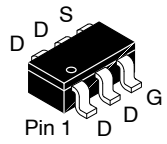
MOSFET – Single, N-Channel, Logic Level, POWERTRENCH®

30 V, 6.3 A, 25 mΩ

FDC655BN

V_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
30 V	25 mΩ @ 10 V	6.3 A
	33 mΩ @ 4.5 V	



TSOT23 6−Lead
(SUPERSOT™ −6)
CASE 419BL

General Description

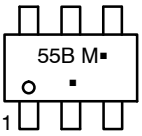
This N−Channel Logic Level MOSFET is produced using **onsemi**'s advanced POWERTRENCH process that has been especially tailored to minimize the on−state resistance and yet maintain superior switching performance.

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

Features

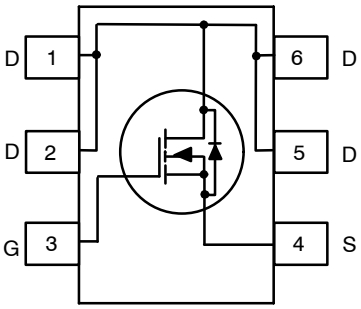
- Max $R_{DS(ON)}$ = 25 mΩ @ V_{GS} = 10 V, I_D = 6.3 A
- Max $R_{DS(ON)}$ = 33 mΩ @ V_{GS} = 4.5 V, I_D = 5.5 A
- Fast Switching
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(ON)}$
- This Device is Pb−Free, Halide Free and is RoHS Compliant

MARKING DIAGRAM



55B = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

PIN ASSIGNMENT



MOSFET MAXIMUM RATINGS (T_C = 25°C, unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DS}	Drain to Source Voltage		30	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	−Continuous T_A = 25°C	(Note 1a)	6.3	A
	−Pulsed		20	
P_D	Power Dissipation	(Note 1a)	1.6	W
		(Note 1b)	0.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Symbol	Parameter		Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	°C/W

ORDERING INFORMATION

Device	Package	Shipping†
FDC655BN	TSOT23−6 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V,	30	–	–	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	25	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1	1.9	3	V
$\Delta V_{GS(th)}$ / ΔT_J	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	–5	–	mV/°C
$R_{DS(ON)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 6.3 A	–	21	25	mΩ
		V_{GS} = 4.5 V, I_D = 5.5 A	–	26	33	
		V_{GS} = 10 V, I_D = 6.3 A, T_J = 125°C	–	30	36	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 6.3 A	–	35	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 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	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	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
$Q_{g(Tot)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 15 V, I_D = 6.3 A	–	9	13	nC
$Q_{g(Tot)}$	Total Gate Charge	V_{GS} = 0 V to 5 V, V_{DD} = 15 V, I_D = 6.3 A	–	5	7	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 6.3 A	–	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 V, I_S = 1.3 A (Note 2)	–	0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 6.3 A, di/dt = 100 A/μs	–	15	26	ns
Q_{rr}	Reverse Recovery Charge		–	4	10	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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 2 oz copper on FR–4 board.
   b. 156°C/W when mounted on a minimum pad.
2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted)

