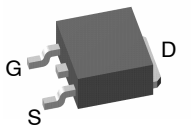
MOSFET – N-Channel, POWERTRENCH®

100 V

FDD3680

V_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
100 V	46 mΩ @ 10 V	25 A



DPAK3 (TO−252 3 LD)
CASE 369AS

General Description

This N−Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

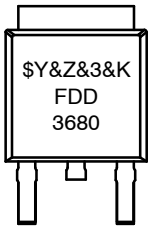
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

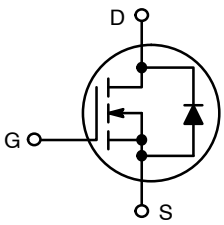
Features

- 25 A, 100 V. $R_{DS(ON)}$ = 46 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 51 mΩ @ V_{GS} = 6 V
- Low Gate Charge (38 nC Typical)
- Fast Switching Speed
- High Performance Trench Technology for Extremely Low $R_{DS(ON)}$
- High Power and Current Handling Capability

MARKING DIAGRAM



$Y	= Logo
FDD3680	= Device Code
&Z	= Assembly Plant Code
&3	= 3−Digit Date Code Format
&K	= 2−Digits Lot Run Traceability Code



N−Channel

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain−Source Voltage	100	V
V_{GSS}	Gate−Source Voltage	+20	V
I_D	Drain Current − Continuous (Note 1)	25	A
	Drain Current − Pulsed	100	
P_D	Maximum Power Dissipation (Note 1)	68	W
	(Note 1a)	3.8	
	(Note 1b)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to +175	°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	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 1)	2.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient (Note 1b)	96	°C/W

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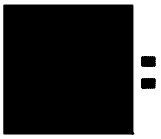
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
DRAIN–SOURCE AVALANCHE RATINGS (Note 1)						
W_{DSS}	Single Pulse Drain–Source Avalanche Energy	V_{DD} = 50 V, I_D = 6.1 A	–	–	245	mJ
I_{AR}	Maximum Drain–Source Avalanche Current		–	–	6.1	A
OFF CHARACTERISTICS						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	101	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	–	–	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	2	2.4	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	–6.5	–	mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 6.1 A V_{GS} = 10 V, I_D = 6.1 A, T_J = 125°C V_{GS} = 6 V, I_D = 5.8 A	– – –	32 61 34	46 92 51	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	25	–	–	A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 6.1 A	–	25	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	–	1735	–	pF
C_{oss}	Output Capacitance		–	176	–	pF
C_{rss}	Reverse Transfer Capacitance		–	53	–	pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 50 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 10 Ω	–	14	25	ns
t_r	Turn–On Rise Time		–	8.5	17	ns
$t_{d(off)}$	Turn–Off Delay Time		–	63	94	ns
t_f	Turn–Off Fall Time		–	21	34	ns
Q_g	Total Gate Charge	V_{DS} = 50 V, I_D = 6.1 A, V_{GS} = 10 V	–	38	53	nC
Q_{gs}	Gate–Source Charge		–	8.1	–	nC
Q_{gd}	Gate–Drain Charge		–	9.2	–	nC
DRAIN–SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain–Source Diode Forward Current		–	–	2.9	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.9 A (Note 2)	–	0.73	1.3	V

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.

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. $R_{\theta JA}$= 40°C/ W when mounted on a 1in^2 pad of 2oz copper.

b. $R_{\theta JA}$= 96°C/ W on a minimum mounting pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

