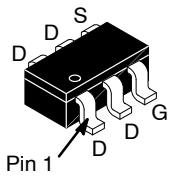
MOSFET – N-Channel, Logic Level, POWERTRENCH®

60 V, 4 A, 60 mΩ

FDC5661N

ON Semiconductor®

www.onsemi.com



TSOT23–6
CASE 419BL

Features

- $R_{DS(on)}$ = 47 mΩ at V_{GS} = 10 V, I_D = 4.3 A
- $R_{DS(on)}$ = 60 mΩ at V_{GS} = 4.5 V, I_D = 4 A
- Typ $Q_{g(TOT)}$ = 14.5 nC at V_{GS} = 10 V
- Low Miller Charge
- UIS Capability
- This Device is Pb−Free, Halogen Free/BFR Free and is RoHS Compliant

Applications

- DC/DC Converter
- Motor Drives

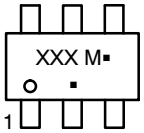
MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain to Source Voltage	V_{DSS}	60	V
Gate to Source Voltage	V_{GS}	±20	V
Drain Current Continuous (V_{GS} = 10 V)	I_D	4.3	A
Pulsed		20	
Single Pulse Avalanche Energy (Note 1)	E_{AS}	81	mJ
Power Dissipation	P_D	1.6	W
Operating and Storage Temperature	T_J, T_{STG}	−55 to +150	°C
Thermal Resistance Junction to Case	$R_{\theta JC}$	30	°C/W
Thermal Resistance Junction to Ambient TO−263, 1in^2 Copper Pad Area	$R_{\theta JA}$	78	°C/W

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.

1. E_{AS} of 81 mJ is 100% test at L = 14 mH, I_{AS} = 3.4 A, Starting T_J = 25°C.

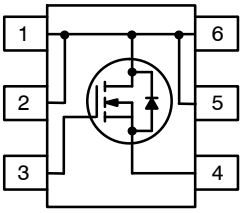
MARKING DIAGRAM



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

(Note: Microdot may be in either location)

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain to Source Breakdown Voltage	B_{VDSS}	I_D = 250 μA, V_{GS} = 0 V	60	–	–	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 48 V, V_{GS} = 0 V	–	–	1	μA
		T_A = 150°C	–	–	250	
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20 V	–	–	±100	nA
ON CHARACTERISTICS						
Gate to Source Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 250 μA	1	2.0	3	V
Drain to Source On−Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 4.3 A	–	38	47	mΩ
		V_{GS} = 4.5 V, I_D = 4 A	–	46	60	
		V_{GS} = 10 V, I_D = 4.3 A, T_J = 150°C	–	69	86	
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	–	763	–	pF
Output Capacitance	C_{oss}		–	68	–	
Reverse Transfer Capacitance	C_{rss}		–	36	–	
Gate Resistance	R_G	f = 1 MHz	–	2.6	–	Ω
Total Gate Charge at 10 V	$Q_{g(TOT)}$	V_{GS} = 0 to 10 V, V_{DD} = 30 V, I_D = 4.3 A	–	14.5	19	nC
Gate to Source Gate Charge	Q_{gs}	V_{DD} = 30 V, I_D = 4.3 A	–	2.4	–	nC
Gate to Drain “Miller” Charge	Q_{gd}		–	2.9	–	nC
SWITCHING CHARACTERISTICS						
Turn−On Time	t_{on}	V_{GS} = 10 V, V_{DD} = 30 V, I_D = 4.3 A, R_{GS} = 6 Ω,	–	–	17.6	ns
Turn−On Delay Time	$t_{d(on)}$		–	7.2	–	ns
Rise Time	t_r		–	1.6	–	ns
Turn−Off Delay Time	$t_{d(off)}$		–	19.3	–	ns
Fall Time	t_f		–	3.1	–	ns
Turn−Off Time	t_{off}		–	–	36	ns
DRAIN−SOURCE DIODE CHARACTERISTICS						
Source to Drain Diode Voltage	V_{SD}	I_{SD} = 4.3 A	–	0.8	1.25	V
		I_{SD} = 2.1 A	–	0.8	1.0	
Reverse Recovery Time	t_{rr}	I_{SD} = 4.3 A, dI_{SD}/dt = 100 A/μs	–	18.4	24	ns
Reverse Recovery Charge	Q_{rr}		–	10.0	13	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.

