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FAIRCHILD

September 2016

FDMQ8205A

GreenBridge^{TM} 2 Series of High-Efficiency Bridge Rectifiers

Features

- Low Power Loss GreenBridge^{TM} Replaces Diode Bridge
- Self Driving Circuitry for MOSFETs
- Low $r_{DS(on)}$ 100V Rated MOSFETs
- Maximizing Available Power and Voltage
- Eliminating Thermal Design Problems
- IEEE802.3at Compatible
  - Meet Detection and Classification Requirement
  - Work with 2 and 4-pair Architecture
  - Small Backfeed Voltage
- Compact MLP 4.5x5 Package

Applications

- Power over Ethernet (PoE) Power Device (PD)
  - IP Phones
  - Network Cameras
  - Wireless Access Points
  - Thin Clients
  - Microcell
  - Femtocell

General Description

FDMQ8205A is GreenBridge^{TM}2 series of quad MOSFETs for a bridge application so that the input will be insensitive to the polarity of a power source coupled to the device. Many known bridge rectifier circuits can be configured using typical diodes. The conventional diode bridge has relatively high power loss that is undesirable in many applications. Especially, Power over Ethernet (PoE) Power Device (PD) application requires high-efficiency bridges because it should be operated with the limited power delivered from Power Source Equipment (PSE) which is classified by IEEE802.3at. FDMQ8205A is configured with low $r_{DS(on)}$ dual P-ch MOSFETs and N-ch MOSFETs so that it can reduce the power loss caused by the voltage drop, compared to the conventional diode bridge. FDMQ8205A enables the application to maximize the available power and voltage and to eliminate the thermal design problems in PoE PD applications.

FDMQ8205A GreenBridge^{TM}2 is compatible with IEEE802.3at PoE standard by not compromising detection and classification requirement as well as small backfeed voltage.

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMQ8205A	FDMQ8205A	MLP4.5x5	13 ”	12 mm	3000 units