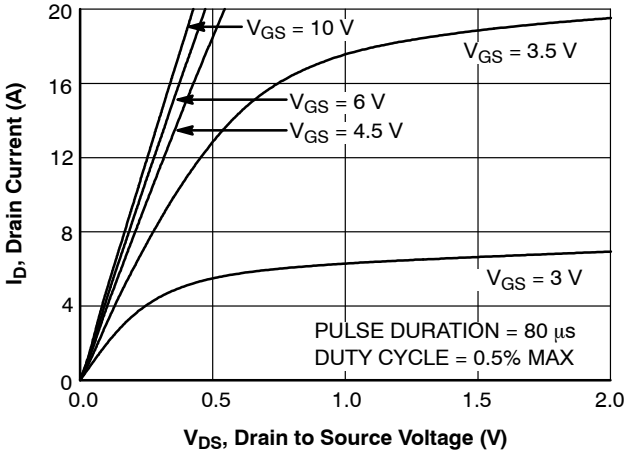

Figure 1. On Region Characteristics

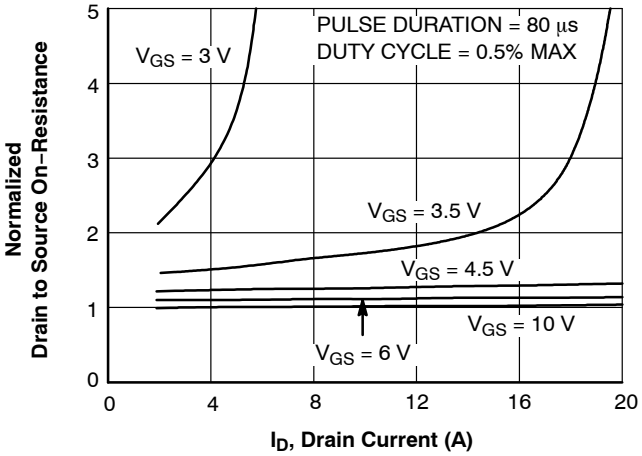

Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

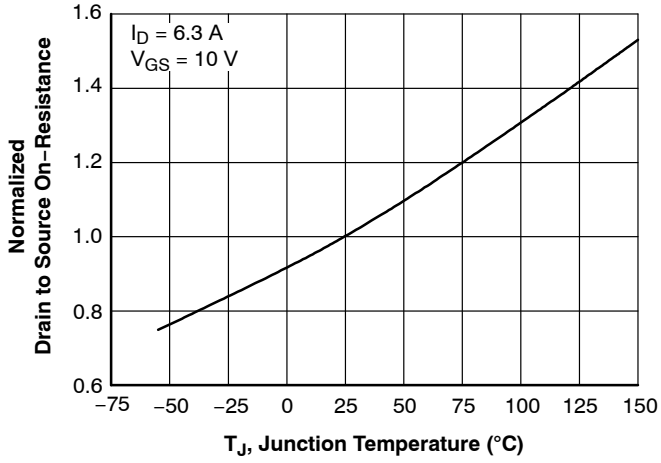

Figure 3. Normalized On Resistance vs. Junction Temperature

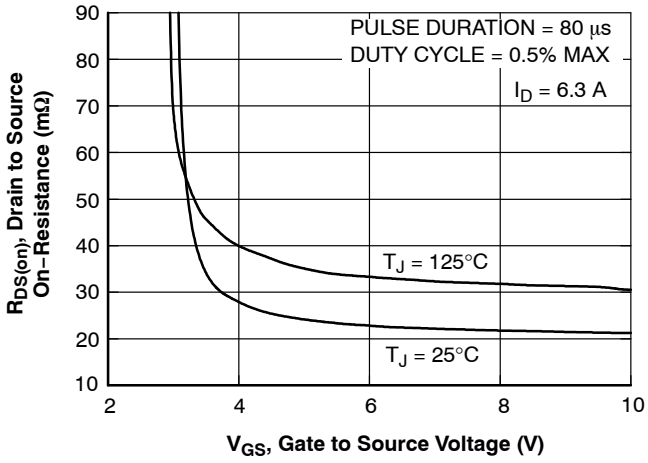

Figure 4. On−Resistance vs. Gate to Source Voltage

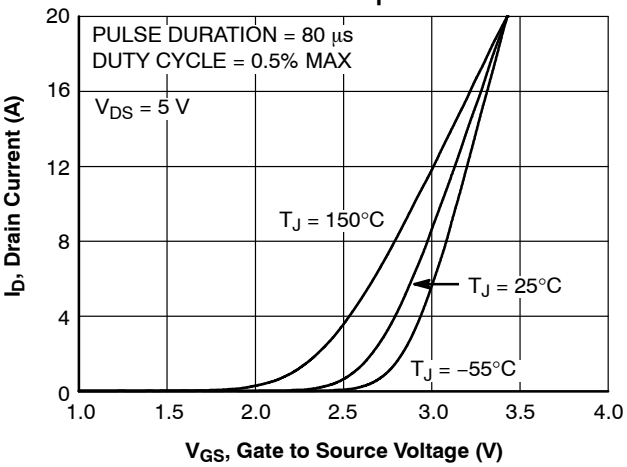

Figure 5. Transfer Characteristics

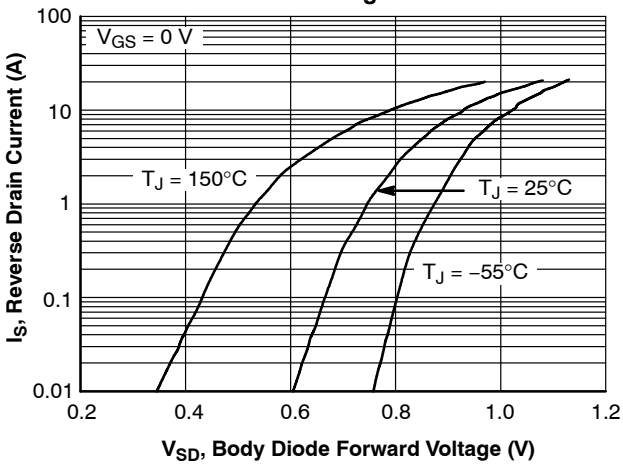

Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

(T_J = 25°C unless otherwise noted)

