

# MOSFET – Power, N-Channel, SMPS

500 V, 44 A, 120 mΩ

## FDH44N50

### Description

UniFET™ MOSFET is ON Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

### Features

- Low Gate Charge  $Q_g$  Results in Simple Drive Requirement (Typ. 90 nC)
- Improved Gate, Avalanche and High Reapplied  $dv/dt$  Ruggedness
- Reduced  $R_{DS(on)}$  (110 mΩ (Typ.) @  $V_{GS} = 10$  V,  $I_D = 22$  A)
- Reduced Miller Capacitance and Low Input Capacitance (Typ.  $C_{rss} = 40$  pF)
- Improved Switching Speed with Low EMI
- 175°C Rated Junction Temperature
- This Device is Pb-Free and is RoHS Compliant

### Applications

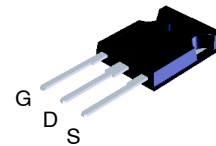
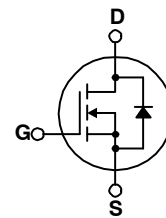
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply



ON Semiconductor®

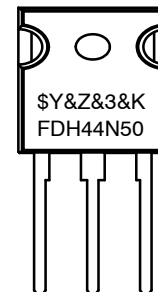
[www.onsemi.com](http://www.onsemi.com)

$V_{DS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
500 V	120 mΩ @ 10 V	44 A



TO-247-3LD  
CASE 340CK

### MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FDH44N50	= Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FDH44N50

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter	FDH44N50	Unit
V <sub>DSS</sub>	Drain to Source Voltage	500	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Drain Current – – Continuous (T <sub>C</sub> = 25°C, V <sub>GS</sub> = 10 V) – Continuous (T <sub>C</sub> = 100°C, V <sub>GS</sub> = 10 V) – Pulsed (Note 1)	44 32 176	A
P <sub>D</sub>	Power Dissipation	750	W
	Derate Above 25°C	5	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature	–55 to + 175	°C
	Soldering Temperature for 10 Seconds	300 (1.6 mm from Case)	°C
	Mounting Torque, 8–32 or M3 Screw	10 ibf*in (1.1 N*m)	

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. Repetitive Rating: Pulse width limited by maximum junction temperature.

## PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Package Method	Reel Size	Tape Width	Quantity
FDH44N50	FDH44N50	TO-247-3	Tube	N/A	N/A	30 Units

## THERMAL CHARACTERISTICS

Symbol	Parameter	FDH44N50	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case, Max.	0.2	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient, Max.	40	

# FDH44N50

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	
<b>STATICS</b>							
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	500	–	–	V	
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 1 mA, Referenced to 25°C	–	0.61	–	V/°C	
r <sub>DS(ON)</sub>	Drain to Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 22 A	–	0.11	0.12	Ω	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2	3.15	4	V	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 500 V V <sub>GS</sub> = 0 V	T <sub>C</sub> = 25°C	–	–	25	μA
			T <sub>C</sub> = 150°C	–	–	250	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V	–	–	±100	nA	

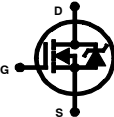
## DYNAMICS

g <sub>fS</sub>	Forward Transconductance	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 22 A	11	–	–	S
Q <sub>g(TOT)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 400 V, I <sub>D</sub> = 44 A	–	90	108	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		–	24	29	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		–	31	37	nC
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 250 V, I <sub>D</sub> = 44 A, R <sub>D</sub> = 5.68 Ω, R <sub>G</sub> = 2.15 Ω	–	16	–	ns
t <sub>r</sub>	Turn-On Rise Time		–	84	–	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		–	45	–	ns
t <sub>f</sub>	Turn-Off Fall Time		–	79	–	ns
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	5335	–	pF
C <sub>oss</sub>	Output Capacitance		–	645	–	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	40	–	pF

## AVALANCHE CHARACTERISTICS

E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 2)		1500	–	–	mJ
I <sub>AR</sub>	Avalanche Current		–	–	44	A

## DRAIN-SOURCE DIODE CHARACTERISTICS

I <sub>S</sub>	Continuous Source Current (Body Diode)	MOSFET symbol Showing the integral reverse p-n junction diode.		–	–	44	A
I <sub>SM</sub>	Pulsed Source Current (Body Diode) (Note 1)			–	–	176	A
V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 44 A	–	0.900	1.2	V	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 44 A, dI <sub>SD</sub> /dt = 100 A/μs	–	920	1100	ns	
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>SD</sub> = 44 A, dI <sub>SD</sub> /dt = 100 A/μs	–	14	18	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.

