

# MOSFET – N-Channel, Shielded Gate, POWER trench®

80 V, 64 A, 6.8 mΩ

## FDMC007N08LCDC

### General Description

This N-Channel MV MOSFET is produced using onsemi's advanced POWER trench process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

### Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)}$  = 6.8 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 22 A
- Max  $R_{DS(on)}$  = 11.1 mΩ at  $V_{GS}$  = 4.5 V,  $I_D$  = 18 A
- 5 V Drive Capable
- 50% Lower  $Q_{rr}$  than Other MOSFET Suppliers
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

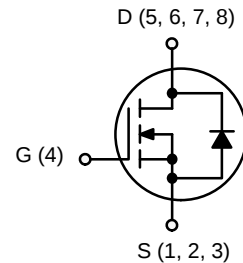
- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Solar

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

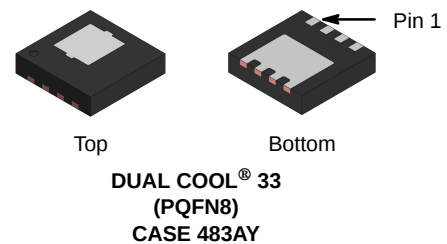
| Symbol         | Parameter                                                                                                                                             | Value                 | Unit |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|
| $V_{DS}$       | Drain to Source Voltage                                                                                                                               | 80                    | V    |
| $V_{GS}$       | Gate to Source Voltage                                                                                                                                | ±20                   | V    |
| $I_D$          | Drain Current:<br>Continuous, $T_C$ = 25 °C (Note 5)<br>Continuous, $T_C$ = 100 °C (Note 5)<br>Continuous, $T_A$ = 25 °C (Note 1a)<br>Pulsed (Note 4) | 64<br>41<br>15<br>339 | A    |
| $E_{AS}$       | Single Pulse Avalanche Energy<br>(Note 3)                                                                                                             | 150                   | mJ   |
| $P_D$          | Power Dissipation:<br>$T_C$ = 25°C<br>$T_A$ = 25°C (Note 1a)                                                                                          | 57<br>3               | W    |
| $T_J, T_{STG}$ | Operating and Storage Junction<br>Temperature Range                                                                                                   | -55 to +150           | °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.

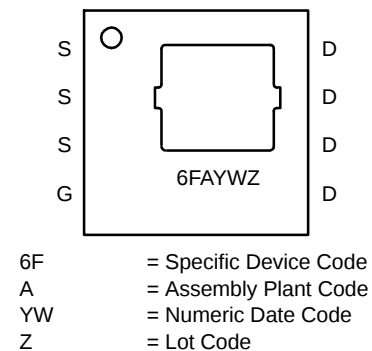
| $V_{DS}$ | $R_{DS(on)}$ MAX                 | $I_D$ MAX |
|----------|----------------------------------|-----------|
| 80 V     | 6.8 mΩ @ 10 V<br>11.1 mΩ @ 4.5 V | 22 A      |



N-CHANNEL MOSFET



### MARKING DIAGRAM



### ORDERING INFORMATION

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

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                         | Value | Unit |
|-----------------|---------------------------------------------------|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case              | 2.2   | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 42    |      |

ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|--------|-----------|----------------|-----|-----|-----|------|
|--------|-----------|----------------|-----|-----|-----|------|

## OFF CHARACTERISTICS

|                                |                                           |                                                                             |    |    |           |               |
|--------------------------------|-------------------------------------------|-----------------------------------------------------------------------------|----|----|-----------|---------------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$                      | 80 |    |           | V             |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$ |    | 67 |           | mV/°C         |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 64\text{ V}$ , $V_{GS} = 0\text{ V}$                              |    |    | 1         | $\mu\text{A}$ |
| $I_{GSS}$                      | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$                          |    |    | $\pm 100$ | nA            |