TYPICAL CHARACTERISTICS

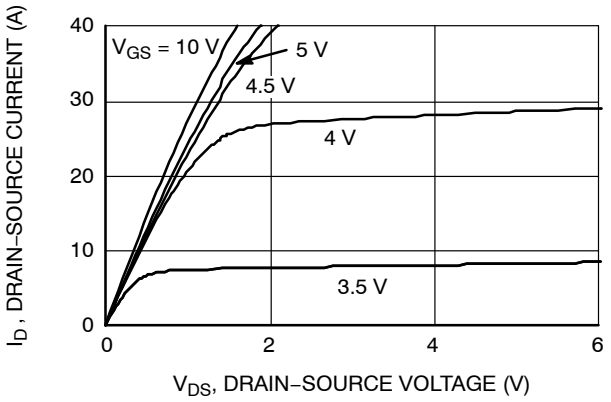


Figure 1. On−Region Characteristics

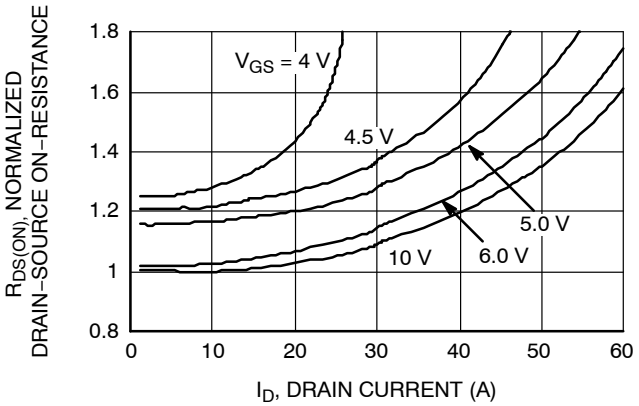


Figure 2. On−Resistance Variation with Drain Current and Gate Voltage

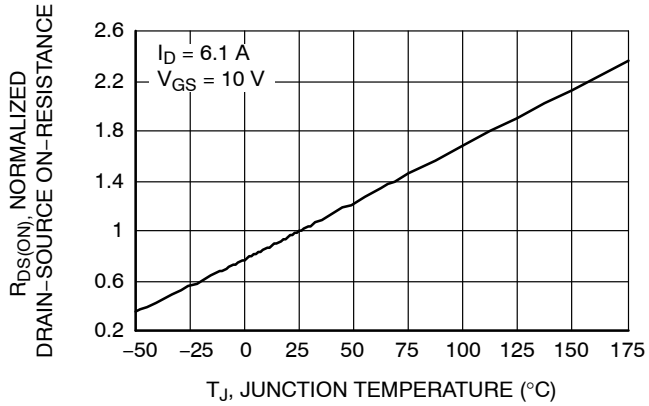


Figure 3. On−Resistance Variation with Temperature

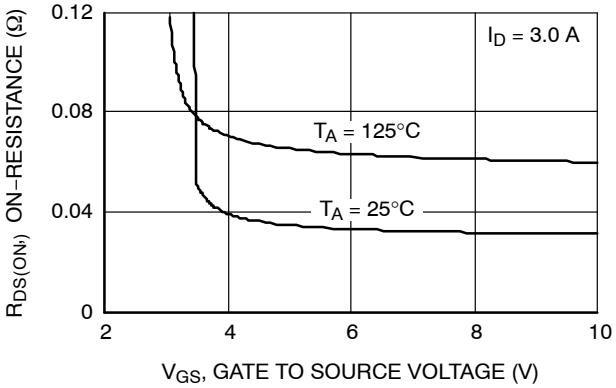


Figure 4. On−Resistance Variation with Gate−to−Source Voltage

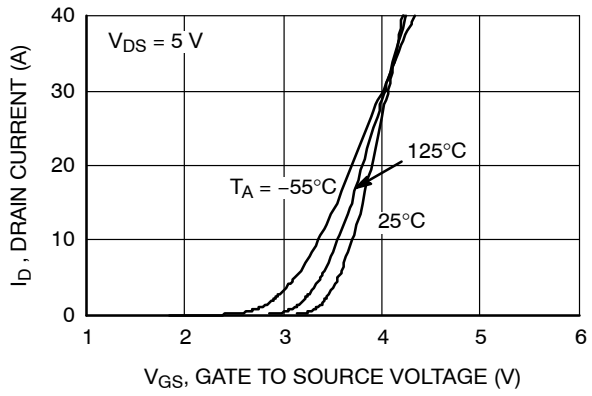


Figure 5. Transfer Characteristics

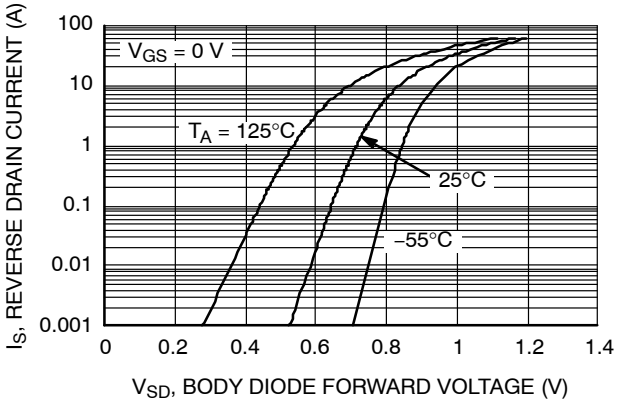


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

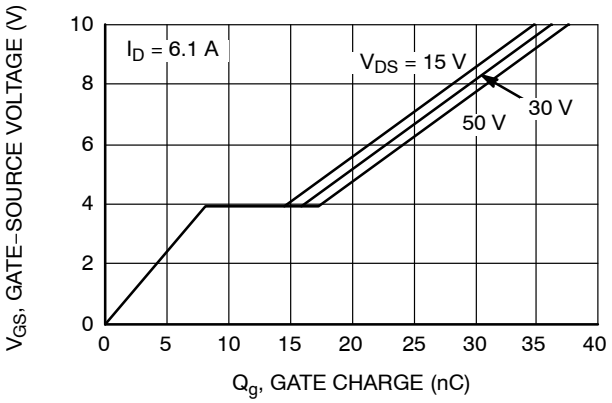


Figure 7. Gate Charge Characteristics

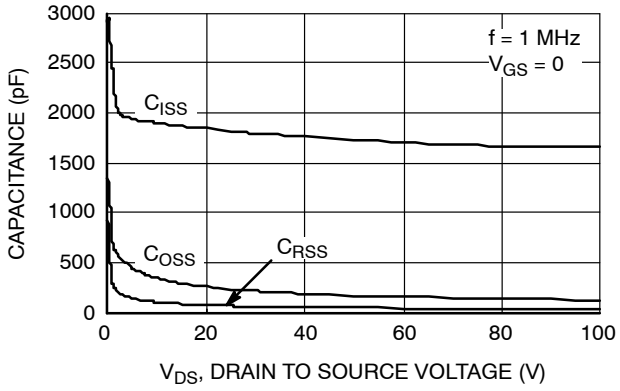


Figure 8. Capacitance Characteristics

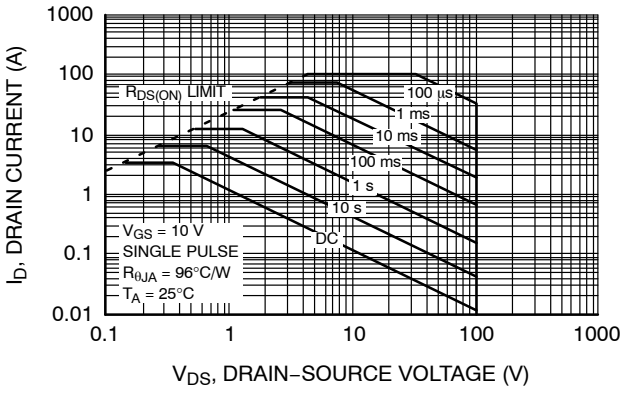


Figure 9. Maximum Safe Operating Area

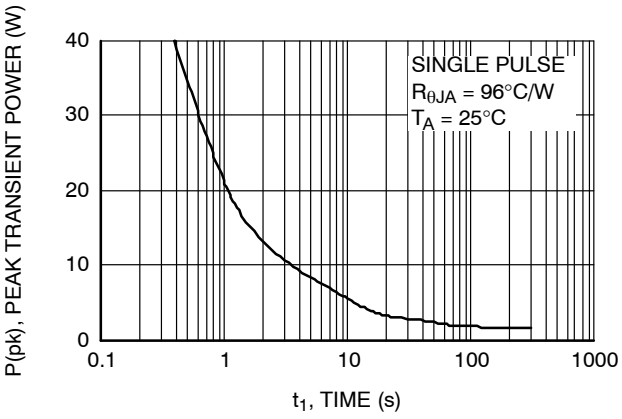


