

### Features

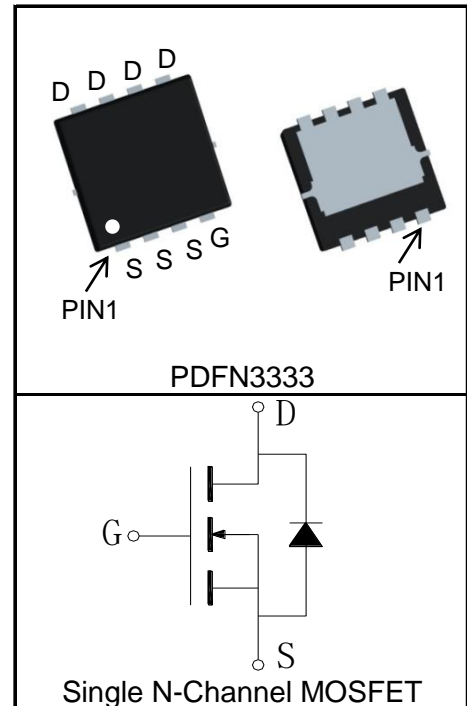
- 40V/25A,  
 $R_{DS(ON)} = 12m\Omega(Typ.)@V_{GS}=10V$   
 $R_{DS(ON)} = 19m\Omega(Typ.)@V_{GS}=4.5V$
- Excellent  $Q_G \times R_{DS(on)}$  product(FOM)
- SGT Technology
- Fast Switching Speed
- 100% avalanche tested

### Applications

- Switching Application Systems



### Pin Description



### Absolute Maximum Ratings

| Symbol   | Parameter   | Rating            | Unit       |   |
|--|---|-------------------|------------|---|
| <b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted) |   |                   |            |   |
| $V_{DSS}$  | Drain-Source Voltage                              | 40                | V          |   |
| $V_{GSS}$  | Gate-Source Voltage                               | $\pm 20$          |            |   |
| $T_J$  | Maximum Junction Temperature                      | 150               | $^\circ C$ |   |
| $T_{STG}$  | Storage Temperature Range                         | -55 to 150        | $^\circ C$ |   |
| $I_S$  | Diode Continuous Forward Current                  | $T_C=25^\circ C$  | 25         | A |
| <b>Mounted on Large Heat Sink</b>                                |   |                   |            |   |
| $I_{DP}^{(1)}$   | 300 $\mu s$ Pulse Drain Current Tested            | $T_C=25^\circ C$  | 100        | A |
| $I_D^{(2)}$  | Continuous Drain Current@ $T_C(V_{GS}=10V)$       | $T_C=25^\circ C$  | 25         | A |
|  |   | $T_C=100^\circ C$ | 16         |   |
|  | Continuous Drain Current@ $T_A(V_{GS}=10V)^{(3)}$ | $T_A=25^\circ C$  | 10         |   |
|  |   | $T_A=70^\circ C$  | 8          |   |
| $P_D$  | Maximum Power Dissipation@ $T_C$                  | $T_C=25^\circ C$  | 21         | W |
|  |   | $T_C=100^\circ C$ | 8          |   |
|  | Maximum Power Dissipation@ $T_A^{(3)}$            | $T_A=25^\circ C$  | 3.5        |   |
|  |   | $T_A=70^\circ C$  | 2.3        |   |

| Symbol                                | Parameter                              | Rating | Unit |
|---------------------------------------|--|--------|------|
| $R_{\theta JC}$                       | Thermal Resistance-Junction to Case    | 6      | °C/W |
| $R_{\theta JA}$ ③                     | Thermal Resistance-Junction to Ambient | 35     | °C/W |
| <b>Drain-Source Avalanche Ratings</b> |  |        |      |
| $E_{AS}$ ④                            | Avalanche Energy, Single Pulsed        | 9      | mJ   |