Typical Application

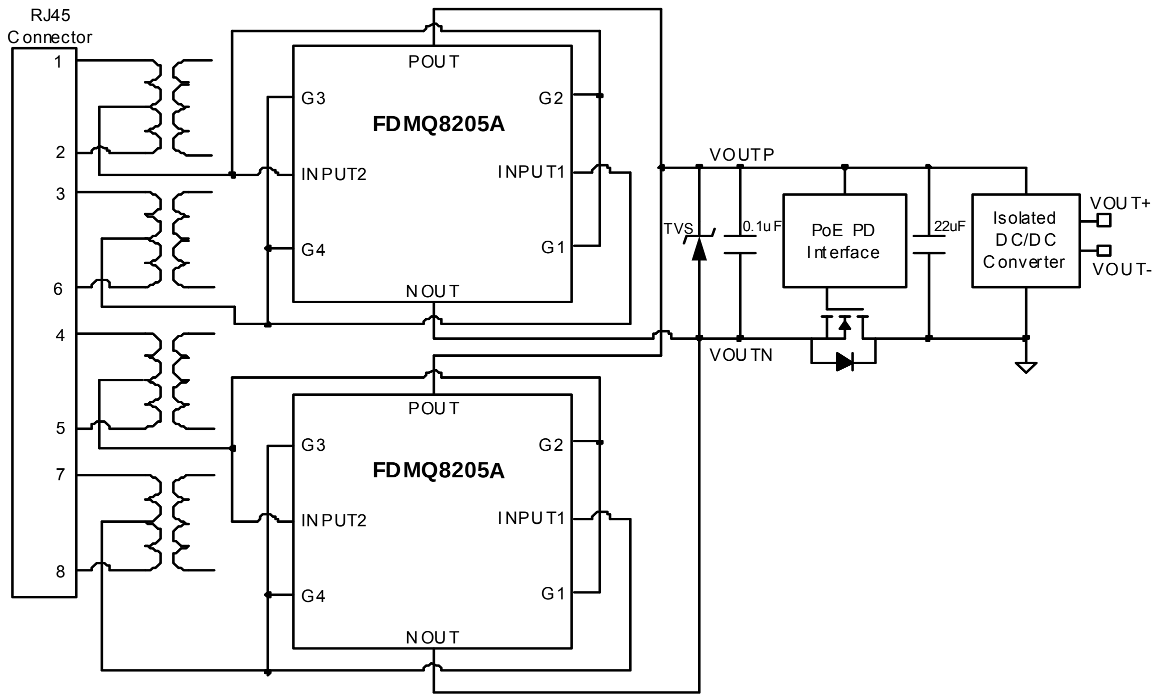


Figure 1. Typical Application of Power Device for Power over Ethernet

Block Diagram

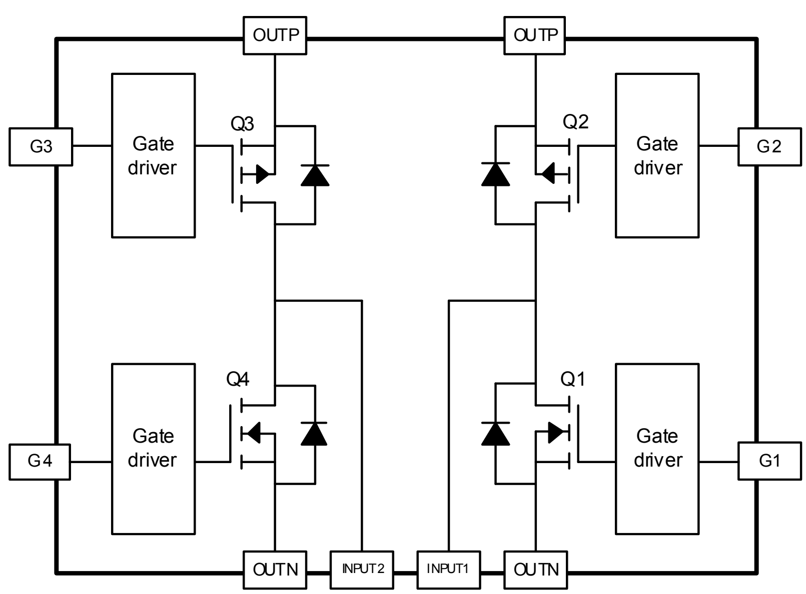


Figure 2. Block Diagram

Pin Configuration

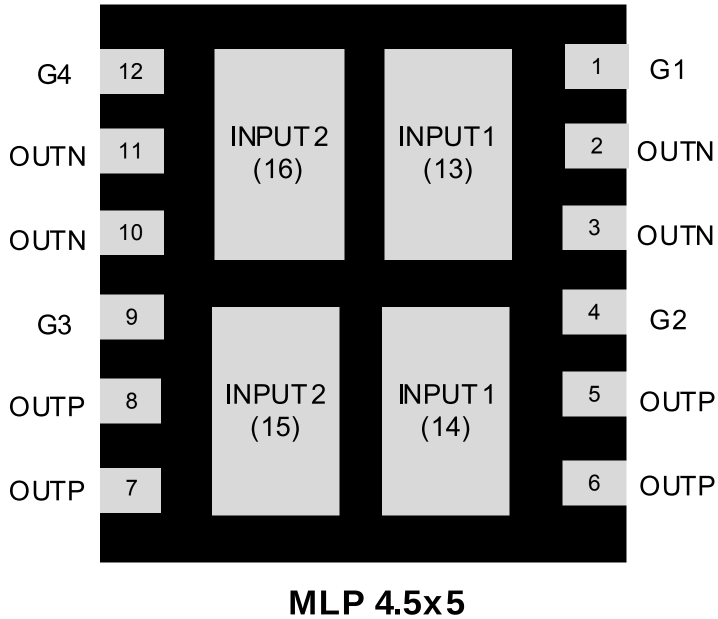


Figure 3. Pin Assignment (Bottom View)

Pin Descriptions

Pin Number	Name	Description
1	G1	Gate of Q1 N-ch MOSFET
4	G2	Gate of Q2 P-ch MOSFET
9	G3	Gate of Q3 P-ch MOSFET
12	G4	Gate of Q4 N-ch MOSFET
13,14	INPUT1	Input1 of GreenBridge™
15,16	INPUT2	Input2 of GreenBridge™
2,3,11,10	OUTN	Negative Output of GreenBridge™
5,6,7,8	OUTP	Positive Output of GreenBridge™

Notes:

1. Show the feature that provides orientation or pin 1 location.

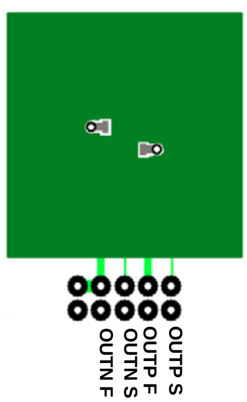
Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