TYPICAL CHARACTERISTICS

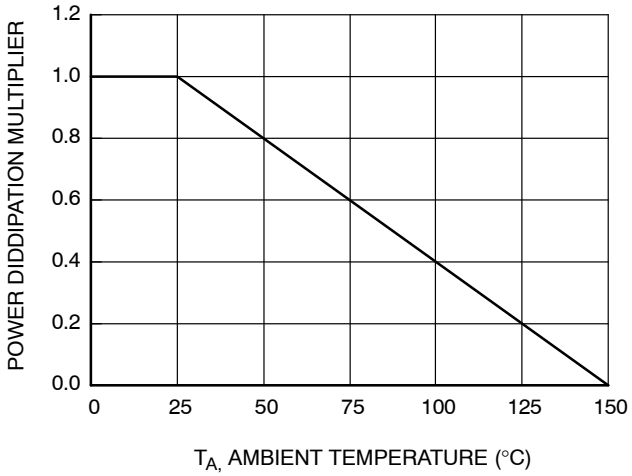


Figure 1. Normalized Power Dissipation vs. Ambient Temperature

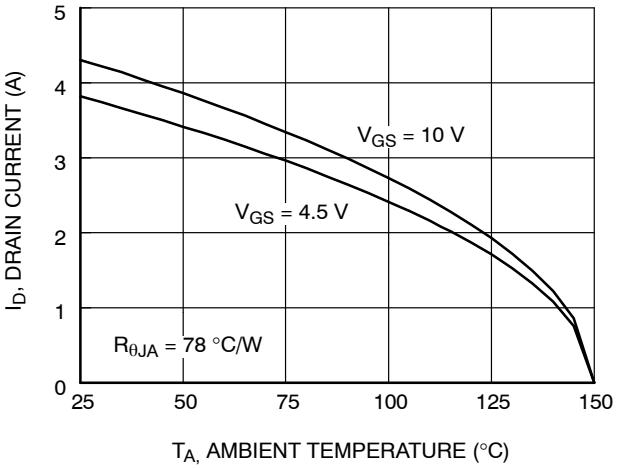


Figure 2. Maximum Continuous Drain Current vs. Ambient Temperature

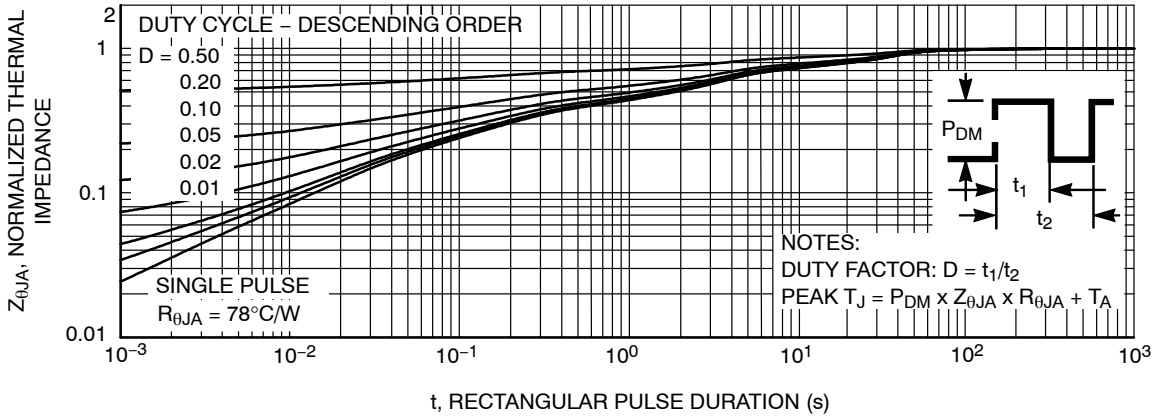


Figure 3. Normalized Maximum Transient Thermal Impedance