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

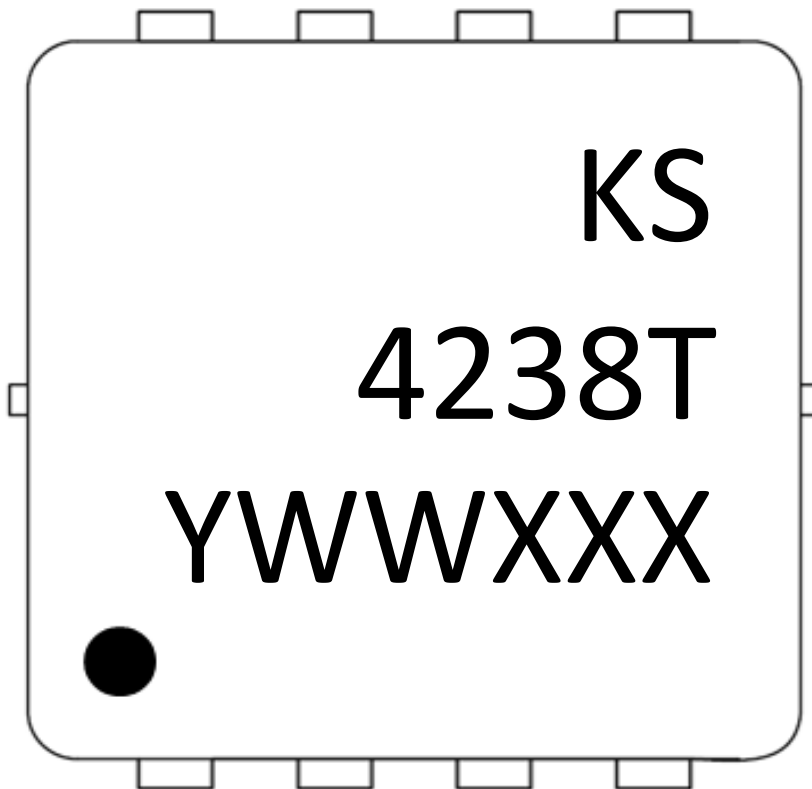
| Symbol                               | Parameter                        | Test Condition   | KS4238MAT |      |           | Unit      |
|--------------------------------------|----------------------------------|--|-----------|------|-----------|-----------|
|                                      |                                  |  | Min.      | Typ. | Max.      |           |
| <b>Static Characteristics</b>        |                                  |  |           |      |           |           |
| $BV_{DSS}$                           | Drain-Source Breakdown Voltage   | $V_{GS}=0V, I_{DS}=250\mu A$                           | 40        |      |           | V         |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current  | $V_{DS}=40V, V_{GS}=0V$                                |           |      | 1         | $\mu A$   |
|                                      |                                  | $T_J=125^\circ\text{C}$                                |           |      | 30        |           |
| $V_{GS(th)}$                         | Gate Threshold Voltage           | $V_{DS}=V_{GS}, I_{DS}=250\mu A$                       | 1.1       | 1.7  | 2.3       | V         |
| $I_{GSS}$                            | Gate Leakage Current             | $V_{GS}=\pm 20V, V_{DS}=0V$                            |           |      | $\pm 100$ | nA        |
| $R_{DS(ON)}$ ⑤                       | Drain-Source On-state Resistance | $V_{GS}=10V, I_{DS}=12A$                               |           | 12   | 16        | $m\Omega$ |
|                                      |                                  | $V_{GS}=4.5V, I_{DS}=8A$                               |           | 19   | 25        | $m\Omega$ |
| <b>Diode Characteristics</b>         |                                  |  |           |      |           |           |
| $V_{SD}$ ⑤                           | Diode Forward Voltage            | $I_{SD}=12A, V_{GS}=0V$                                |           | 0.87 | 1.2       | V         |
| $t_{rr}$                             | Reverse Recovery Time            | $I_{SD}=12A, dI_{SD}/dt=100A/\mu s$                    |           | 18   |           | ns        |
| $Q_{rr}$                             | Reverse Recovery Charge          |  |           | 31   |           | nC        |
| <b>Dynamic Characteristics</b> ⑥     |                                  |  |           |      |           |           |
| $R_G$                                | Gate Resistance                  | $V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$                  |           | 1    |           | $\Omega$  |
| $C_{iss}$                            | Input Capacitance                | $V_{GS}=0V,$<br>$V_{DS}=20V,$<br>Frequency=1.0MHz      |           | 375  |           | $\mu F$   |
| $C_{oss}$                            | Output Capacitance               |  |           | 230  |           |           |
| $C_{riss}$                           | Reverse Transfer Capacitance     |  |           | 15   |           |           |
| $t_{d(ON)}$                          | Turn-on Delay Time               | $V_{DD}=20V, I_{DS}=12A,$<br>$V_{GS}=10V, R_G=3\Omega$ |           | 6    |           | ns        |
| $t_r$                                | Turn-on Rise Time                |  |           | 9    |           |           |
| $t_{d(OFF)}$                         | Turn-off Delay Time              |  |           | 13   |           |           |
| $t_f$                                | Turn-off Fall Time               |  |           | 8    |           |           |
| <b>Gate Charge Characteristics</b> ⑥ |                                  |  |           |      |           |           |
| $Q_g$                                | Total Gate Charge                | $V_{DS}=20V, V_{GS}=10V,$<br>$I_{DS}=12A$              |           | 4    |           | nC        |
| $Q_{gs}$                             | Gate-Source Charge               |  |           | 1.8  |           |           |
| $Q_{gd}$                             | Gate-Drain Charge                |  |           | 1.3  |           |           |