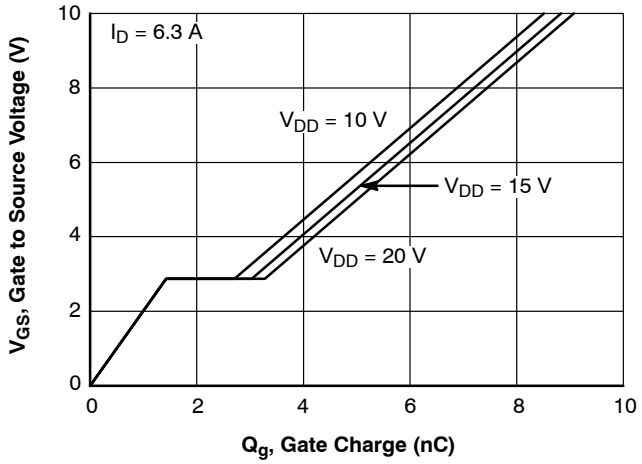

Figure 7. Gate Charge Characteristics

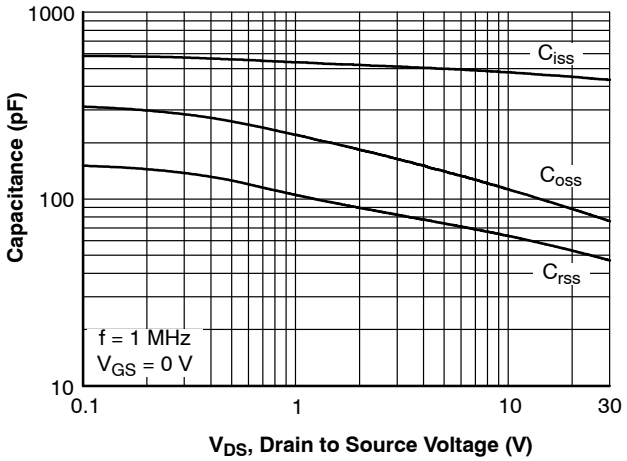

Figure 8. Capacitance vs. Drain to Source Voltage

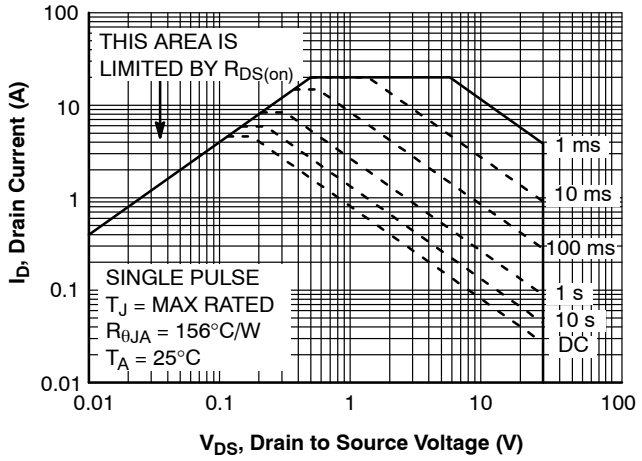

Figure 9. Forward Bias Safe Operating Area

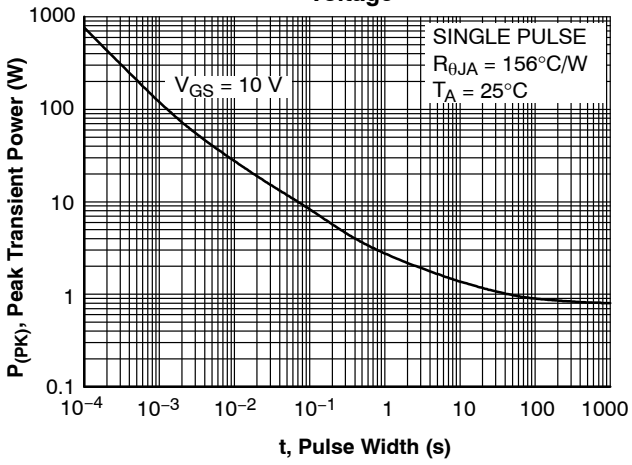

Figure 10. Single Pulse Maximum Power Dissipation

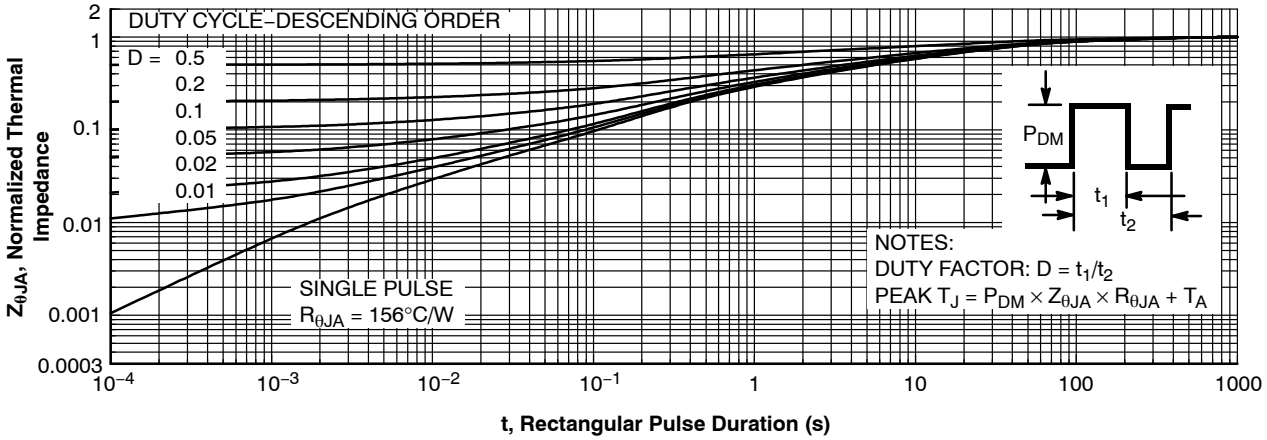

Figure 11. Junction−to−Ambient Transient Thermal Response Curve

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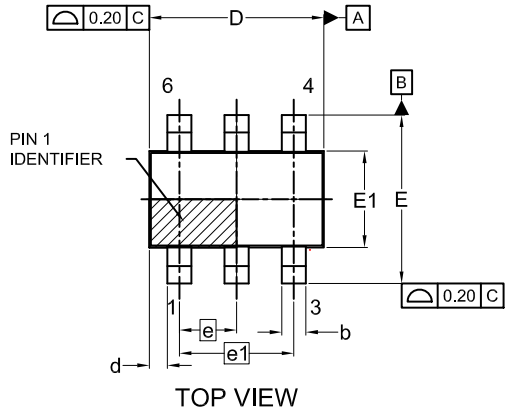
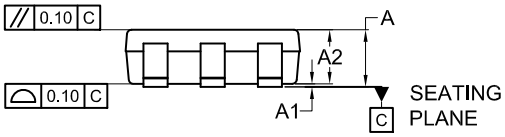
SCALE 2:1

TSOT23 6−Lead
CASE 419BL
ISSUE A

DATE 31 AUG 2020

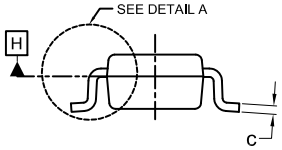


TOP VIEW