## ON CHARACTERISTICS

|                                  |                                                          |                                                                                    |     |      |      |            |
|----------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|-----|------|------|------------|
| $V_{GS(th)}$                     | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 130\text{ }\mu\text{A}$                                 | 1.0 | 1.5  | 2.5  | V          |
| $\Delta V_{GS(th)} / \Delta T_J$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 130\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$        |     | -5.2 |      | mV/°C      |
| $R_{DS(on)}$                     | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{ V}$ , $I_D = 22\text{ A}$                                       |     | 5.1  | 6.8  | m $\Omega$ |
|                                  |                                                          | $V_{GS} = 4.5\text{ V}$ , $I_D = 18\text{ A}$                                      |     | 7.3  | 11.1 |            |
|                                  |                                                          | $V_{GS} = 10\text{ V}$ , $I_D = 22\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$ |     | 9.5  | 12.5 |            |
| $g_{FS}$                         | Forward Transconductance                                 | $V_{DS} = 5\text{ V}$ , $I_D = 22\text{ A}$                                        |     | 80   |      | S          |

## DYNAMIC CHARACTERISTICS

|           |                              |                                                                     |     |      |      |          |
|-----------|------------------------------|---------------------------------------------------------------------|-----|------|------|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$ |     | 2195 | 3070 | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                     |     | 521  | 730  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                     |     | 25   | 40   | pF       |
| $R_g$     | Gate Resistance              |                                                                     | 0.1 | 0.5  | 0.9  | $\Omega$ |

## SWITCHING CHARACTERISTICS

|              |                               |                                                                                                     |  |    |    |    |
|--------------|-------------------------------|-----------------------------------------------------------------------------------------------------|--|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 40\text{ V}$ , $I_D = 22\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$ |  | 11 | 21 | ns |
| $t_r$        | Rise Time                     |                                                                                                     |  | 3  | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                                     |  | 36 | 58 | ns |
| $t_f$        | Fall Time                     |                                                                                                     |  | 4  | 10 | ns |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{ V}$ to $10\text{ V}$ , $V_{DD} = 40\text{ V}$ , $I_D = 22\text{ A}$               |  | 31 | 44 | nC |
|              |                               | $V_{GS} = 0\text{ V}$ to $4.5\text{ V}$ , $V_{DD} = 40\text{ V}$ , $I_D = 22\text{ A}$              |  | 15 | 21 | nC |
| $Q_{gs}$     | Gate to Source Charge         | $V_{DD} = 40\text{ V}$ , $I_D = 22\text{ A}$                                                        |  | 5  |    | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge | $V_{DD} = 40\text{ V}$ , $I_D = 22\text{ A}$                                                        |  | 4  |    | nC |
| $Q_{oss}$    | Output Charge                 | $V_{DD} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$                                                      |  | 29 |    | nC |
| $Q_{sync}$   | Total Gate Charge Sync        | $V_{DS} = 0\text{ V}$ , $I_D = 22\text{ A}$                                                         |  | 28 |    | nC |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|          |                                       |                                                          |  |     |     |    |
|----------|---------------------------------------|----------------------------------------------------------|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}$ , $I_S = 2.5\text{ A}$ (Note 2)    |  | 0.7 | 1.2 | V  |
|          |                                       | $V_{GS} = 0\text{ V}$ , $I_S = 22\text{ A}$ (Note 2)     |  | 0.8 | 1.3 |    |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 11\text{ A}$ , $di/dt = 300\text{ A}/\mu\text{s}$ |  | 18  | 32  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                          |  | 24  | 38  | nC |

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted) (continued)

| Symbol                                    | Parameter               | Test Condition                                            | Min | Typ | Max | Unit |
|-------------------------------------------|-------------------------|-----------------------------------------------------------|-----|-----|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |                         |                                                           |     |     |     |      |
| $t_{rr}$                                  | Reverse Recovery Time   | $I_F = 11\text{ A}$ , $di/dt = 1000\text{ A}/\mu\text{s}$ |     | 15  | 26  | ns   |
| $Q_{rr}$                                  | Reverse Recovery Charge |                                                           |     | 60  | 96  | nC   |

