

## Features

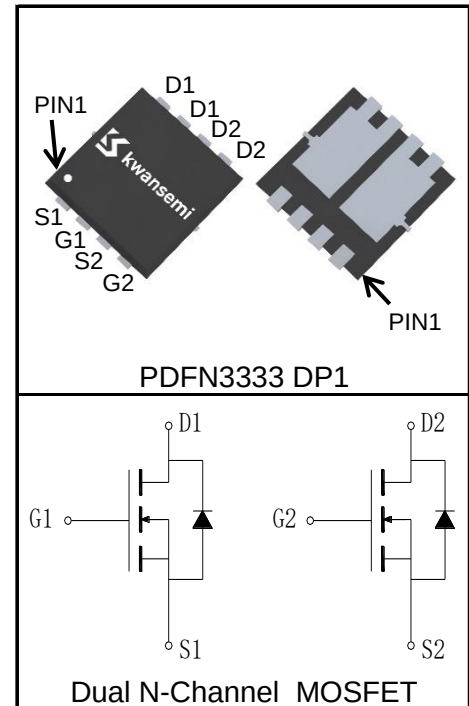
- 20V/40A,  
 $R_{DS(ON)} = 6.7m\Omega(Typ.)@V_{GS}=4.5V$   
 $R_{DS(ON)} = 7.7m\Omega(Typ.)@V_{GS}=2.5V$
- Low  $R_{DS(ON)}$
- Super High Dense Cell Design
- Fast Switching Speed
- 100% avalanche tested

## Applications

- Switching Application Systems



## Pin Description



## Absolute Maximum Ratings

| Symbol                                                       | Parameter                                                                    |                       | Rating     | Unit |
|--------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------|------------|------|
| Common Ratings (T <sub>C</sub> =25°C Unless Otherwise Noted) |                                                                              |                       |            |      |
| V <sub>DSS</sub>                                             | Drain-Source Voltage                                                         |                       | 20         | V    |
| V <sub>GSS</sub>                                             | Gate-Source Voltage                                                          |                       | ±12        |      |
| T <sub>Jmax</sub>                                            | Maximum Junction Temperature                                                 |                       | 150        | °C   |
| T <sub>J</sub> , T <sub>STG</sub>                            | Operating and Storage Temperature Range                                      |                       | -55 to 150 | °C   |
| I <sub>S</sub>                                               | Diode Continuous Forward Current                                             | T <sub>C</sub> =25°C  | 40         | A    |
| Mounted on Large Heat Sink                                   |                                                                              |                       |            |      |
| I <sub>DP</sub> <sup>①</sup>                                 | Pulse Drain Current                                                          | T <sub>C</sub> =25°C  | 160        | A    |
| I <sub>D</sub> <sup>②</sup>                                  | Continuous Drain Current@T <sub>C</sub> (V <sub>GS</sub> =4.5V)              | T <sub>C</sub> =25°C  | 40         | A    |
|                                                              |                                                                              | T <sub>C</sub> =100°C | 25         |      |
|                                                              | Continuous Drain Current@T <sub>A</sub> (V <sub>GS</sub> =4.5V) <sup>③</sup> | T <sub>A</sub> =25°C  | 15         |      |
|                                                              |                                                                              | T <sub>A</sub> =70°C  | 12         |      |
| P <sub>D</sub>                                               | Maximum Power Dissipation@T <sub>C</sub>                                     | T <sub>C</sub> =25°C  | 20         | W    |
|                                                              |                                                                              | T <sub>C</sub> =100°C | 8          |      |
|                                                              | Maximum Power Dissipation@T <sub>A</sub> <sup>③</sup>                        | T <sub>A</sub> =25°C  | 2.8        |      |
|                                                              |                                                                              | T <sub>A</sub> =70°C  | 1.8        |      |

| Symbol                                | Parameter                              | Rating | Unit |
|---------------------------------------|----------------------------------------|--------|------|
| $R_{\theta JC}$                       | Thermal Resistance-Junction to Case    | 6.2    | °C/W |
| $R_{\theta JA}^{③}$                   | Thermal Resistance-Junction to Ambient | 45     | °C/W |
| <b>Drain-Source Avalanche Ratings</b> |                                        |        |      |
| $E_{AS}^{④}$                          | Avalanche Energy, Single Pulsed        | 81     | mJ   |