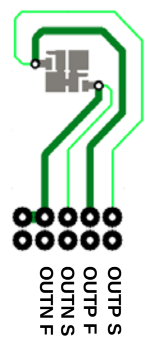
		Min.	Max.	Units
INPUT1, INPUT2 to OUTN			100	V
OUTP to INPUT1, INPUT2			100	V
INPUT1 to INPUT2			100	V
INPUT2 to INPUT1			100	V
OUTP to OUTN			100	V
G1, G2, G3, G4 to OUTN			70	V
OUTP to G1, G2, G3, G4			70	V
$V_{G\_TRANSIENT}$	Transient Gate Voltage, Pulse Width < 200 µs, Duty Cycle < 0.003%		100	V
Continuous I_{INPUT} (GreenBridge^{TM} Current, Q1+Q3 or Q2+Q4)	T_A= 25 °C (Note 2a)		3.0	A
	T_A= 25 °C (Note 2b)		1.7	A
Pulsed I_{INPUT} (Q1+Q3 or Q2+Q4)	Pulse Width < 300 µs, Duty Cycle < 2% (Note 3)		58	A
P_D (Power Dissipation, Q1+Q3 or Q2+Q4)	T_A= 25 °C (Note 2a)		2.5	W
	T_A= 25 °C (Note 2b)		0.78	W
Max Junction Temperature			150	°C

Notes :

2. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 50 °C/W when mounted on a 1 in^2 pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.



b. 160 °C/W when mounted on a minimum pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.

3. Pulse Id measured at td <= 300µs, refer to SOA graph for more details.

Thermal Characteristics

Symbol	Parameter		Min.	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case			5.1		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 2a)		50		
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 2b)		160		

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Conditions	Min.	Max.	Units
V_{INPUT}	Input Voltage of Bridge	INPUT1 to INPUT2 or INPUT2 to INPUT1		57	V
V_G	Gate Voltage of MOSFETs	G1, G4 to OUTN G2, G3 to OUTP		57	V
I_{INPUT}	Input Current of Bridge	Bridge Current through Q2 and Q4 or (Q3 and Q1)		1.7	A
Ambient Operation Temperature (T_A)			-40	85	°C
Junction Operating Temperature (T_J) (Note 5)			-40	125	°C

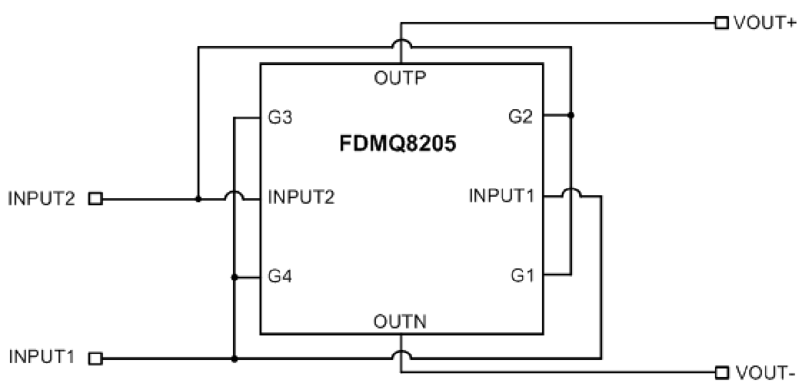
Electrical Characteristics

Unless otherwise noted: T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{INPUT}	Input Voltage of Bridge	At INPUT1 to INPUT2 or INPUT2 to INPUT1			57	V
V_G	Gate Voltage of MOSFETs	At G1, G4 to OUTN and G2, G3 to OUTP			57	V
I_Q	Quiescent Current	Detection Mode 1.5 V <V_{INPUT}=V_G<10.1V (Note 4)			5	µA
		Classification Mode 10.2 V <V_{INPUT}=V_G<23.9 V (Note 4)			400	µA
		Power On Mode Maximum V_{INPUT}=V_G=57 V (Note 4)			3.2	mA
V_{TURN_ON}	Turn-On Voltage of MOSFETs	Turn-On of MOSFETs while V_G Increases (Note 4)	32		36	V
$I_{LEAKAGE}$	Turn-Off Leakage Current	V_{OUTP}=57 V, V_{OUTN}=0 V T_J = -40 °C to 85 °C (Note 4)			700	µA
V_{BF}	Backfeed Voltage	V_{OUTP}=57 V, V_{OUTN}=0 V, 100 kOhm between INPUT1 and INPUT2 T_J = -40 °C to 85 °C (Note 4)			2.7	V
$r_{DS(on)}$	N-ch MOSFET	V_G=42 V, I_{INPUT}=1.5 A, T_A =25 °C		35	51	mΩ
		V_G=48 V, I_{INPUT}=1.5 A, T_A =25 °C		29	44	mΩ
		V_G=57 V, I_{INPUT}=1.5 A, T_A =25 °C		26	37	mΩ
	P-ch MOSFET	V_G= -42 V, I_{INPUT}= -1.5 A, T_A =25 °C		95	147	mΩ
		V_G= -48 V, I_{INPUT}= -1.5 A, T_A =25 °C		83	125	mΩ
		V_G= -57 V, I_{INPUT}= -1.5 A, T_A =25 °C		76	107	mΩ