**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  $T_{J\text{max}}$ ,  $I_{AS} = 6\text{A}$ ,  $L = 0.5\text{mH}$ ,  $V_{DD} = 24\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
- ⑤Pulse test; Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- ⑥Guaranteed by design, not subject to production testing.

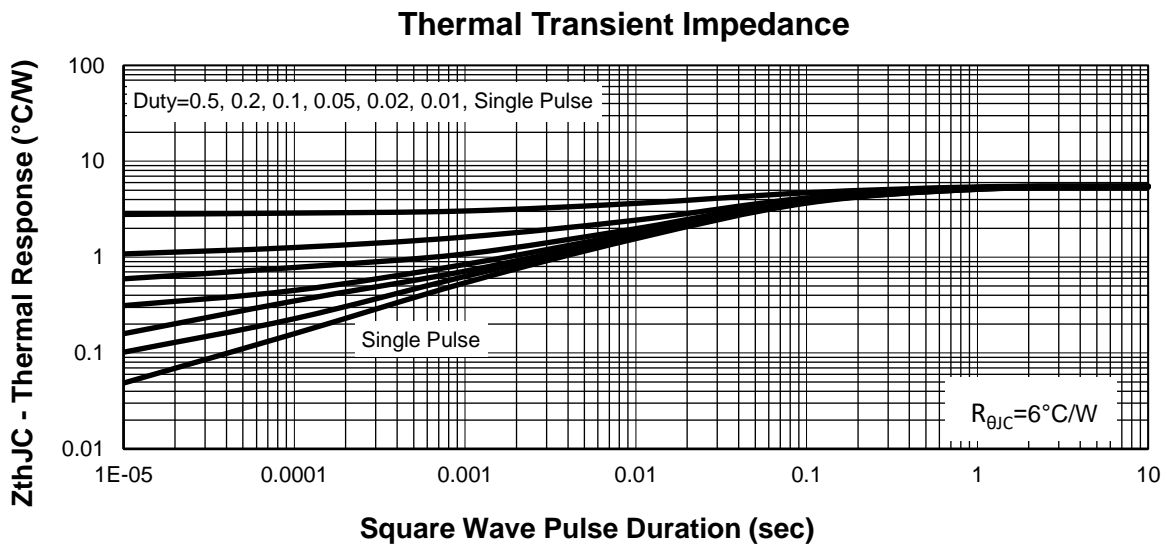
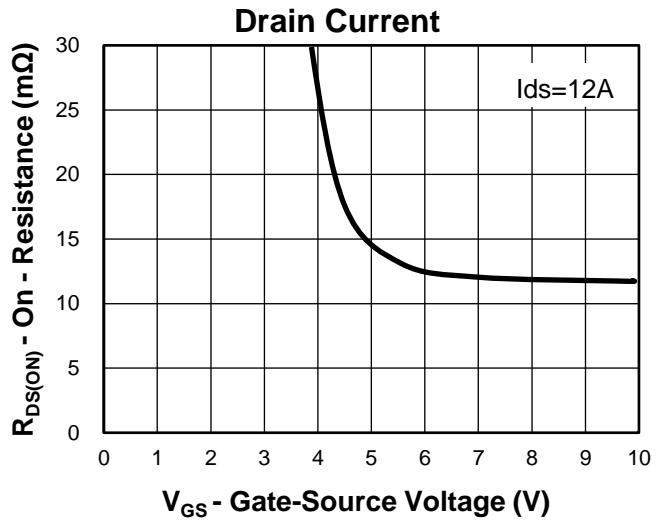
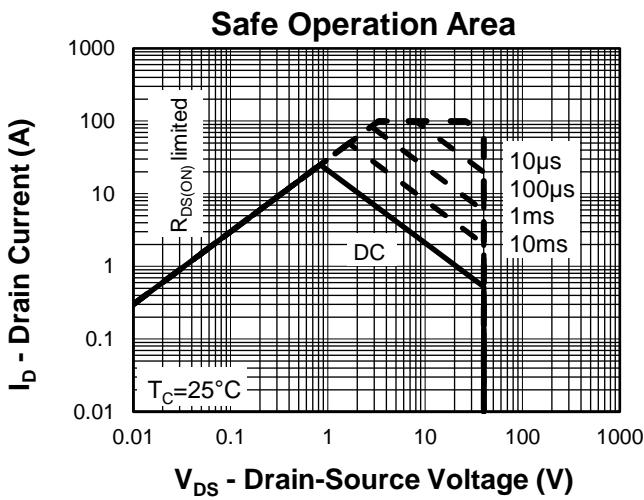
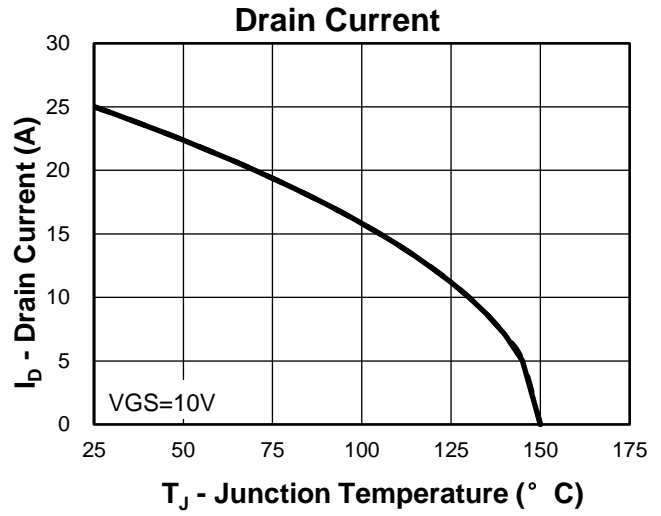
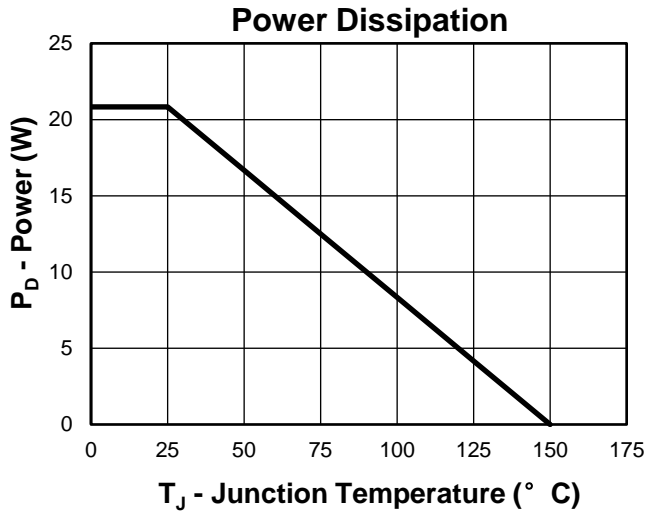
**Ordering and Marking Information**

| Device    | Package  | Packaging | Quantity | Reel Size | Tape width |
|-----------|----------|-----------|----------|-----------|------------|
| KS4238MAT | PDFN3333 | Tape&Reel | 5000     | 13"       | 12mm       |