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

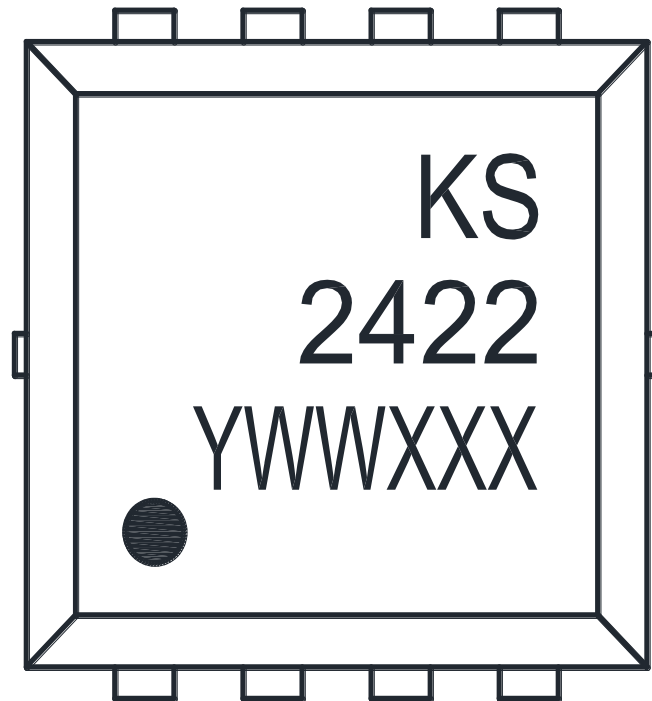
| Symbol                        | Parameter                        | Test Condition                                                                        | Rating |      |      | Unit |
|-------------------------------|----------------------------------|---------------------------------------------------------------------------------------|--------|------|------|------|
|                               |                                  |                                                                                       | Min.   | Typ. | Max. |      |
| Static Characteristics        |                                  |                                                                                       |        |      |      |      |
| BV <sub>DSS</sub>             | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                           | 20     |      |      | V    |
| I <sub>DSS</sub>              | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V                                             |        |      | 1    | μA   |
|                               |                                  | T <sub>J</sub> =125°C                                                                 |        |      | 30   |      |
| V <sub>GS(th)</sub>           | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                             | 0.5    | 0.7  | 1.1  | V    |
| I <sub>GSS</sub>              | Gate Leakage Current             | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                            |        |      | ±100 | nA   |
| R <sub>DS(ON)</sub> ⑤         | Drain-Source On-state Resistance | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =15A                                           |        | 6.7  | 8    | mΩ   |
|                               |                                  | V <sub>GS</sub> =2.5V, I <sub>DS</sub> =10A                                           |        | 7.7  | 10   | mΩ   |
| Diode Characteristics         |                                  |                                                                                       |        |      |      |      |
| V <sub>SD</sub> ⑤             | Diode Forward Voltage            | I <sub>SD</sub> =15A, V <sub>GS</sub> =0V                                             |        | 0.86 | 1.2  | V    |
| t <sub>rr</sub>               | Reverse Recovery Time            | I <sub>SD</sub> =15A, dI <sub>SD</sub> /dt=100A/μs                                    |        | 12   |      | ns   |
| Q <sub>rr</sub>               | Reverse Recovery Charge          |                                                                                       |        | 19   |      | nC   |
| Dynamic Characteristics ⑥     |                                  |                                                                                       |        |      |      |      |
| R <sub>G</sub>                | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                      |        | 3.2  |      | Ω    |
| C <sub>iss</sub>              | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, Frequency=1.0MHz                           |        | 1825 |      | pF   |
| C <sub>oss</sub>              | Output Capacitance               |                                                                                       |        | 275  |      |      |
| C <sub>rss</sub>              | Reverse Transfer Capacitance     |                                                                                       |        | 265  |      |      |
| t <sub>d(ON)</sub>            | Turn-on Delay Time               | V <sub>DD</sub> =10V, I <sub>DS</sub> =15A, V <sub>GS</sub> =4.5V, R <sub>G</sub> =3Ω |        | 9    |      | ns   |
| t <sub>r</sub>                | Turn-on Rise Time                |                                                                                       |        | 13   |      |      |
| t <sub>d(OFF)</sub>           | Turn-off Delay Time              |                                                                                       |        | 15   |      |      |
| t <sub>f</sub>                | Turn-off Fall Time               |                                                                                       |        | 16   |      |      |
| Gate Charge Characteristics ⑥ |                                  |                                                                                       |        |      |      |      |
| Q <sub>g</sub>                | Total Gate Charge                | V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>DS</sub> =15A                     |        | 23   |      | nC   |
| Q <sub>gs</sub>               | Gate-Source Charge               |                                                                                       |        | 2.7  |      |      |
| Q <sub>gd</sub>               | Gate-Drain Charge                |                                                                                       |        | 6.7  |      |      |