2. Starting T<sub>J</sub> = 25°C, L = 1.61 mH, I<sub>AS</sub> = 44 A

TYPICAL CHARACTERISTICS

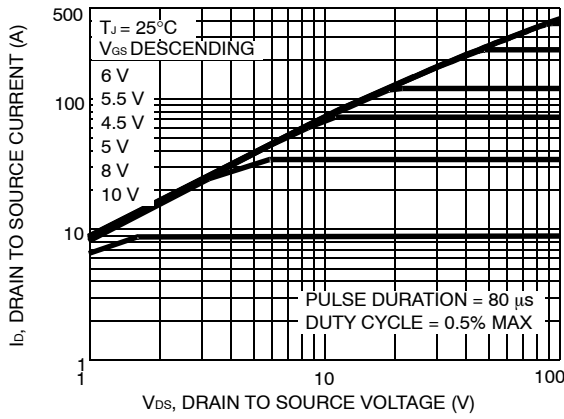


Figure 1. Output Characteristics

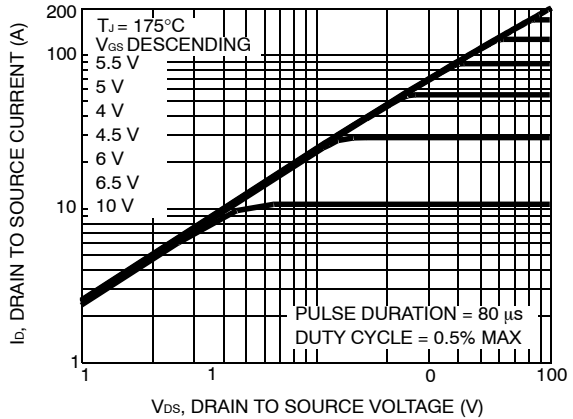


Figure 2. Output Characteristics

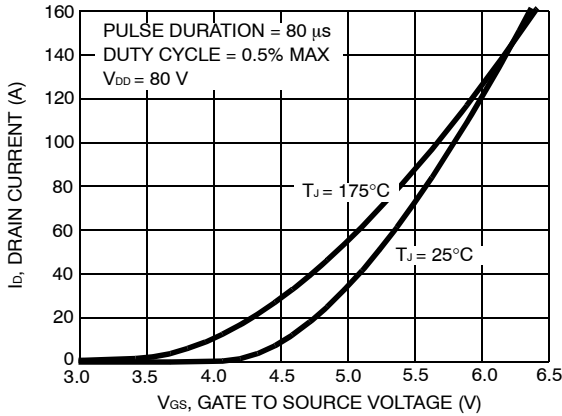


Figure 3. Transfer Characteristics

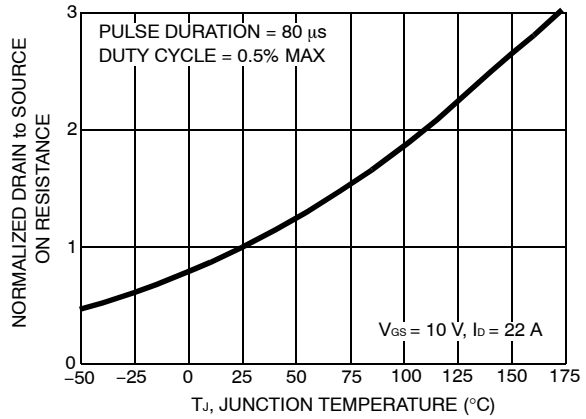


Figure 4. Normalized Drain to Source On Resistance vs. Junction Temperature

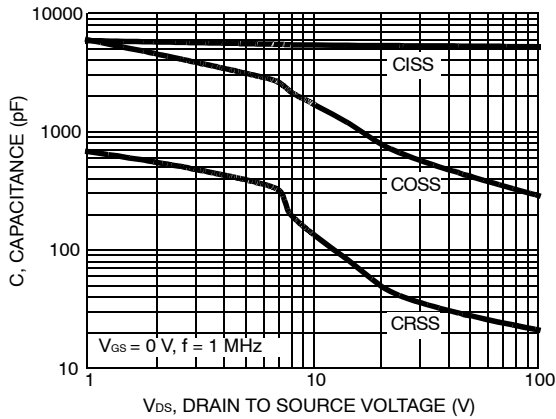