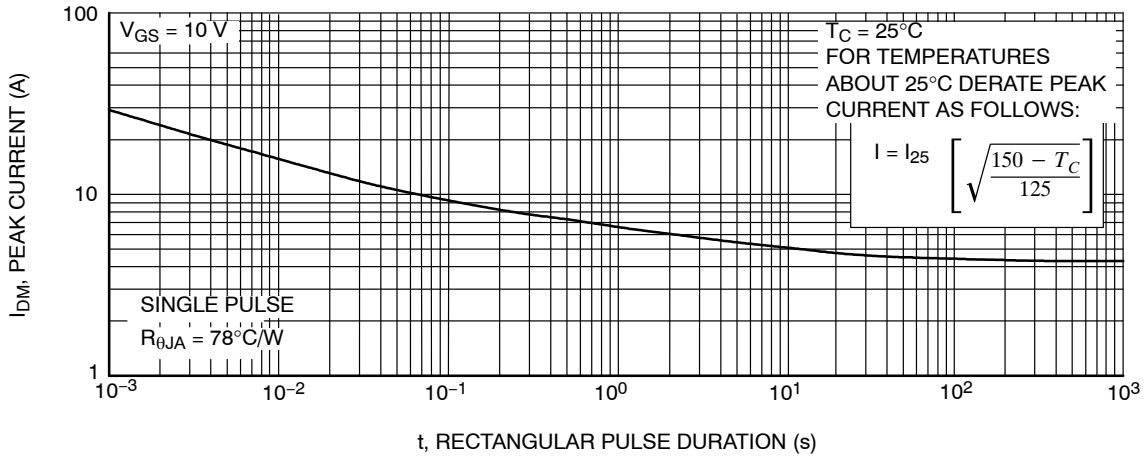


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

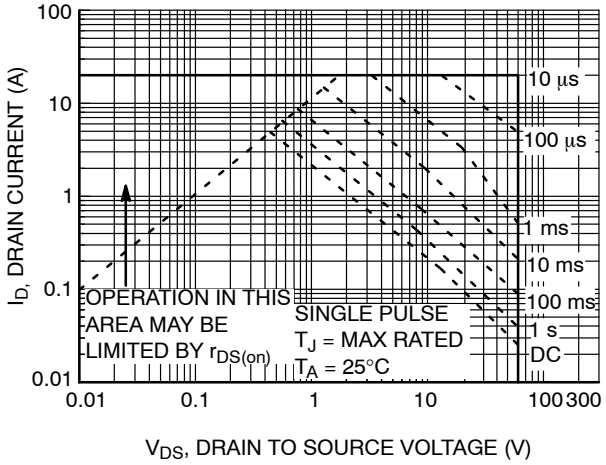


Figure 5. Forward Bias Safe Operating Area

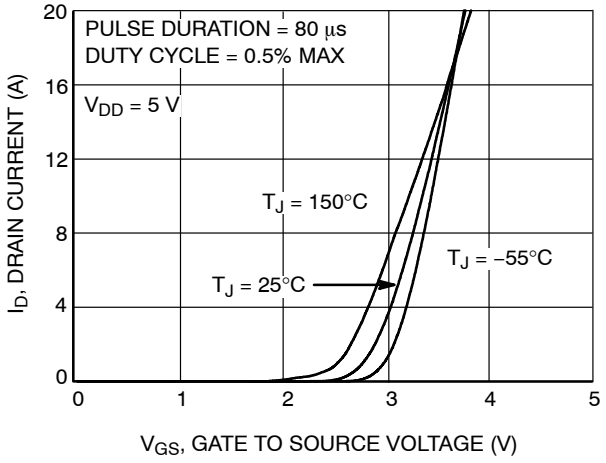


Figure 6. Transfer Characteristics

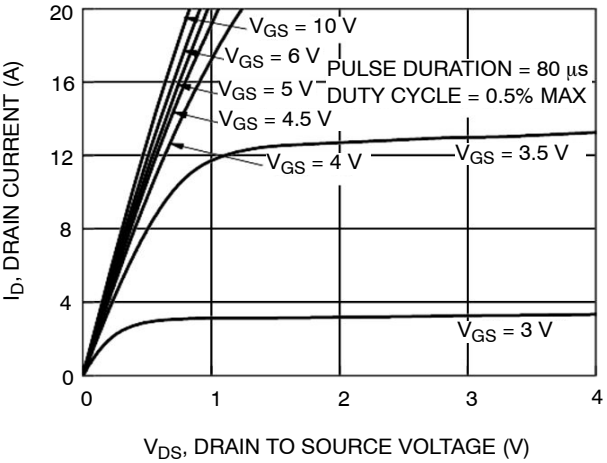


Figure 7. Saturation Characteristics

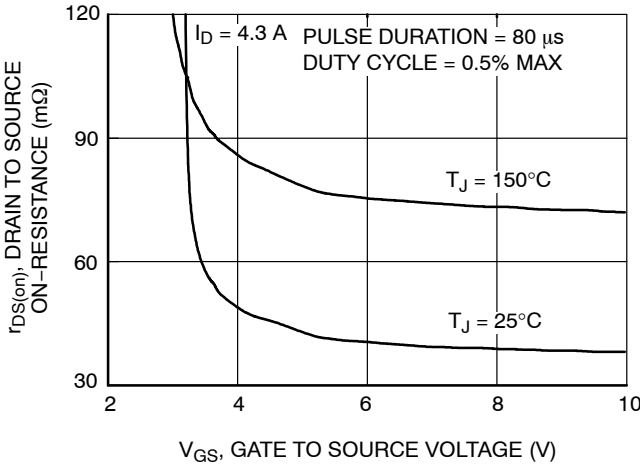