**Notes:**

- ①Pulse width limited by safe operating area.
- ②Calculated continuous current based on maximum allowable junction temperature.
- ③When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ .
- ④Limited by  $T_{J\text{max}}$ , Starting  $T_J = 25^\circ\text{C}$ ,  $I_{AS\text{max}} = 18\text{A}$ ,  $L = 0.5\text{mH}$ ,  $V_{DD} = 15\text{V}$ ,  $R_G = 25\Omega$ ,  $V_{GS} = 4.5\text{V}$ . Part not recommended for use above this value. 100% Final Test at  $I_{AS} = 9\text{A}$ ,  $L = 0.5\text{mH}$ .
- ⑤Pulse test; Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- ⑥Guaranteed by design, not subject to production testing.

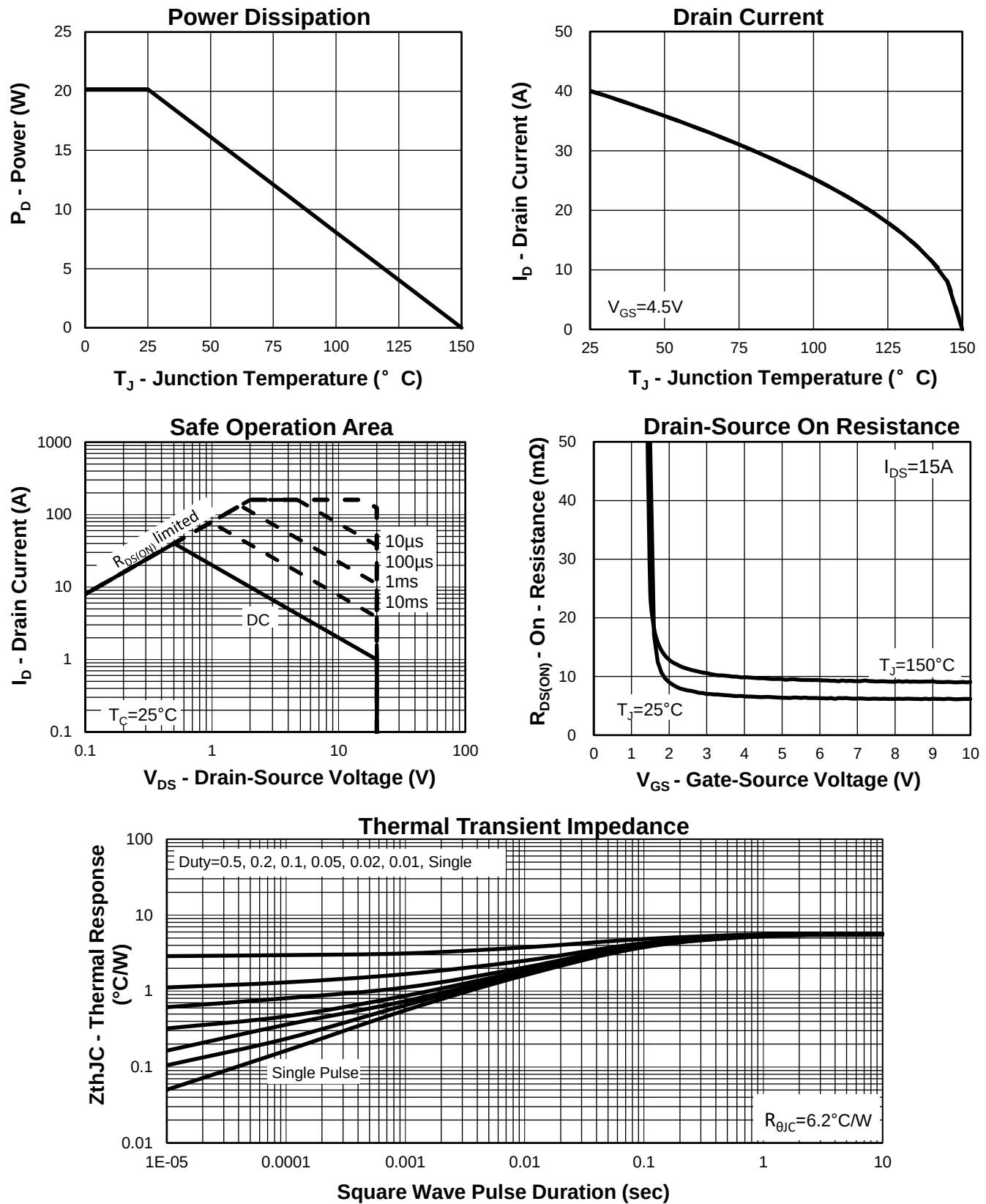
**Ordering and Marking Information**

| Device   | Package      | Packaging | Quantity | Reel Size | Tape width |
|----------|--------------|-----------|----------|-----------|------------|
| KS2422MC | PDFN3333 DP1 | Tape&Reel | 5000     | 13"       | 12mm       |