Figure 5. Capacitance vs. Drain to Source Voltage

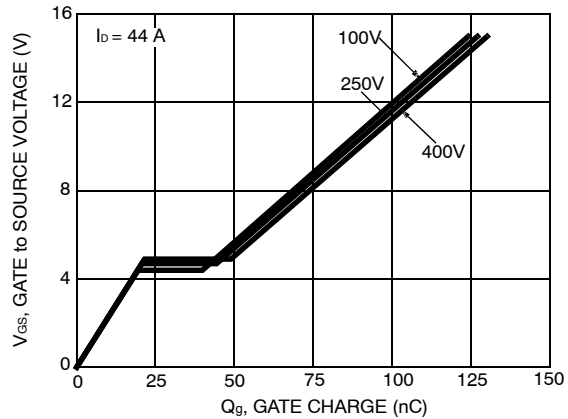
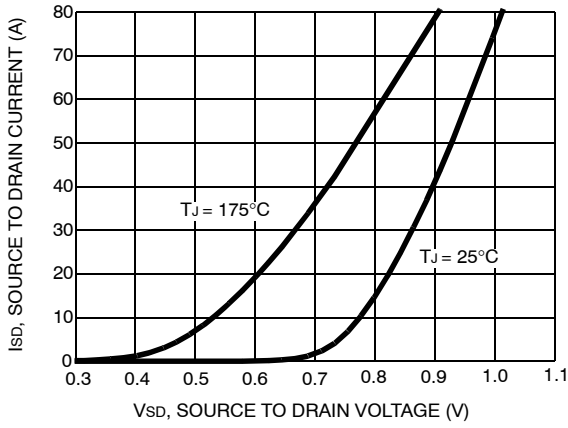


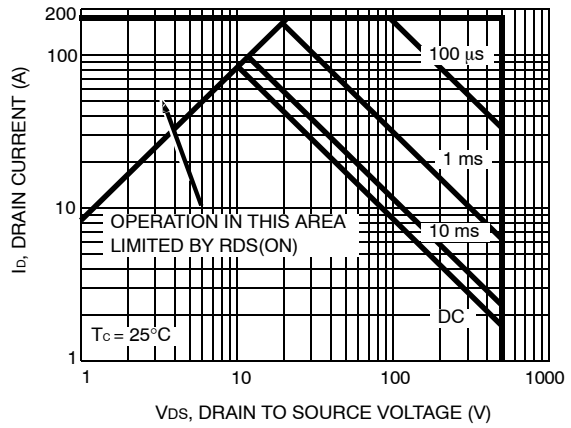
Figure 6. Gate Charge Waveforms for Constant Gate Current

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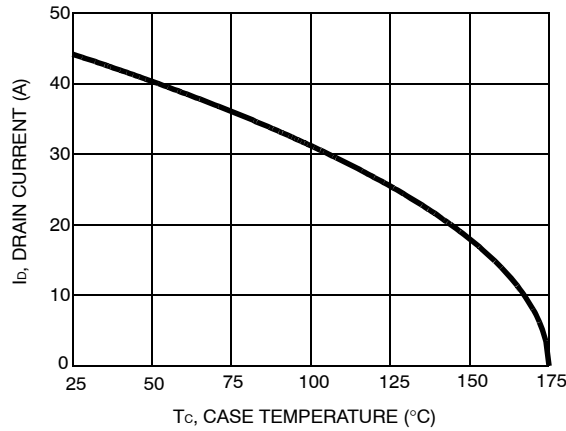
## TYPICAL CHARACTERISTICS



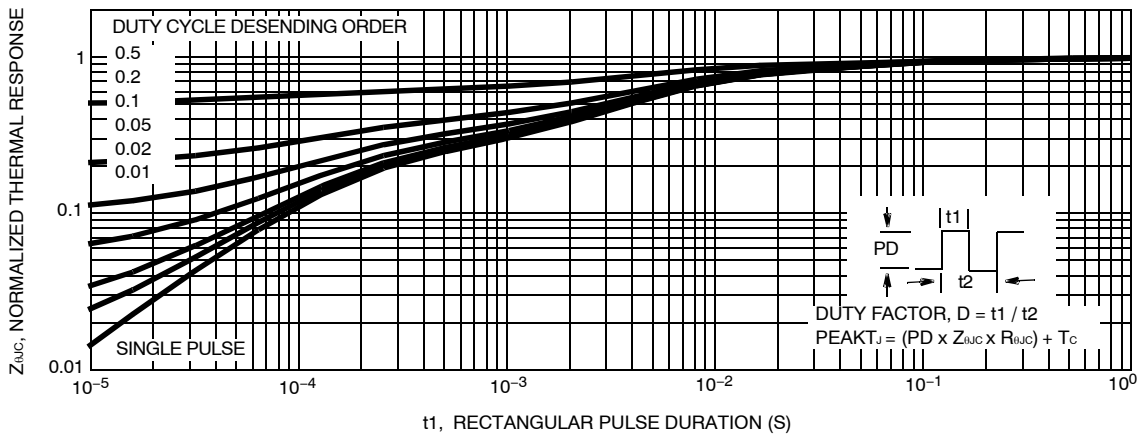
**Figure 7. Body Diode Forward Voltage vs. Body Diode Current**