Figure 8. Drain to Source On−Resistance Variation vs. Gate to Source Voltage

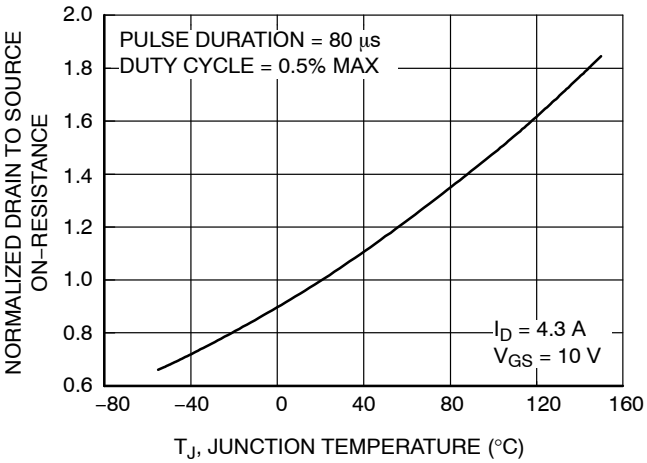


Figure 9. Normalized Drain to Source On Resistance vs. Junction Temperature

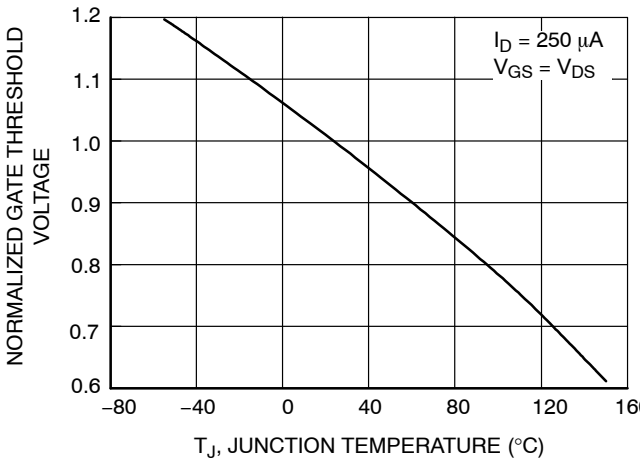


Figure 10. Normalized Gate Threshold Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS (continued)