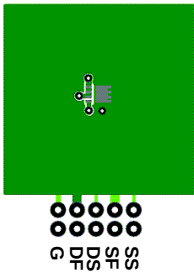
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**THERMAL CHARACTERISTICS**

| Symbol          | Parameter                                            | Value | Unit                        |
|-----------------|------------------------------------------------------|-------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Top Source)    | 6.0   | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Bottom Source) | 2.2   | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a)    | 42    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b)    | 105   | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1c)    | 29    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1d)    | 40    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1e)    | 19    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1f)    | 23    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1g)    | 30    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1h)    | 79    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1i)    | 17    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1j)    | 26    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1k)    | 12    | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1l)    | 16    | $^{\circ}\text{C}/\text{W}$ |

**NOTES:**

- $R_{\theta JA}$  is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



- a)  $42\text{ }^{\circ}\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper.



- b)  $105\text{ }^{\circ}\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Still air,  $20.9 \times 10.4 \times 12.7\text{ mm}$  Aluminum Heat Sink,  $1\text{ in}^2$  pad of 2 oz copper
  - Still air,  $20.9 \times 10.4 \times 12.7\text{ mm}$  Aluminum Heat Sink, minimum pad of 2 oz copper
  - Still air,  $45.2 \times 41.4 \times 11.7\text{ mm}$  Aavid Thermalloy Part # 10-L41B-11 Heat Sink,  $1\text{ in}^2$  pad of 2 oz copper
  - Still air,  $45.2 \times 41.4 \times 11.7\text{ mm}$  Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
  - 200FPM Airflow, No Heat Sink,  $1\text{ in}^2$  pad of 2 oz copper
  - 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
  - 200FPM Airflow,  $20.9 \times 10.4 \times 12.7\text{ mm}$  Aluminum Heat Sink,  $1\text{ in}^2$  pad of 2 oz copper
  - 200FPM Airflow,  $20.9 \times 10.4 \times 12.7\text{ mm}$  Aluminum Heat Sink, minimum pad of 2 oz copper
  - 200FPM Airflow,  $45.2 \times 41.4 \times 11.7\text{ mm}$  Aavid Thermalloy Part # 10-L41B-11 Heat Sink,  $1\text{ in}^2$  pad of 2 oz copper
  - 200FPM Airflow,  $45.2 \times 41.4 \times 11.7\text{ mm}$  Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- Pulse Test: Pulse Width  $< 300\text{ }\mu\text{s}$ , Duty cycle  $< 2.0\%$ .
  - $E_{AS}$  of 150 mJ is based on starting  $T_J = 25\text{ }^{\circ}\text{C}$ ;  $L = 3\text{ mH}$ ,  $I_{AS} = 10\text{ A}$ ,  $V_{DD} = 80\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 32\text{ A}$ .
  - Pulsed  $I_d$  please refer to Figure 11 SOA graph for more details.
  - Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