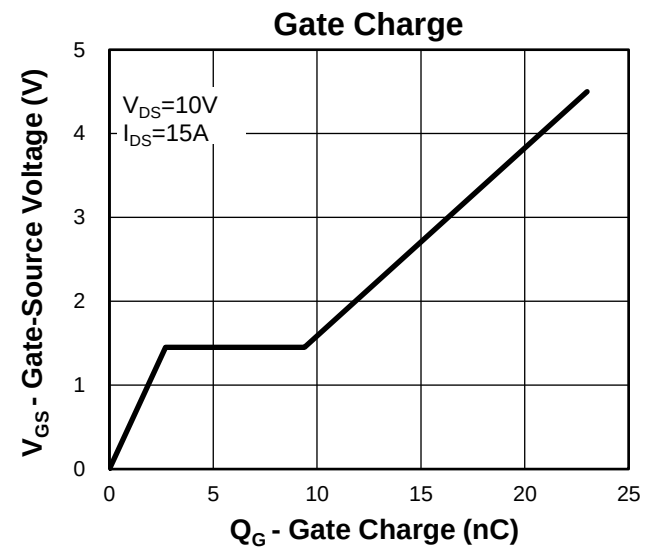
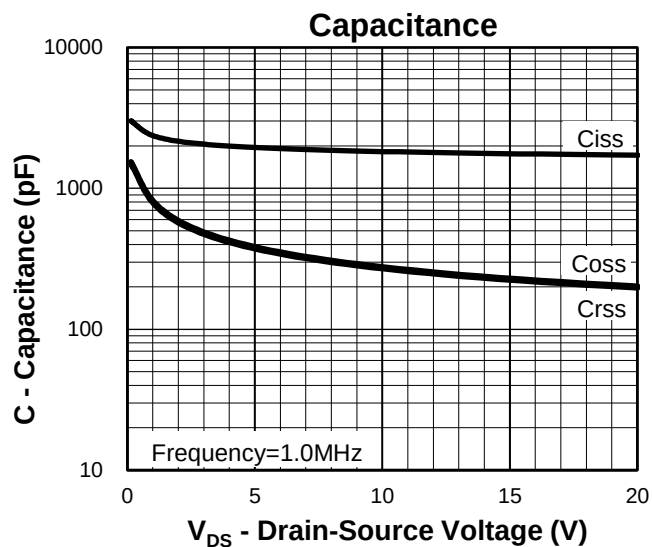
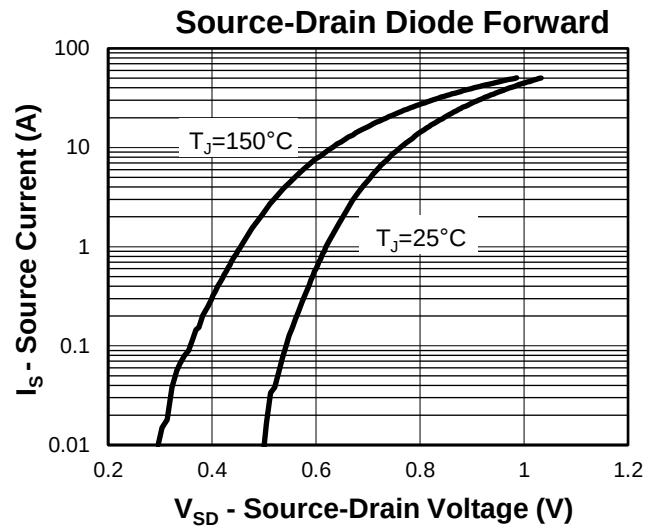
