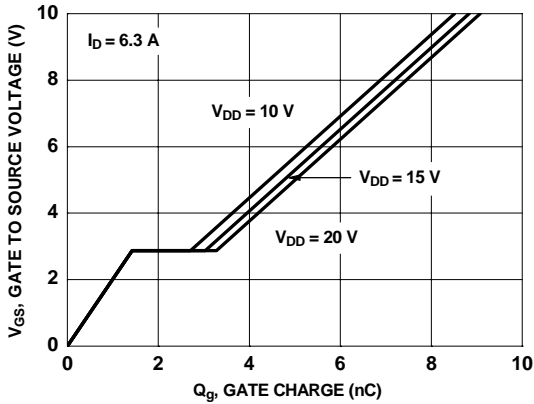
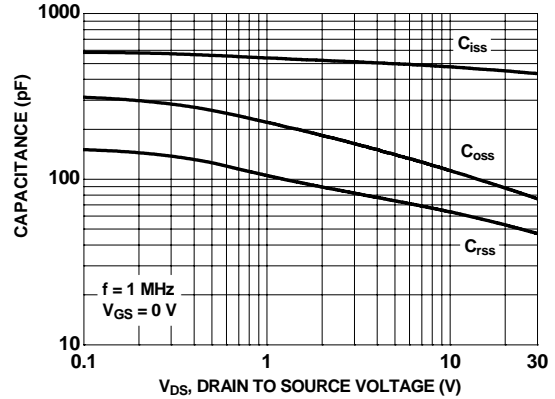


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

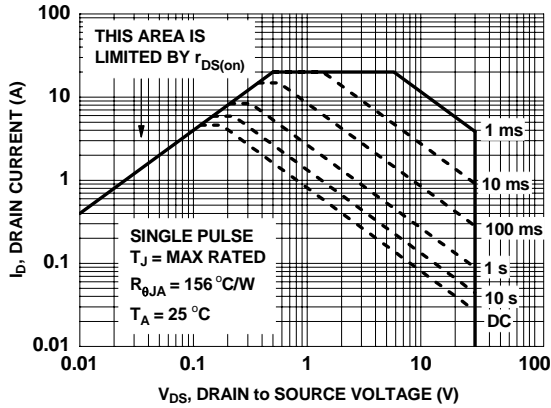
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



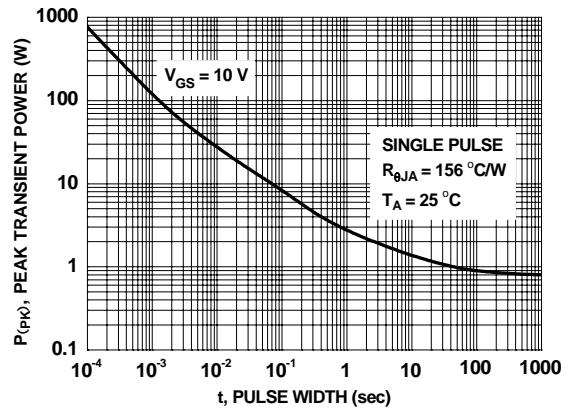
**Figure 7. Gate Charge Characteristics**



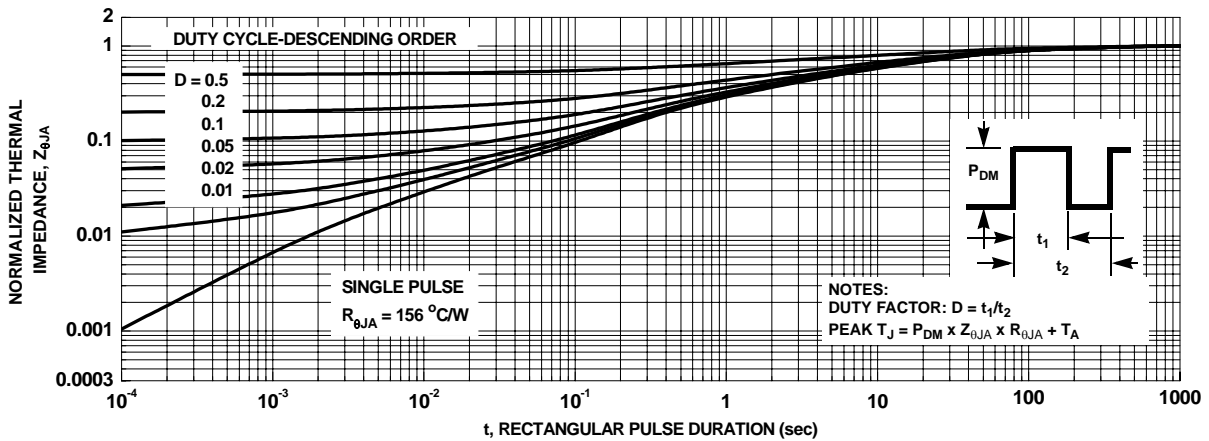
**Figure 8. Capacitance vs Drain to Source Voltage**



**Figure 9. Forward Bias Safe Operating Area**



**Figure 10. Single Pulse Maximum Power Dissipation**



**Figure 11. Junction-to-Ambient Transient Thermal Response Curve**

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