**TYPICAL CHARACTERISTICS**  
( $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

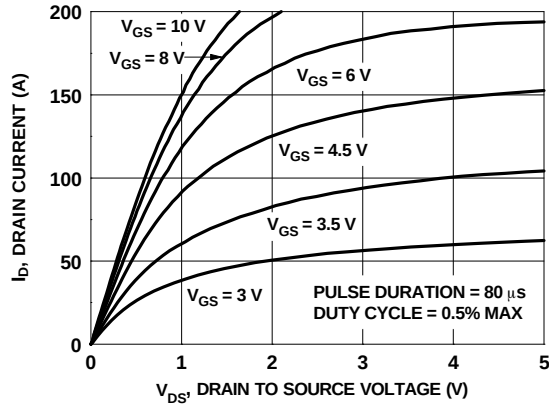


Figure 1. On Region Characteristics

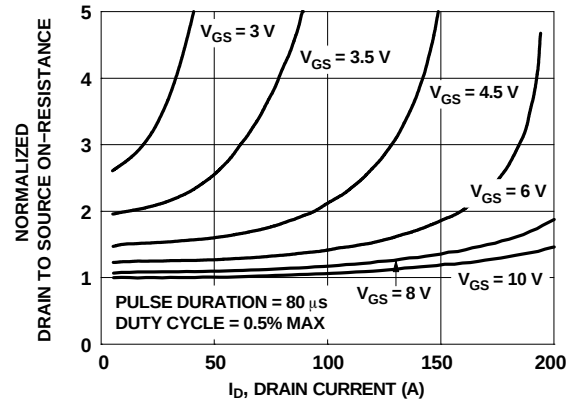


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

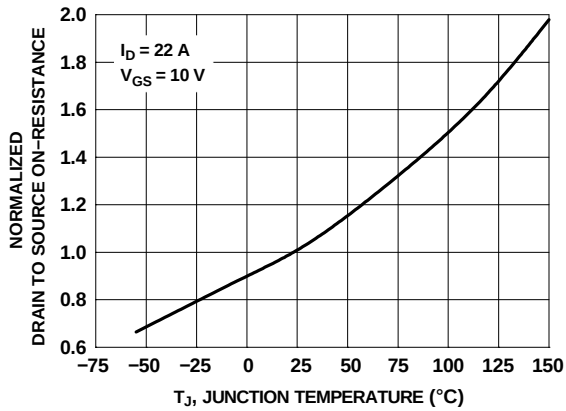


Figure 3. Normalized On-Resistance vs. Junction Temperature

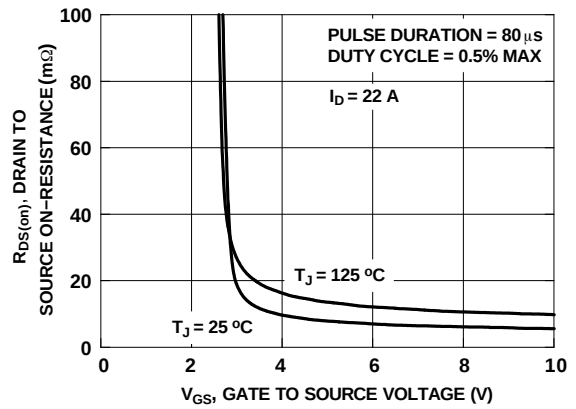


Figure 4. On-Resistance vs. Gate to Source Voltage

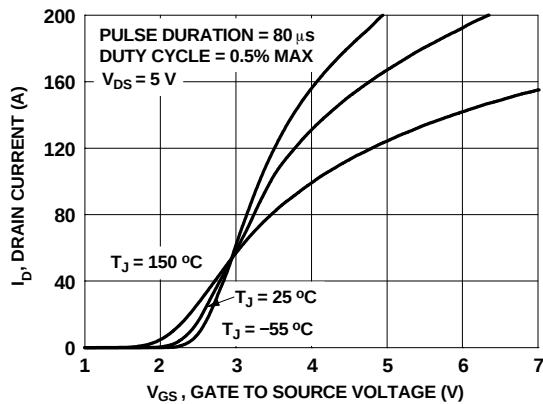


Figure 5. Transfer Characteristics

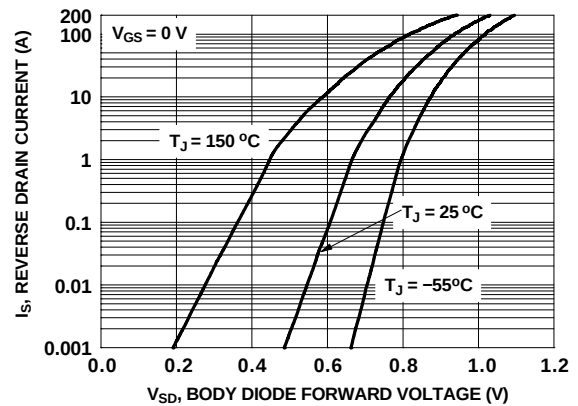


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

**TYPICAL CHARACTERISTICS**  
( $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

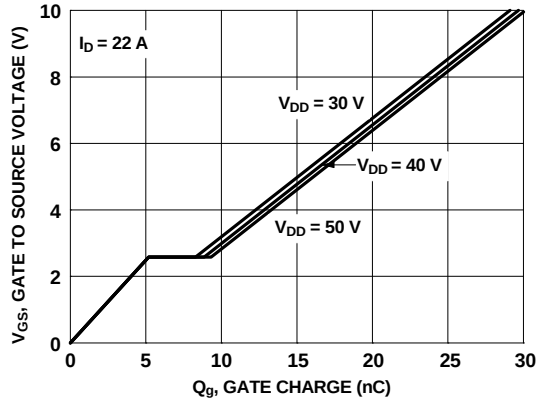


Figure 7. Gate Charge Characteristics

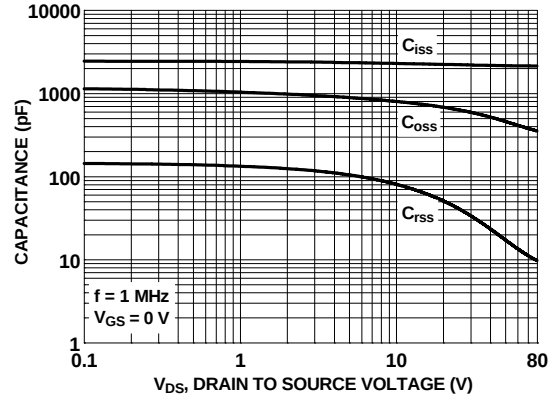


Figure 8. Capacitance vs. Drain to Source Voltage

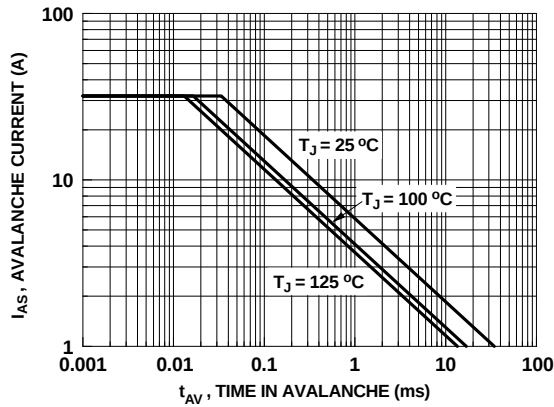


Figure 9. Unclamped Inductive Switching Capability

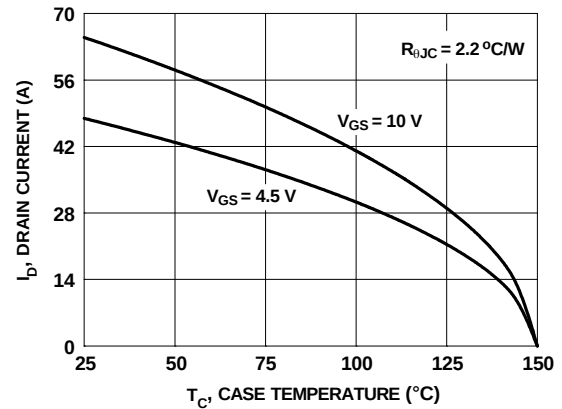


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

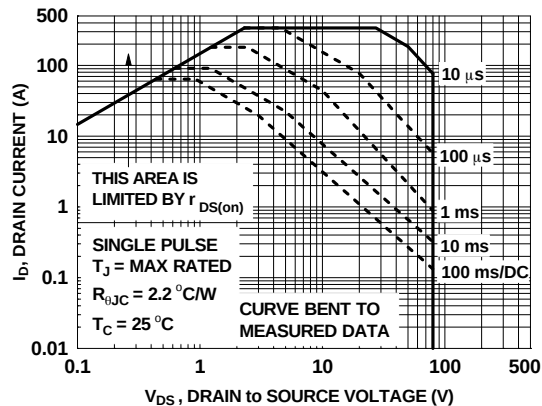


Figure 11. Forward Bias Safe Operating Area

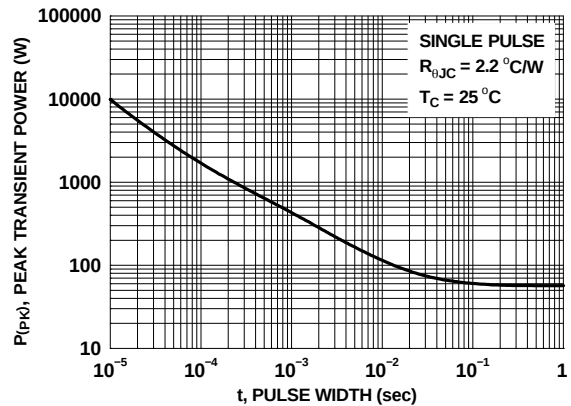


Figure 12. Single Pulse Maximum Power Dissipation

**TYPICAL CHARACTERISTICS**  
( $T_J = 25\text{ }^{\circ}\text{C}$  UNLESS OTHERWISE NOTED)

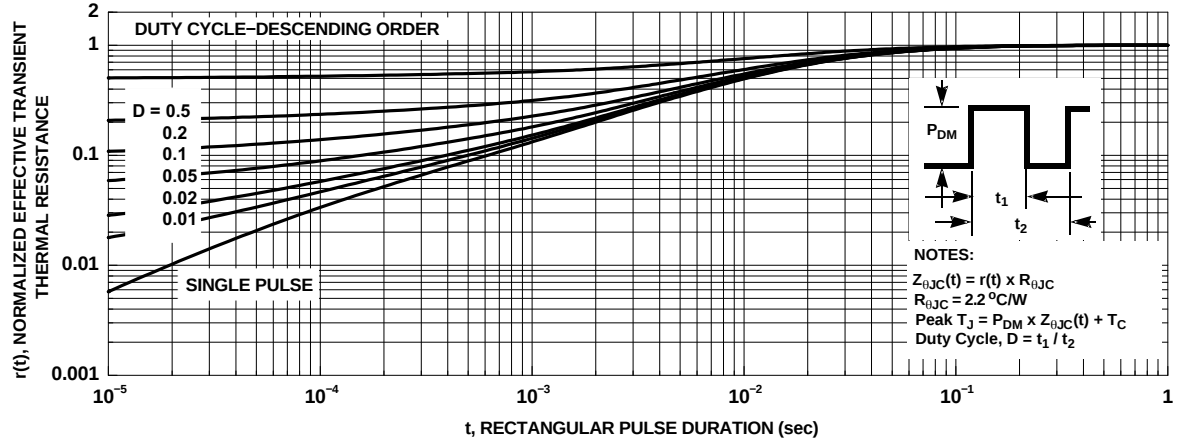


Figure 13. Junction-to-Case Transient Thermal Response Curve

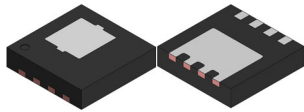
**ORDERING INFORMATION**

| Device         | Marking | Package                                          | Reel Size | Tape Width | Quantity   |
|----------------|---------|--------------------------------------------------|-----------|------------|------------|
| FDMC007N08LCDC | 6F      | DUAL COOL 33 (PQFN8)<br>(Pb-Free / Halogen Free) | 13"       | 12 mm      | 3000 Units |