Figure 10. Single Pulse Maximum Power Dissipation

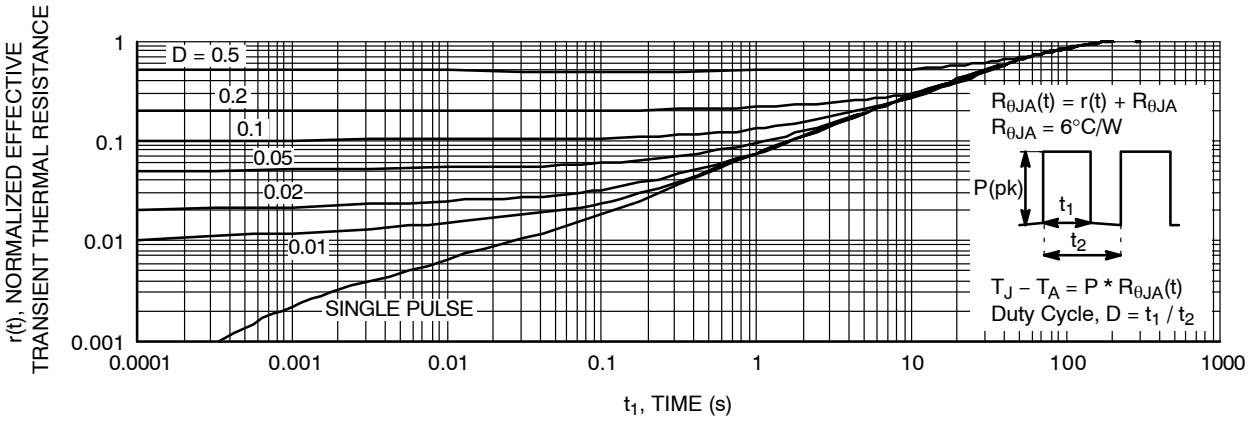


Figure 11. Transient Thermal Response Curve

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

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Shipping†
FDD3680	FDD3680	DPAK3 (TO−252 3 LD)	13”	16 mm	2500 / 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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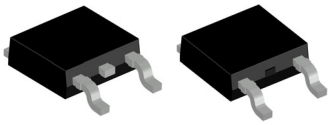
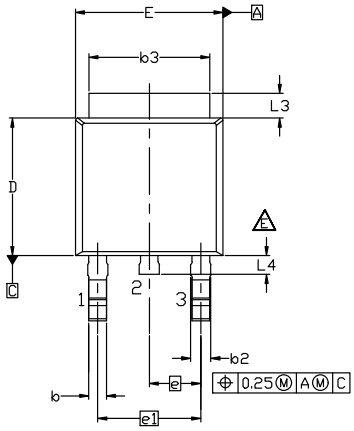
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

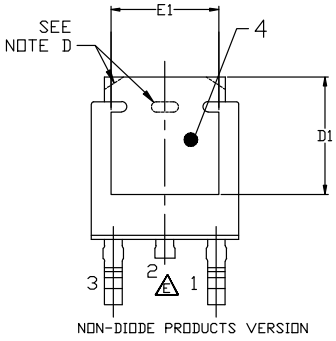


DPAK3 6.10x6.54x2.29, 4.57P
CASE 369AS
ISSUE B

DATE 20 DEC 2023

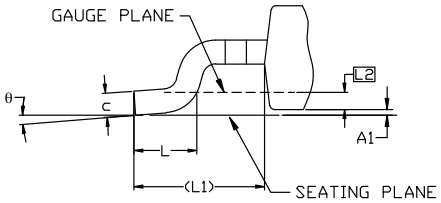


NON-DIODE PRODUCTS VERSION



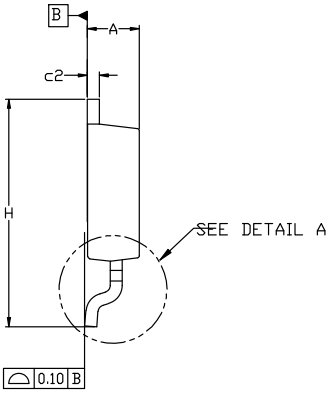
NON-DIODE PRODUCTS VERSION

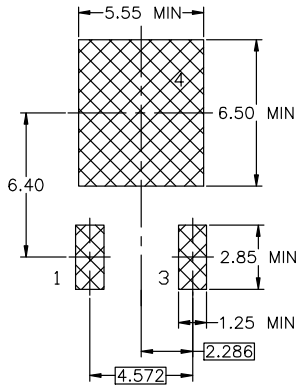
NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE F, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2018.
D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX PLASTIC BODY STUB WITHOUT CENTER LEAD.
F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.



DETAIL A
(ROTATED -90°)
SCALE: 12X

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	–	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	---	---
E	6.35	6.54	6.73
E1	4.32	---	---
e	2.286 BSC		
e1	4.572 BSC		
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90 REF		
L2	0.51 BSC		
L3	0.89	1.08	1.27
L4	---	---	1.02
θ	0°	---	10°





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.

GENERIC MARKING DIAGRAM*

*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.

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

DOCUMENT NUMBER:	**98AON13810G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**DPAK3 6.10x6.54x2.29, 4.57P**	**PAGE 1 OF 1**

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