**Figure 8. Maximum Safe Operating Area**



**Figure 9. Maximum Drain Current vs. Case Temperature**



**Figure 10. Normalized Transient Thermal Impedance, Junction to Case**

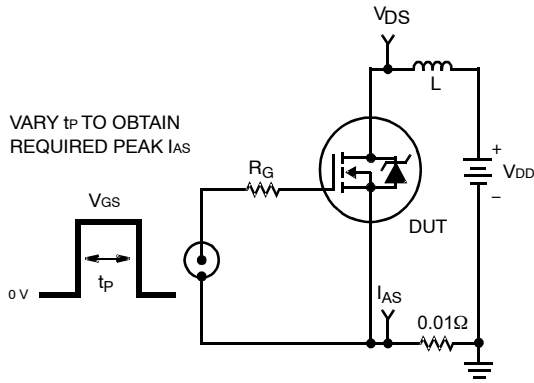


Figure 11. Unclamped Energy Test Circuit

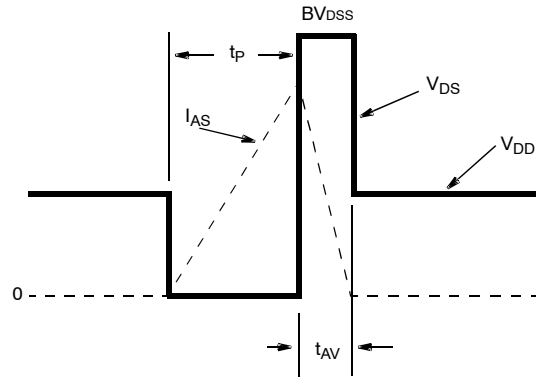


Figure 12. Unclamped Energy Waveforms

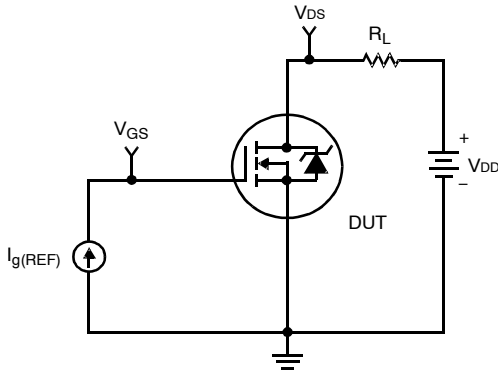


Figure 13. Gate Charge Test Circuit

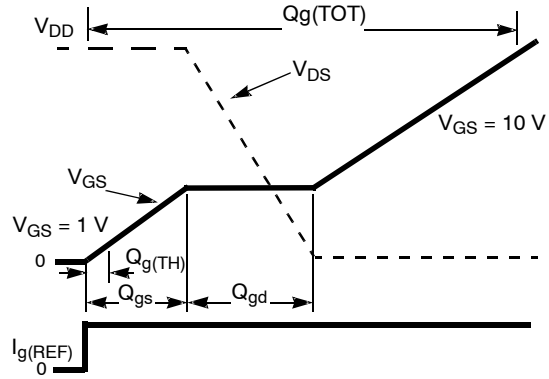


Figure 14. Gate Charge Waveforms

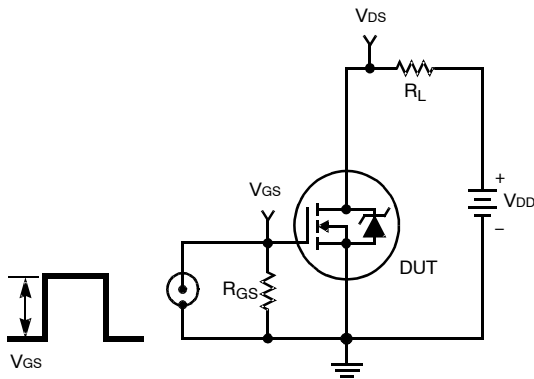


Figure 15. Switching Time Test Circuit