Notes:

4. INPUT1 is connected to G3 and G4 and also INPUT2 is connected to G1 and G2 like below.



5. Backfeed Voltage can not be guaranteed for junction temperature in excess of 85 °C. See V_{BF} in Electrical Characteristics Table.

Typical Characteristics (Q1 or Q4 N-Channel) T_J = 25°C unless otherwise noted.

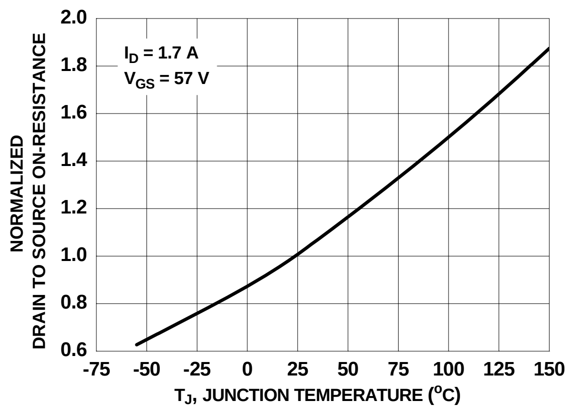


Figure 4. Normalized On Resistance vs. Junction Temperature

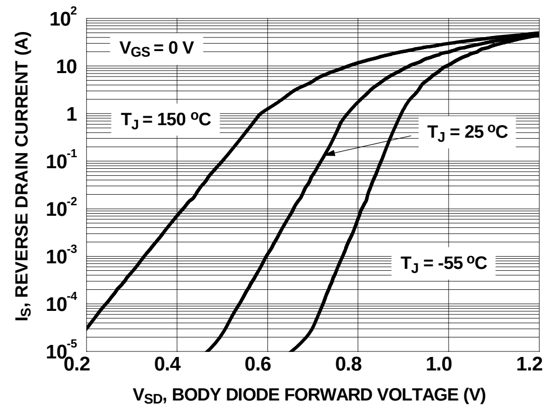


Figure 5. Source to Drain Diode Forward Voltage vs. Source Current

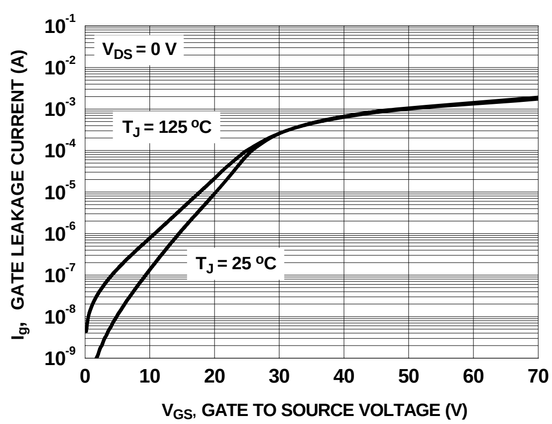


Figure 6. Gate Leakage Current vs. Gate to Source Voltage

Typical Characteristics (Q2 or Q3 P-Channel) T_J = 25 °C unless otherwise noted.