REVISION HISTORY

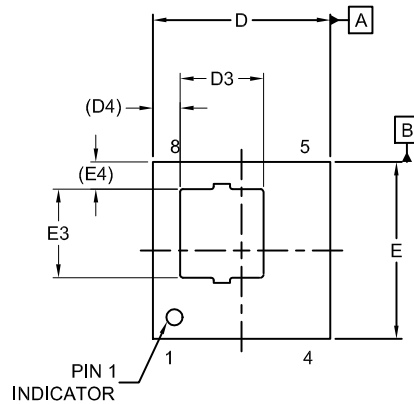
| Revision | Description of Changes                                               | Date      |
|----------|----------------------------------------------------------------------|-----------|
| 6        | Update package drawing and Pin 1 location to align with case outline | 8/25/2025 |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

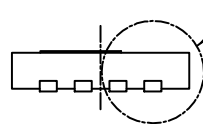


**PQFN8 3.3X3.3, 0.65P**  
**CASE 483AY**  
**ISSUE A**

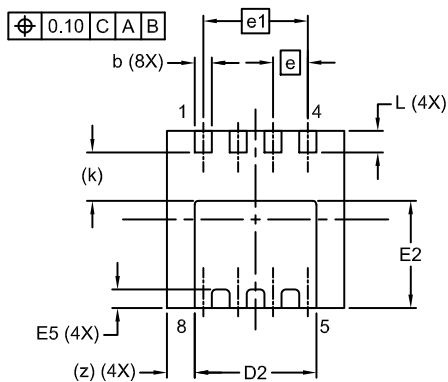
DATE 08 SEP 2021



**TOP VIEW**



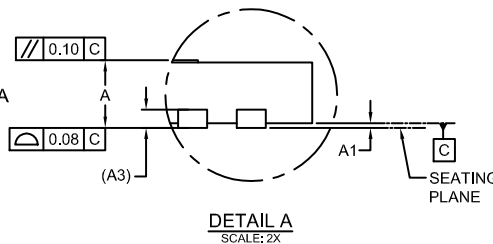
**FRONT VIEW**



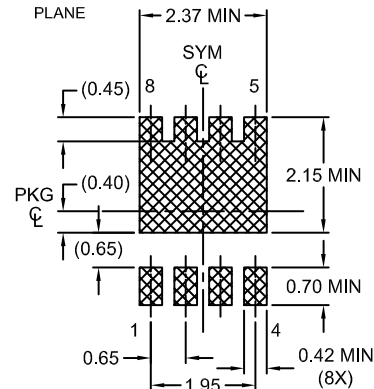
**BOTTOM VIEW**

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. 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   | 0.70        | 0.75 | 0.80 |
| A1  | 0.00        | -    | 0.05 |
| A3  | 0.20 REF    |      |      |
| b   | 0.27        | 0.32 | 0.37 |
| D   | 3.20        | 3.30 | 3.40 |
| D2  | 2.17        | 2.27 | 2.37 |
| D3  | 1.45        | 1.55 | 1.65 |
| D4  | 0.51 REF    |      |      |
| E   | 3.20        | 3.30 | 3.40 |
| E2  | 1.85        | 1.95 | 2.05 |
| E3  | 1.55        | 1.65 | 1.75 |
| E4  | 0.51 REF    |      |      |
| E5  | 0.24        | 0.34 | 0.44 |
| e   | 0.65 BSC    |      |      |
| e1  | 1.95 BSC    |      |      |
| k   | 0.90 REF    |      |      |
| L   | 0.30        | 0.40 | 0.50 |
| z   | 0.52 REF    |      |      |



**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, SOLDERM/D.

|                         |                             |                                                                                                                                                                                  |
|-------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>PQFN8 3.3X3.3, 0.65P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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