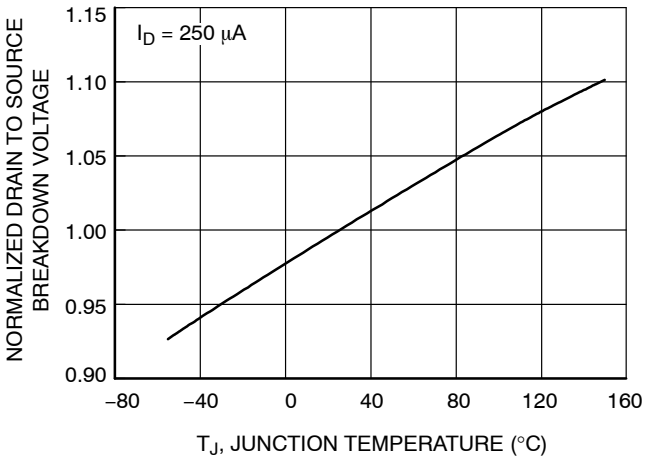


Figure 11. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

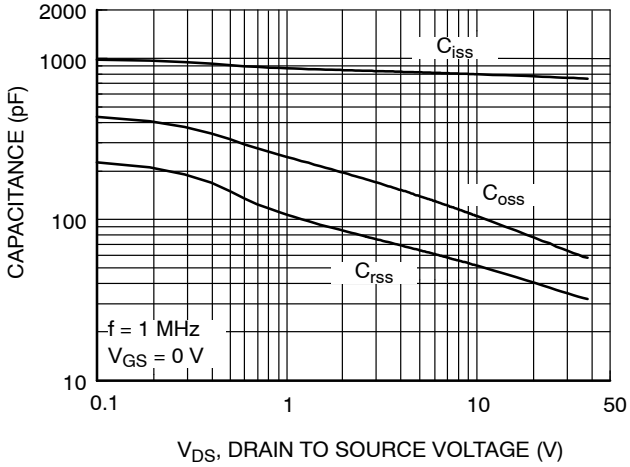


Figure 12. Capacitance vs. Drain to Source Voltage

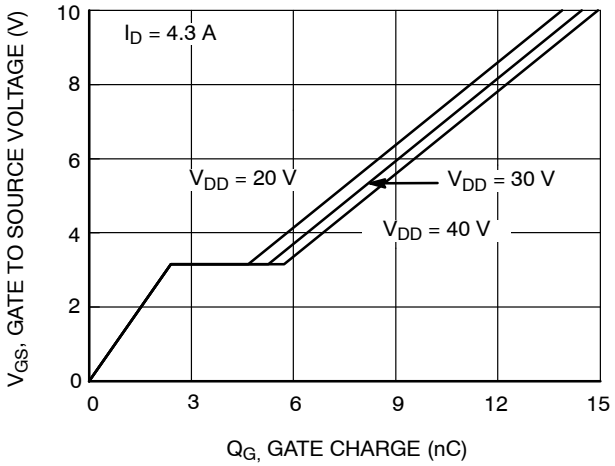


Figure 13. Gate Charge vs. Gate to Source Voltage

ORDERING INFORMATION

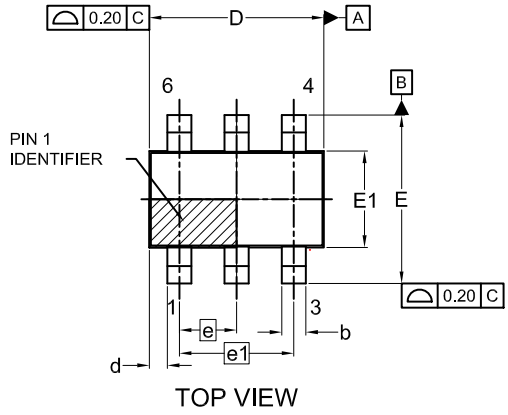
Device Marking	Device	Package	Shipping†
.661N	FDC5661N	TSOT23−6 (Pb−Free)	3000 / Tape & Reel

†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.

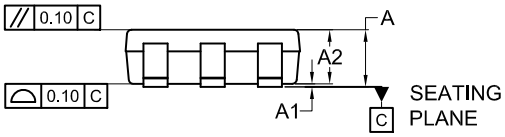
1
SCALE 2:1

TSOT23 6−Lead
CASE 419BL
ISSUE A

DATE 31 AUG 2020

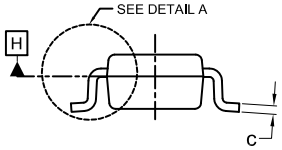


TOP VIEW

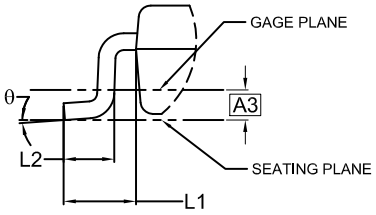


FRONT VIEW

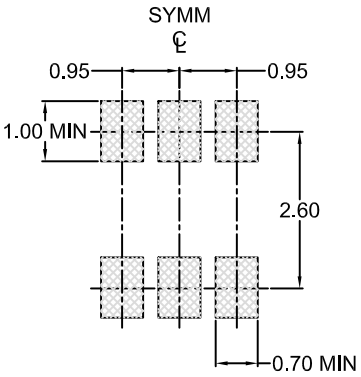
NOTE 4



SIDE VIEW



DETAIL A



LAND PATTERN
RECOMMENDATION

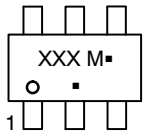
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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.

DOCUMENT NUMBER:	**98AON83292G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TSOT23 6−Lead**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales