

MOSFET – N-Channel, QFET

400 V, 16 A, 270 mΩ

FQP17N40

Description

This N-Channel Enhancement Mode Power MOSFET is produced using onsemi's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

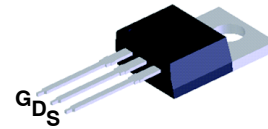
- 16 A, 400 V $R_{DS(on)} = 270 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 8.0 \text{ A}$
- Low Gate Charge (Typ. 45 nC)
- Low C_{RSS} (Typ. 30 pF)
- 100% Avalanche Tested
- This Device is Pb-Free.

ABSOLUTE MAXIMUM RATINGS

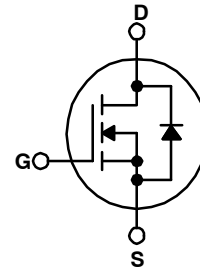
($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	400	V
I_D	Drain Current – Continuous ($T_C = 25^\circ\text{C}$) – Continuous ($T_C = 100^\circ\text{C}$)	16 10.1	A
I_{DM}	Drain Current – Pulsed (Note 1)	64	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	16	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	17	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation – ($T_C = 25^\circ\text{C}$) – Derate Above 25°C	170 1.35	W W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to $+150$	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

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.



TO-220-3
CASE 340AT



MARKING DIAGRAM

&Z&3&K FQP 17N40

&Z = Assembly Plant Code
 &3 = Date Code (Year & week)
 &K = 2-Digit Lot Code
 FQP17N40 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping [†]
FQP17N40	TO-220-3 (Pb-Free)	1000 Units / Tube

[†]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](#).

FQP17N40

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max	0.74	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	400	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	–	0.44	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	–	–	1	μA
		$V_{DS} = 320\text{ V}, T_C = 125^\circ\text{C}$	–	–	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	–	–	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	–	–	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 8.0\text{ A}$	–	0.21	0.27	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 8.0\text{ A}$	–	13	–	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	1800	2300	pF
C_{oss}	Output Capacitance		–	270	350	pF
C_{rss}	Reverse Transfer Capacitance		–	30	40	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200\text{ V}, I_D = 17.2\text{ A}, R_G = 25\text{ }\Omega$ (Note 4)	–	40	90	ns
t_r	Turn-On Rise Time		–	185	380	ns
$t_{d(off)}$	Turn-Off Delay Time		–	90	190	ns
t_f	Turn-Off Fall Time		–	105	220	ns
Q_g	Total Gate Charge	$V_{DS} = 320\text{ V}, I_D = 17.2\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	–	45	60	nC
Q_{gs}	Gate-Source Charge		–	11.4	–	nC
Q_{gd}	Gate-Drain Charge		–	21.7	–	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain–Source Diode Forward Current		–	–	16	A
I _{SM}	Maximum Pulsed Drain–Source Diode Forward Current		–	–	64	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 16 A	–	–	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 17.2 A, dI _F /dt = 100 A/μs	–	290	–	ns
Q _{rr}	Reverse Recovery Charge		–	2.5	–	μC

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. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $L = 6.8\text{ mH}$, $I_{AS} = 16\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\text{ }\Omega$ starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 17.2\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

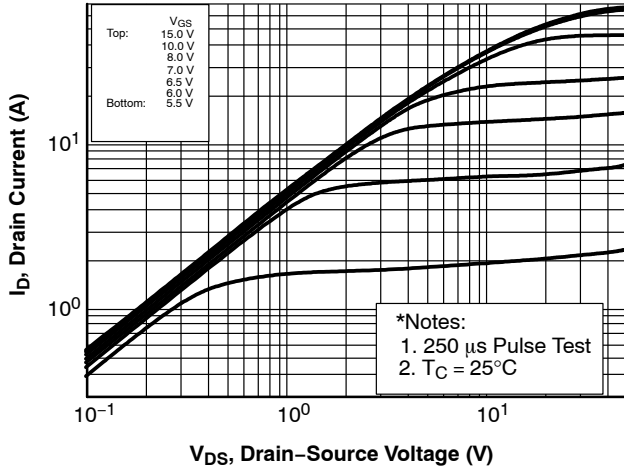


Figure 1. On-Region Characteristics

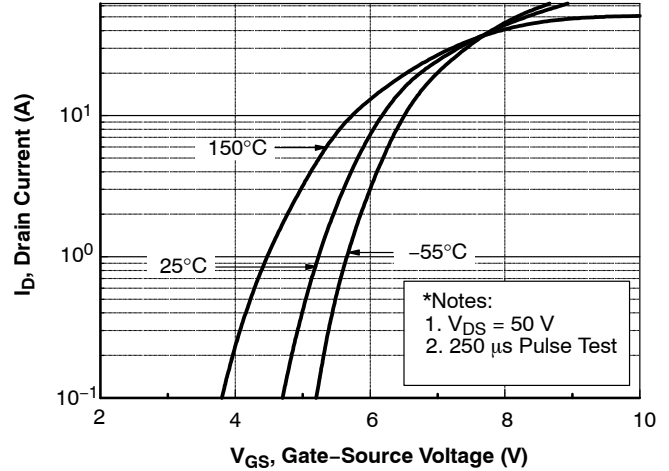


Figure 2. Transfer Characteristics

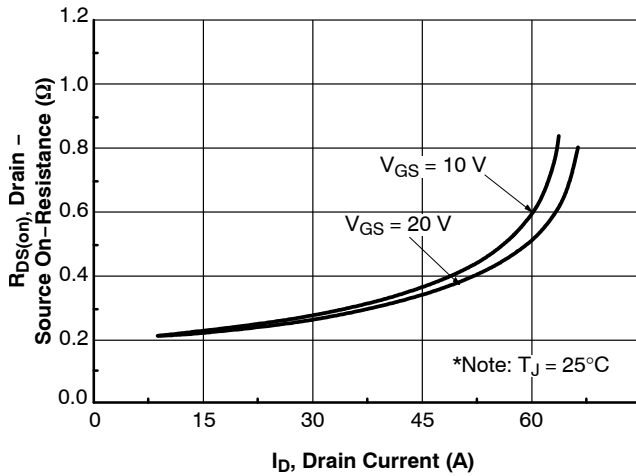


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

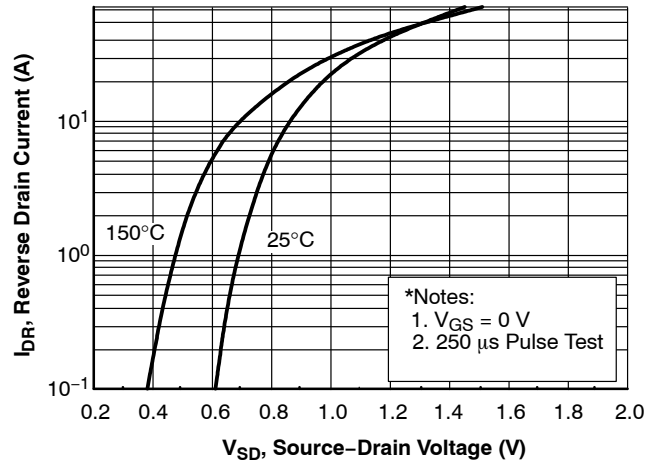


Figure 4. Body Diode Forward Voltage Variation vs Source Current and Temperature

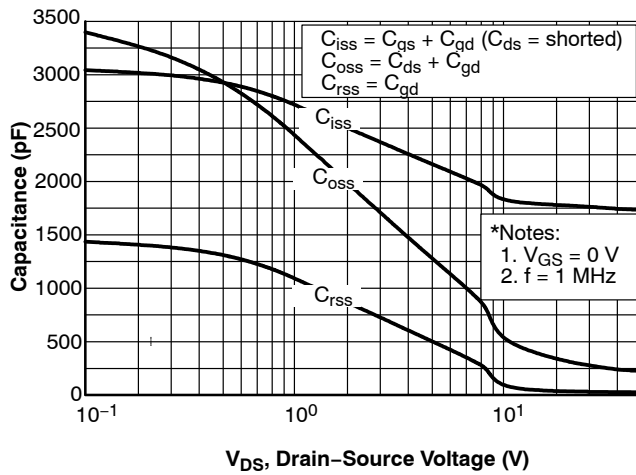


Figure 5. Capacitance Characteristics

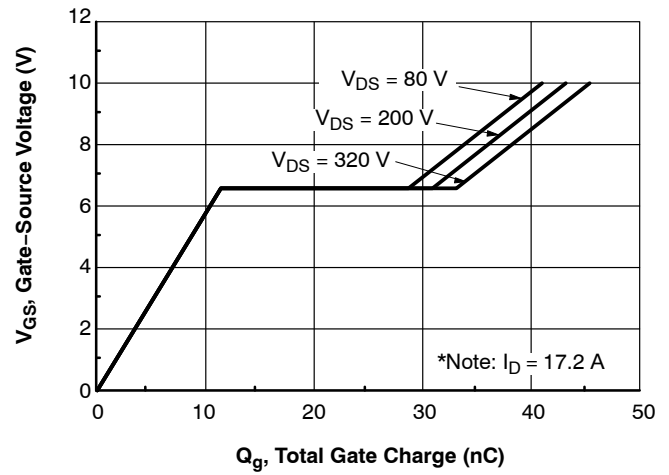


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)

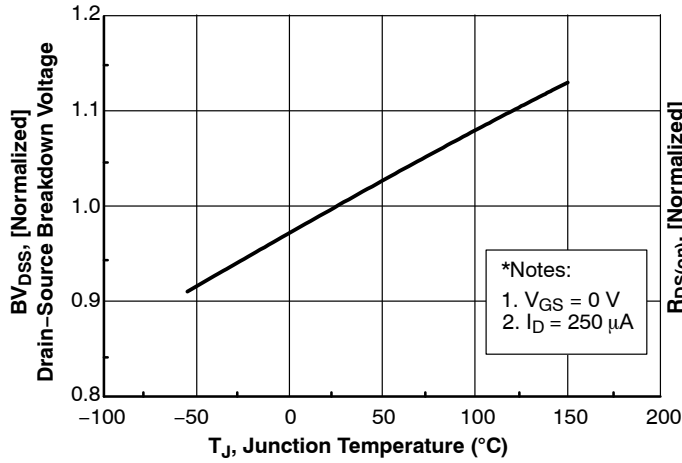


Figure 7. Breakdown Voltage Variation vs Temperature

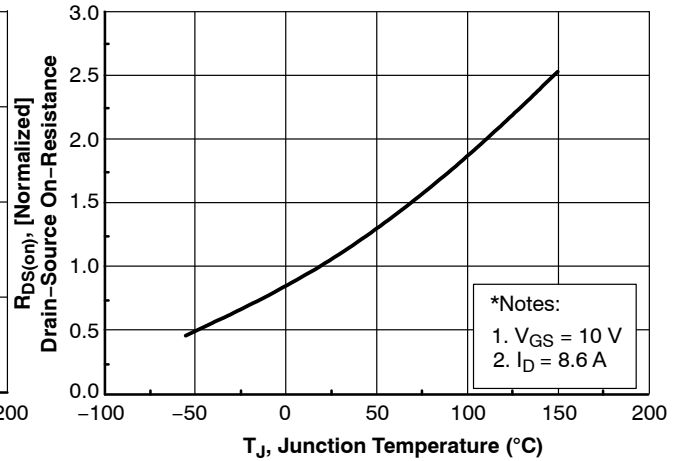


Figure 8. On-Resistance Variation vs Temperature

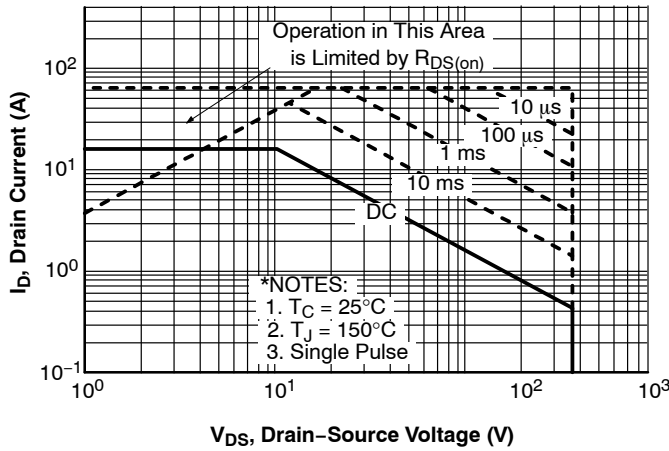


Figure 9. Maximum Safe Operating Area

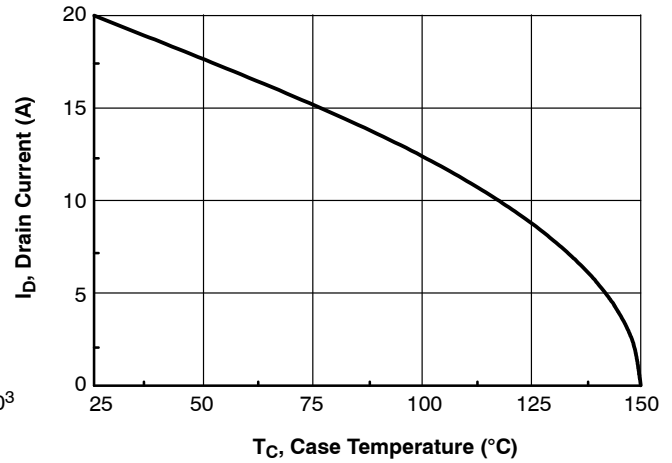


Figure 10. Maximum Drain Current vs. Case Temperature

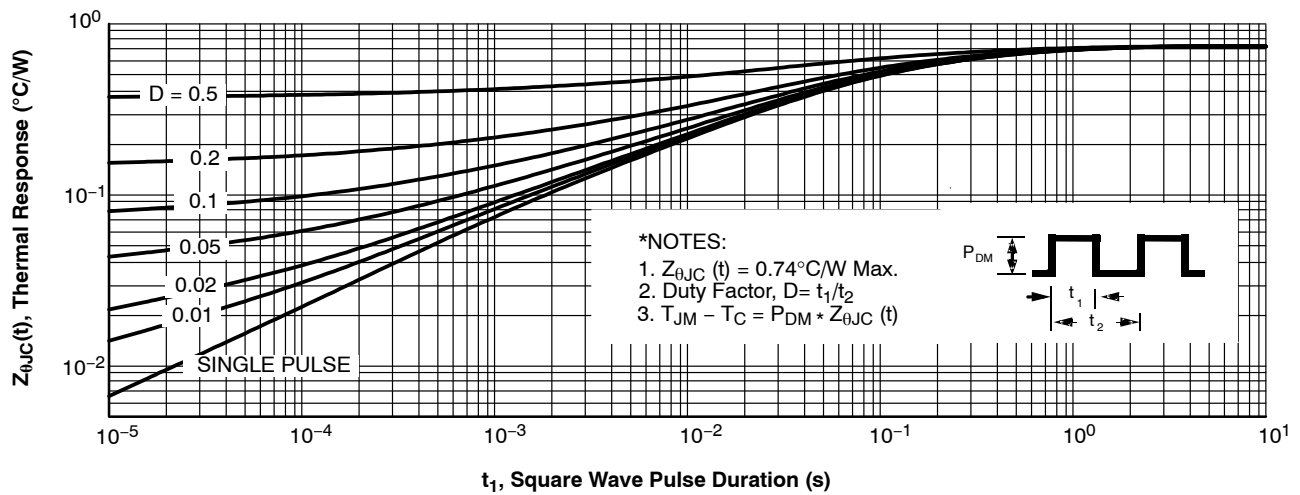


Figure 11. Transient Thermal Response Curve

FQP17N40

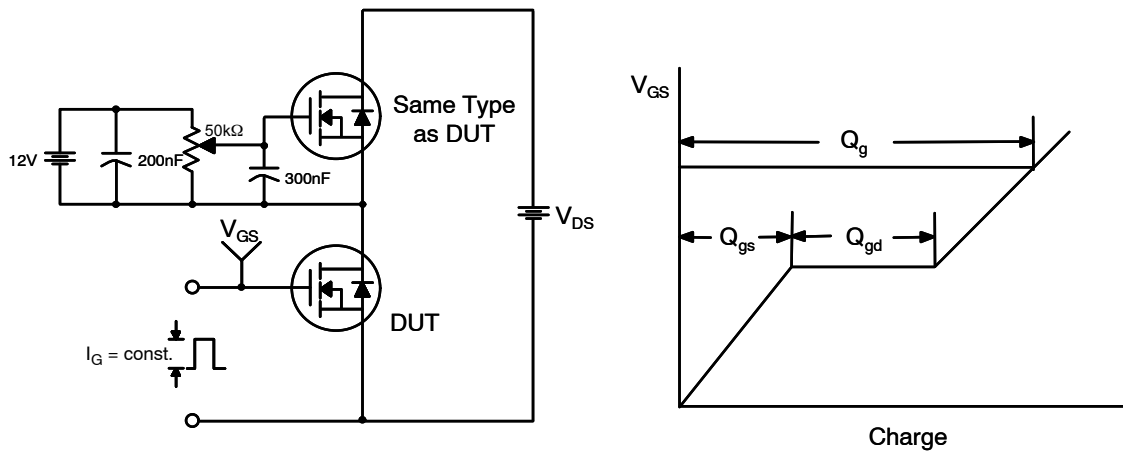


Figure 12. Gate Charge Test Circuit & Waveform

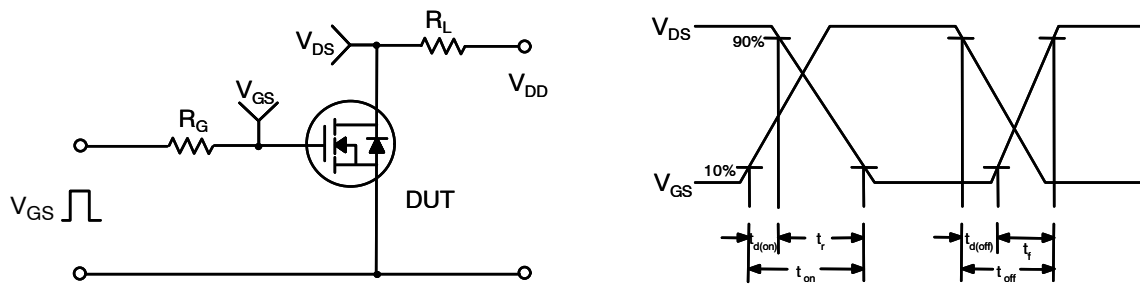


Figure 13. Resistive Switching Test Circuit & Waveforms

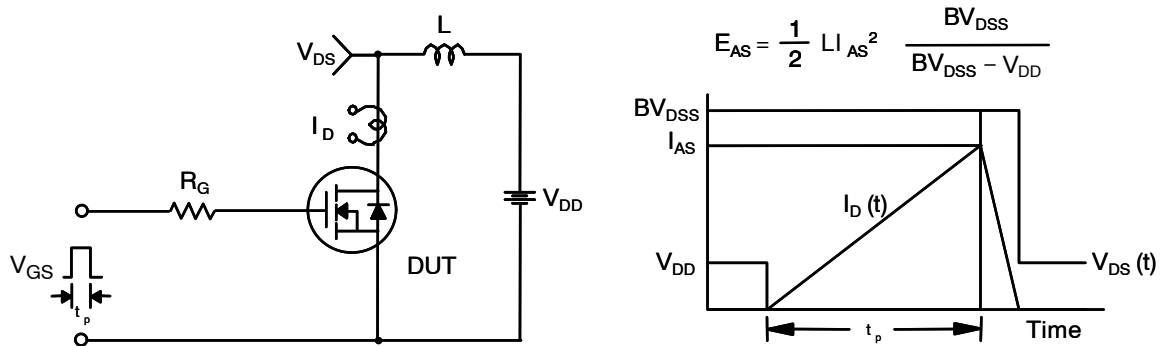


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

The diagram shows a switching circuit. A MOSFET labeled "DUT" has its gate connected to a driver MOSFET. The driver MOSFET's gate is driven by a square wave V_{GS} through a resistor R_G . The driver MOSFET is labeled "Same Type as DUT". The drain of the driver MOSFET is connected to the gate of the DUT MOSFET. The source of the driver MOSFET is connected to the source of the DUT MOSFET, which is also connected to ground. The drain of the DUT MOSFET is connected to a load inductor L and a DC supply V_{DD} . The voltage across the DUT MOSFET is labeled V_{DS} and the current through it is labeled I_{SD} . The current through the inductor L is labeled I_L . The voltage across the inductor is labeled V_L . The voltage across the DUT MOSFET is labeled V_{DS} . The voltage across the inductor is labeled V_L . The voltage across the DUT MOSFET is labeled V_{DS} . The voltage across the inductor is labeled V_L .

- dv/dt controlled by R_G
- I_{SD} controlled by pulse period

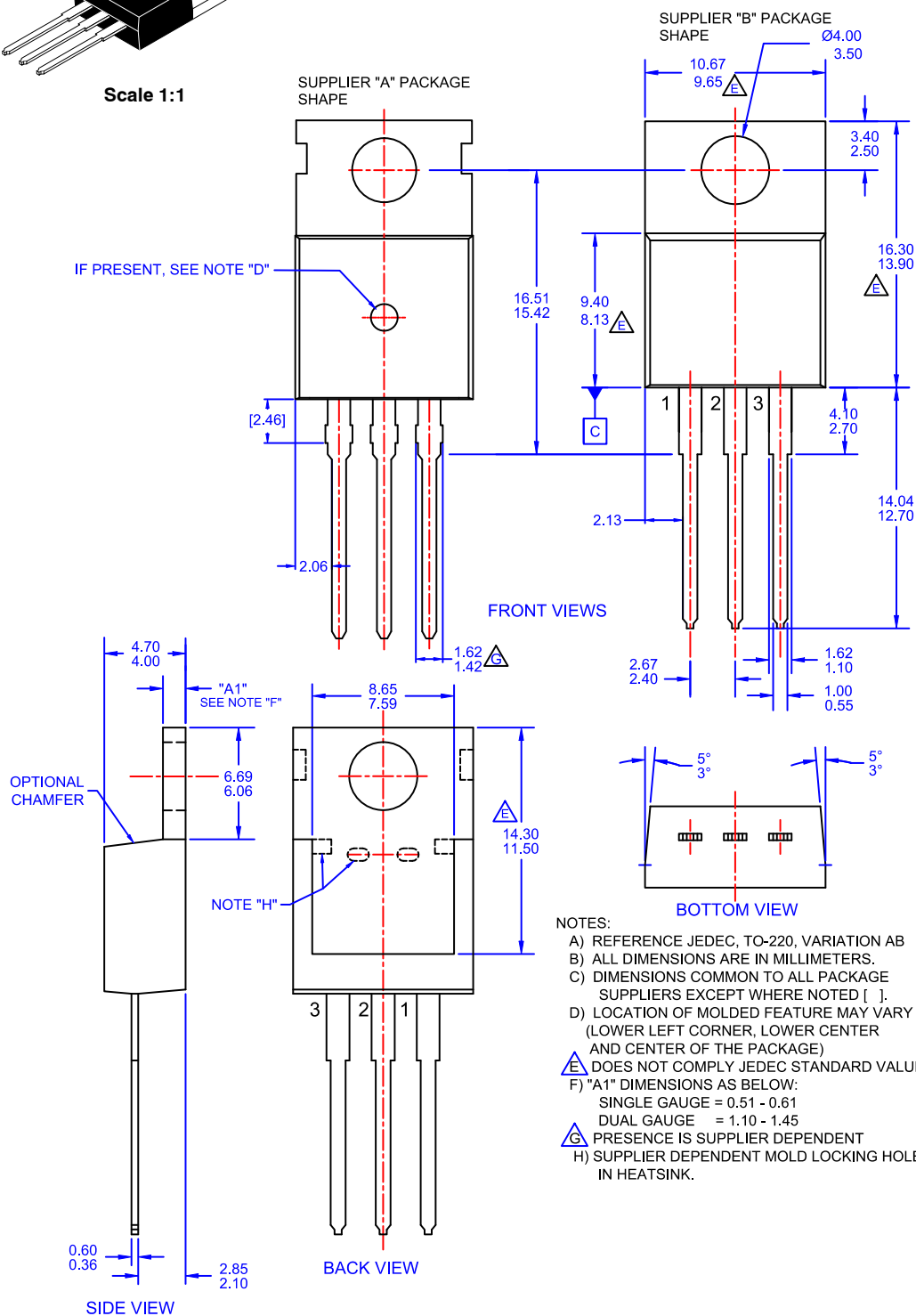


ON



TO-220-3LD
CASE 340AT
ISSUE A

DATE 03 OCT 2017



DOCUMENT NUMBER:	98AON13818G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TO-220-3LD	PAGE 1 OF 1

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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