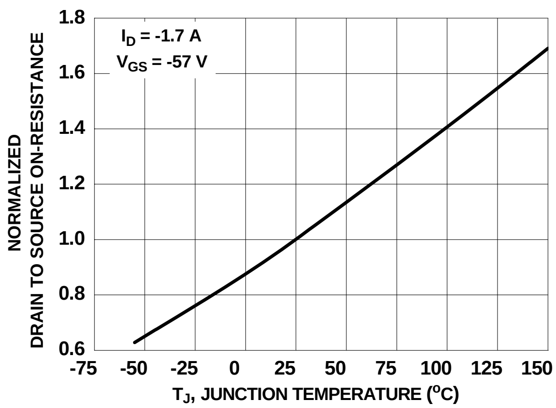


Figure 7. Normalized On Resistance vs. Junction Temperature

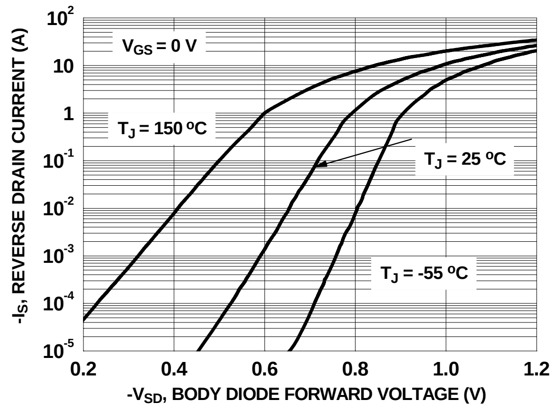


Figure 8. Source to Drain Diode Forward Voltage vs. Source Current

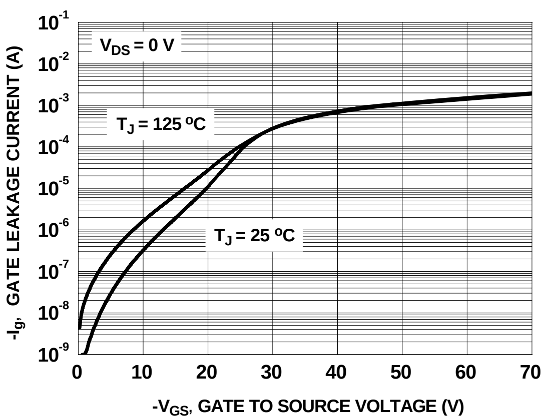


Figure 9. Gate Leakage Current vs. Gate to Source Voltage

Typical Characteristics (Q1 + Q3 or Q2 + Q4 In Serial) T_J = 25°C unless otherwise noted.

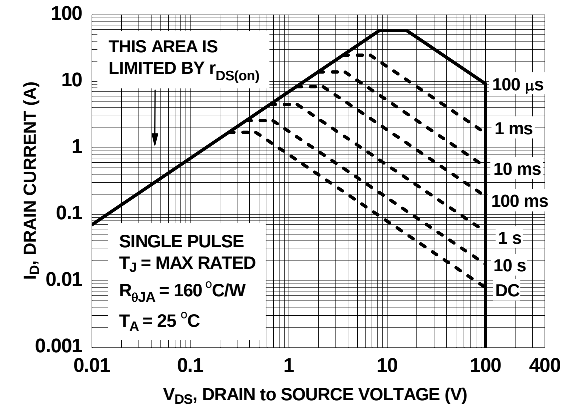


Figure 10. Forward Bias Safe Operating Area

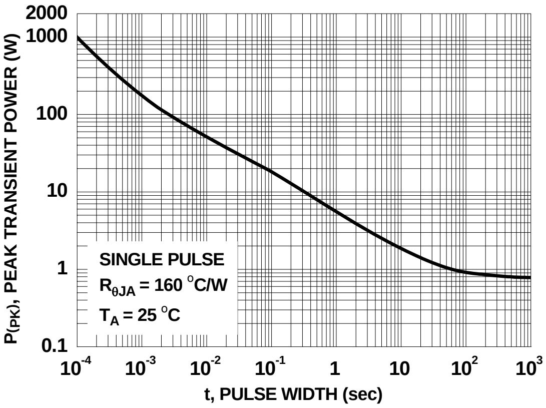


Figure 11. Single Pulse Maximum Power Dissipation

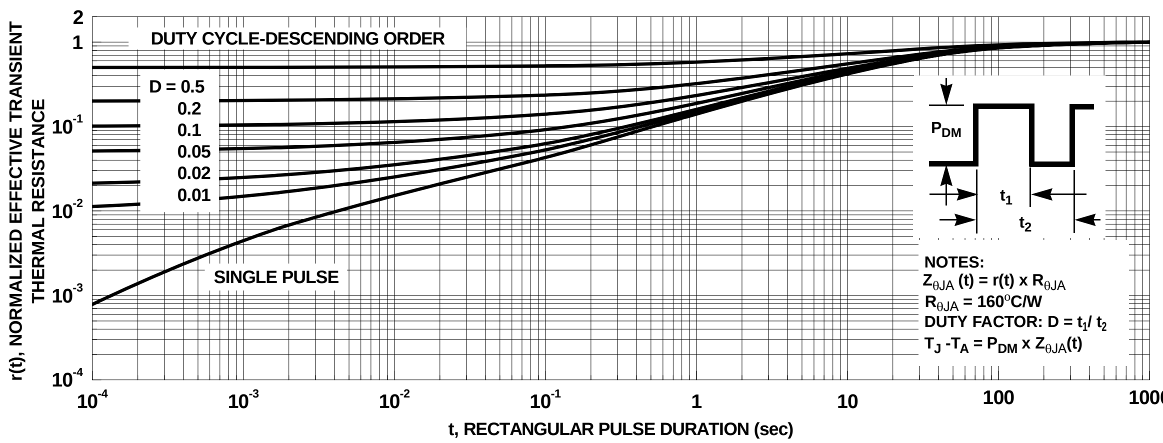


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

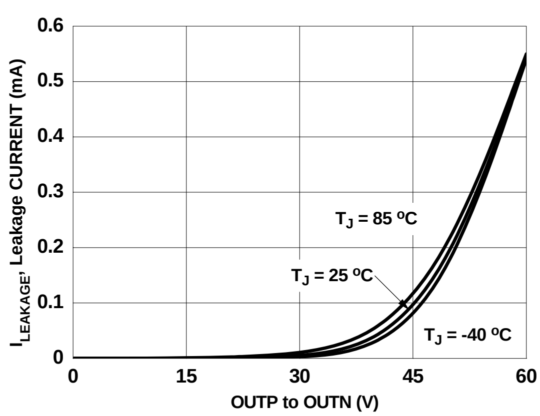
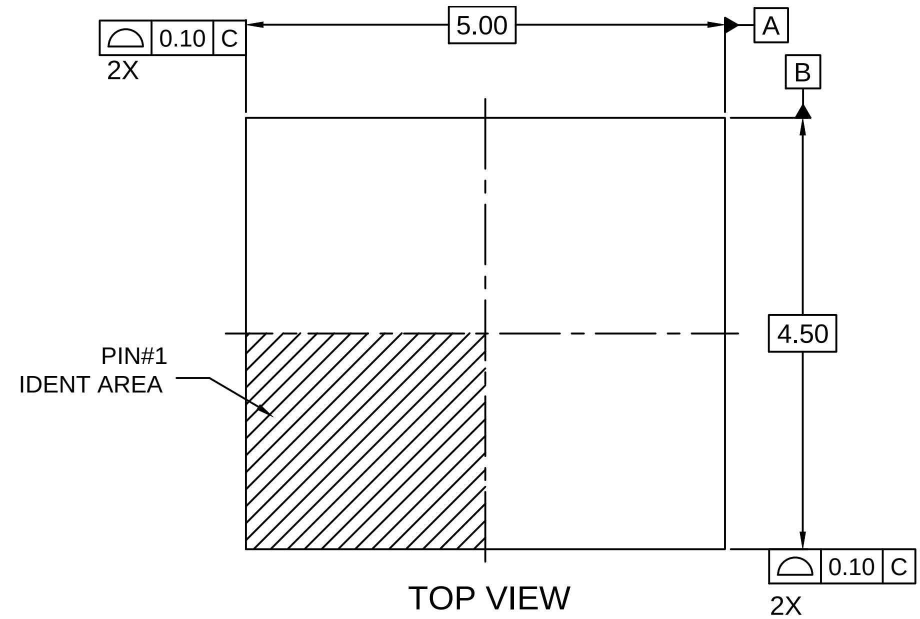
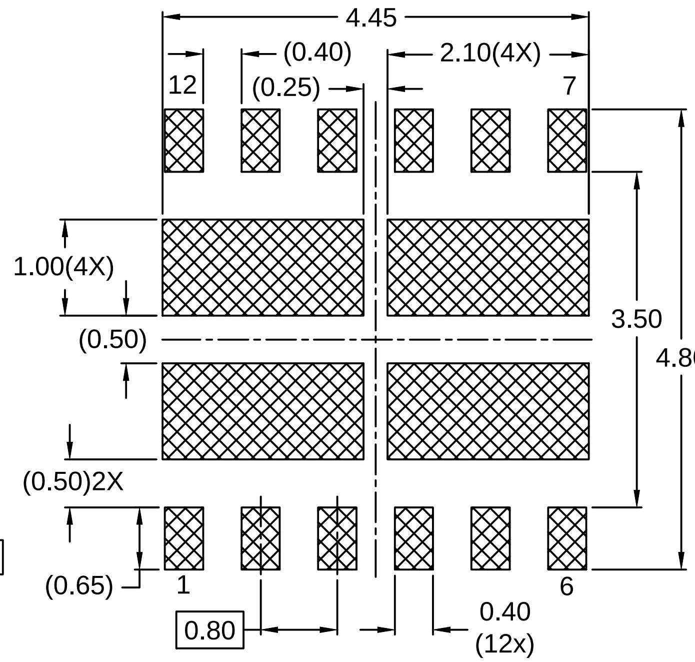


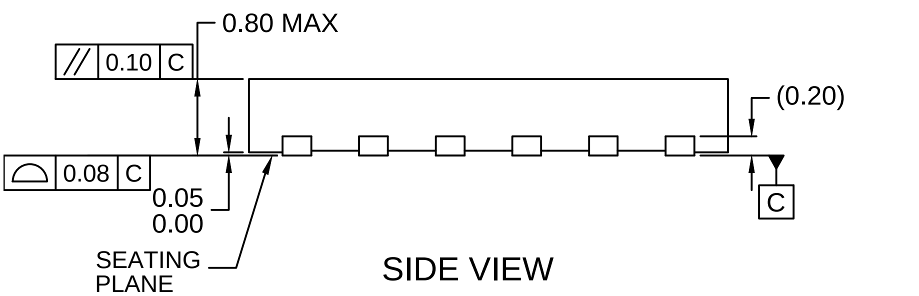
Figure 13. Leakage vs. Output Voltage Curve



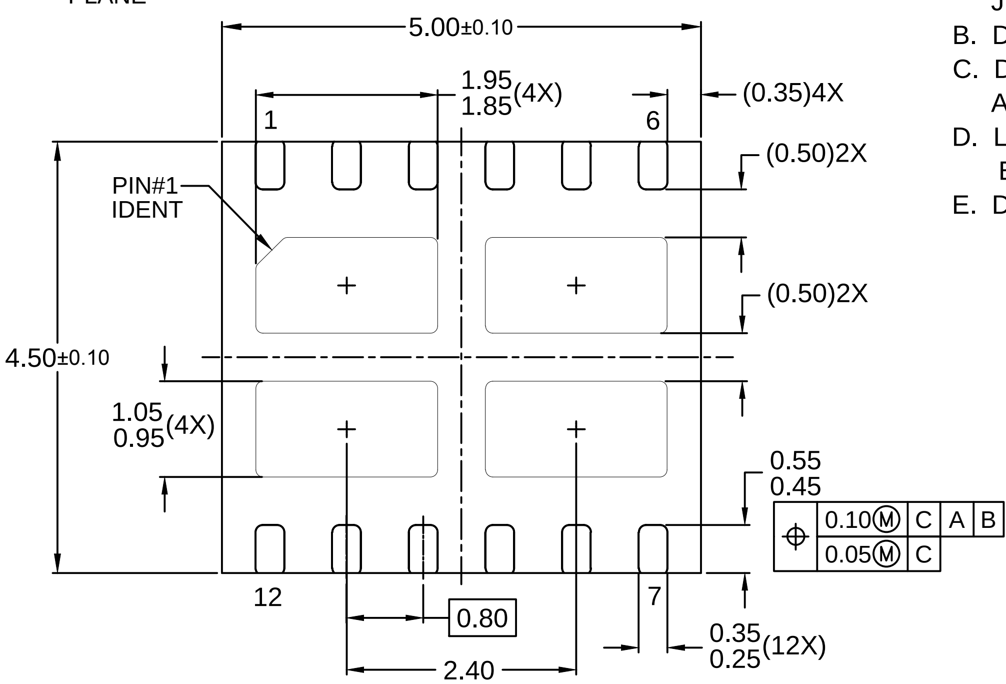
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES:

A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.

E. DRAWING FILENAME: MKT-MLP12Erev2.

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