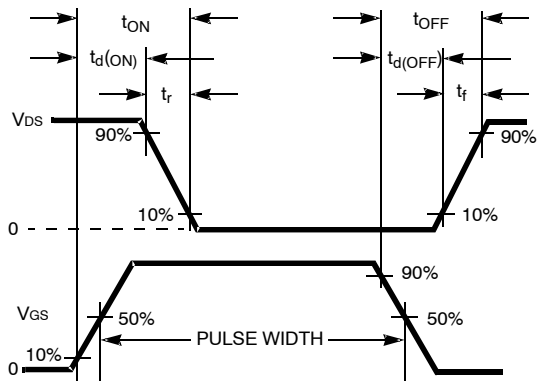
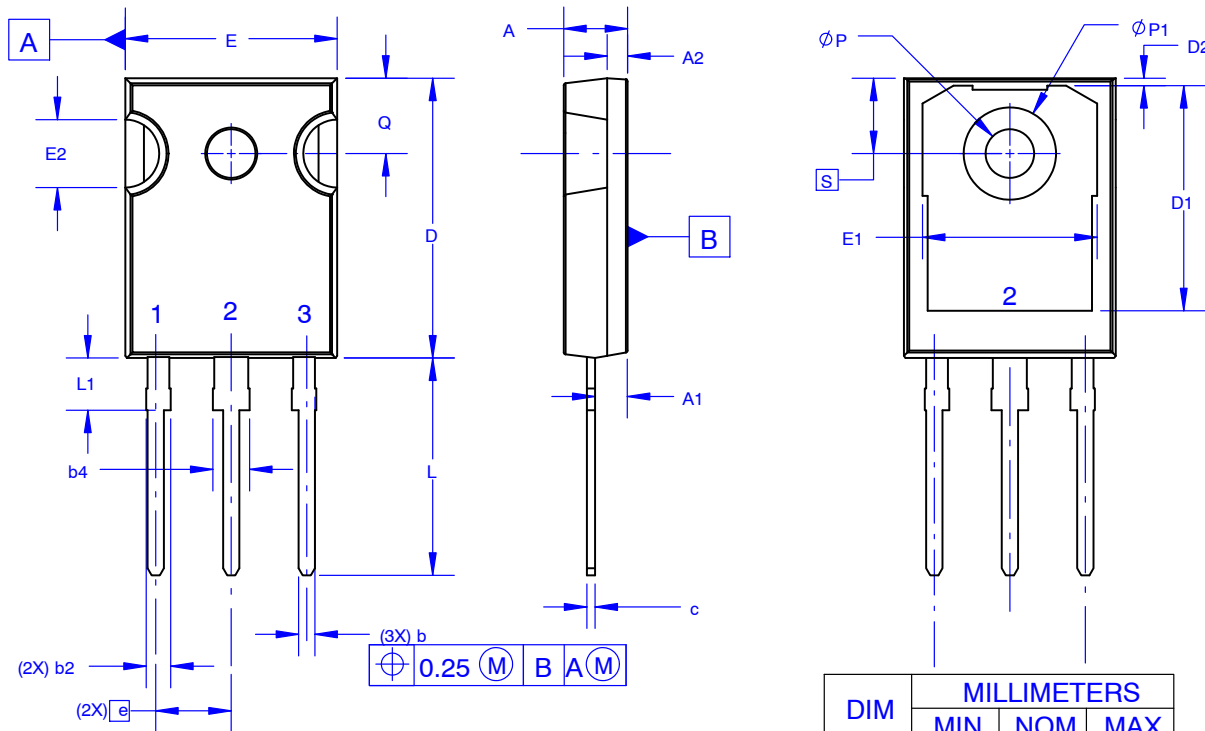


Figure 16. Switching Time Waveform



**TO-247-3LD SHORT LEAD**  
**CASE 340CK**  
**ISSUE A**

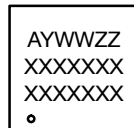
DATE 31 JAN 2019



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

**GENERIC MARKING DIAGRAM\***



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

\*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.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
∅P	3.51	3.58	3.65
∅P1	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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