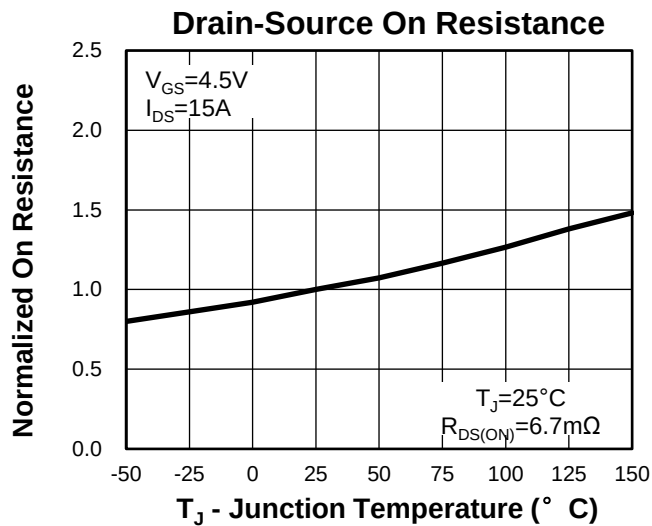
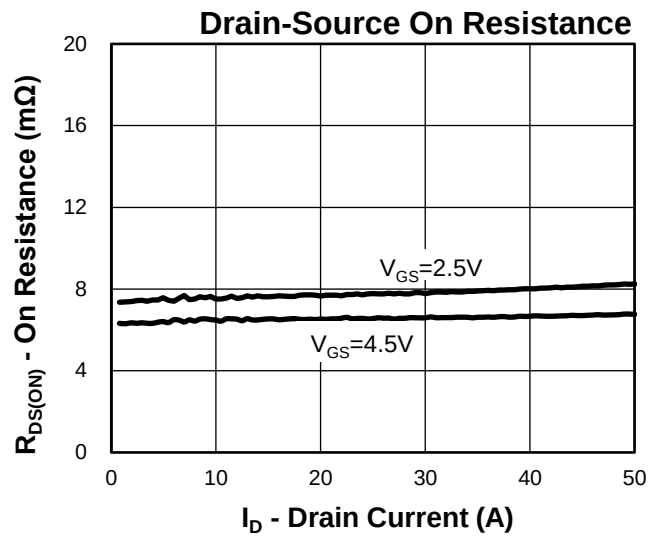
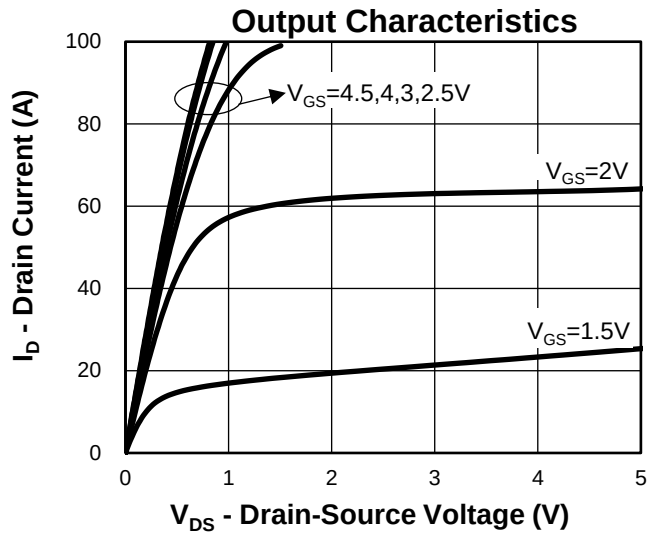