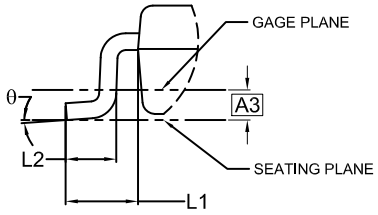


FRONT VIEW

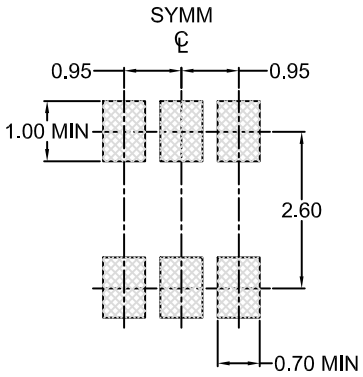
NOTE 4



SIDE VIEW



DETAIL A



LAND PATTERN
RECOMMENDATION

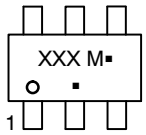
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25MM PER END. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	0.05	0.10
A2	0.70	0.85	1.00
A3		0.25 BSC	
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.80	2.95	3.10
d		0.30 REF	
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e		0.95 BSC	
e1		1.90 BSC	
L1		0.60 REF	
L2	0.20	0.40	0.60
θ	0°	---	10°

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**TSOT23 6−Lead**	**PAGE 1 OF 1**

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