1st Line: Kwansemi Code(KS)  
 2nd Line: Part Number(2422)  
 3rd Line: Lot Number(YWWXXX)

## Typical Characteristics

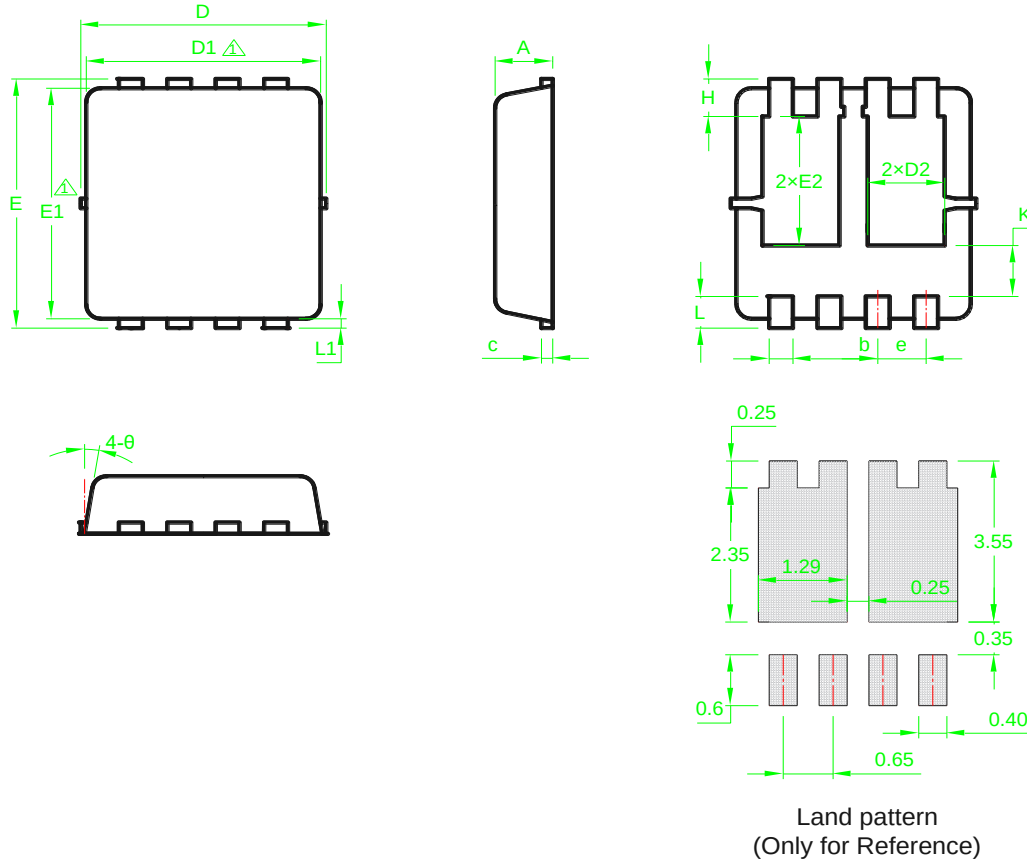


## Typical Characteristics



## Package Information

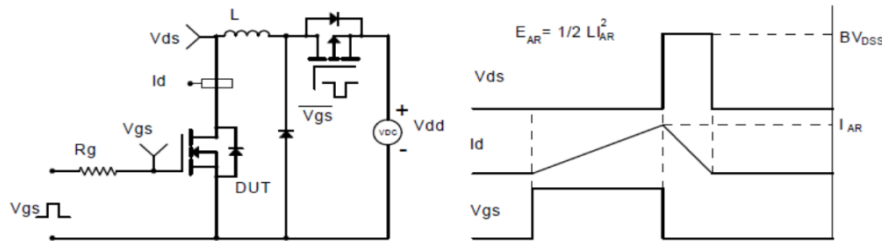
### PDFN3333 DP1



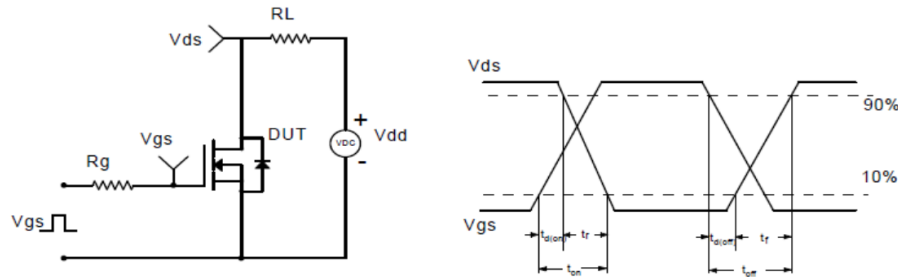
| SYMBOL | MM   |      |      | INCH  |       |       | SYMBOL | MM      |      |      | INCH     |       |       |
|--------|------|------|------|-------|-------|-------|--------|---------|------|------|----------|-------|-------|
|        | MIN  | NOM  | MAX  | MIN   | NOM   | MAX   |        | MIN     | NOM  | MAX  | MIN      | NOM   | MAX   |
| A      | 0.70 | 0.80 | 0.90 | 0.028 | 0.031 | 0.035 | E2     | 1.65    | *    | 1.95 | 0.065    | *     | 0.077 |
| b      | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 | e      | 0.65BSC |      |      | 0.026BSC |       |       |
| c      | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 | H      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D      | 3.20 | 3.30 | 3.40 | 0.126 | 0.130 | 0.134 | K      | 0.50    | *    | 0.80 | 0.020    | *     | 0.031 |
| D1     | 3.00 | 3.15 | 3.25 | 0.118 | 0.124 | 0.128 | L      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D2     | 0.80 | 1.00 | 1.20 | 0.031 | 0.039 | 0.047 | L1     | 0.10    | 0.15 | 0.20 | 0.004    | 0.006 | 0.008 |
| E      | 3.20 | 3.30 | 3.40 | 0.126 | 0.130 | 0.134 | θ      | 8°      | *    | 12°  | 8°       | *     | 12°   |
| E1     | 2.90 | 3.05 | 3.20 | 0.114 | 0.120 | 0.126 |        |         |      |      |          |       |       |

△ Dimensions D1 and E1 do not include mold flash protrusions or gate burrs.

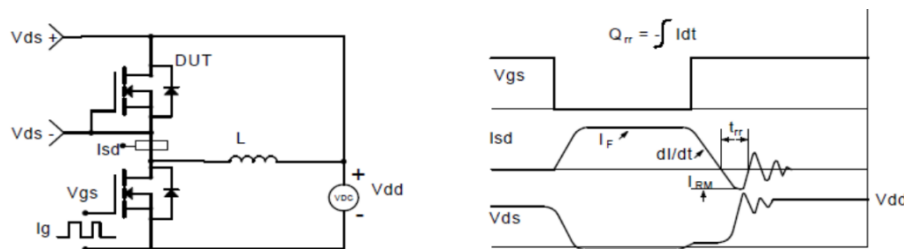
### Avalanche Test Circuit and Waveforms



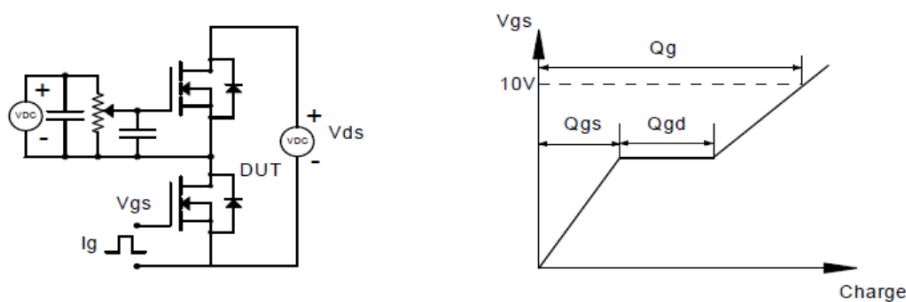
### Switching Time Test Circuit and Waveforms



### Diode Recovery Test Circuit and Waveforms



### Gate Charge Test Circuit and Waveform



### Customer Service

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