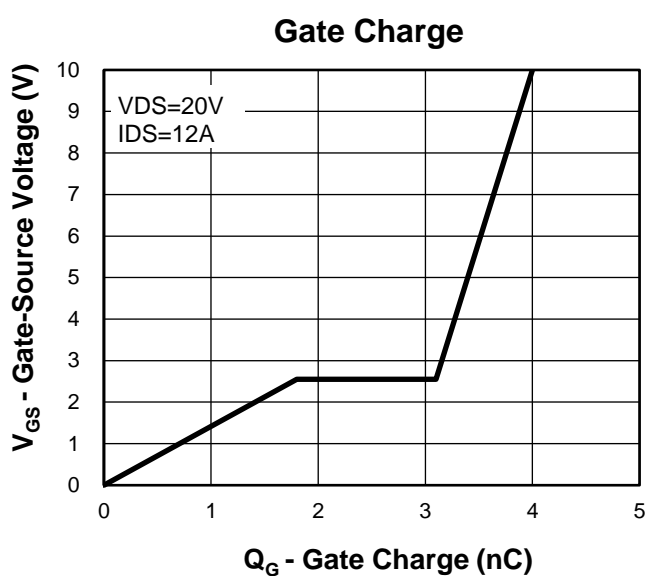
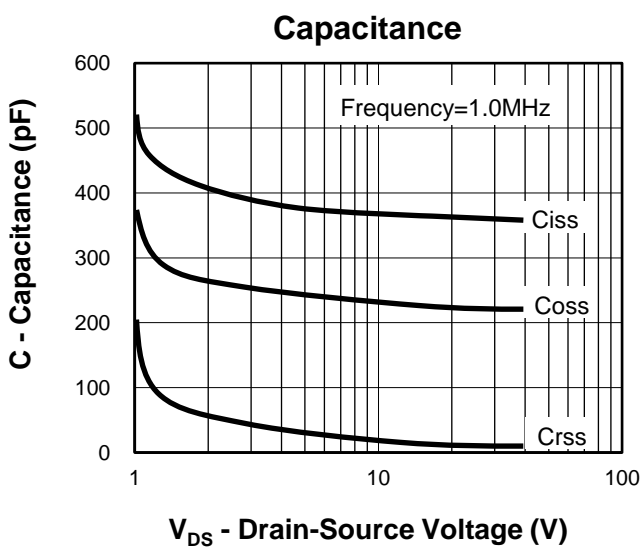
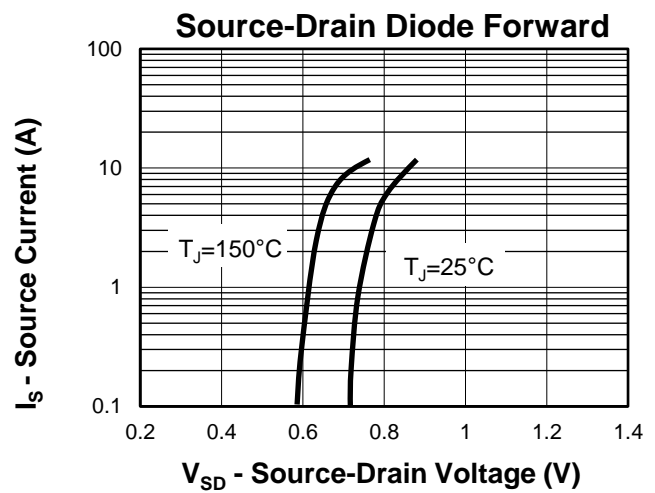
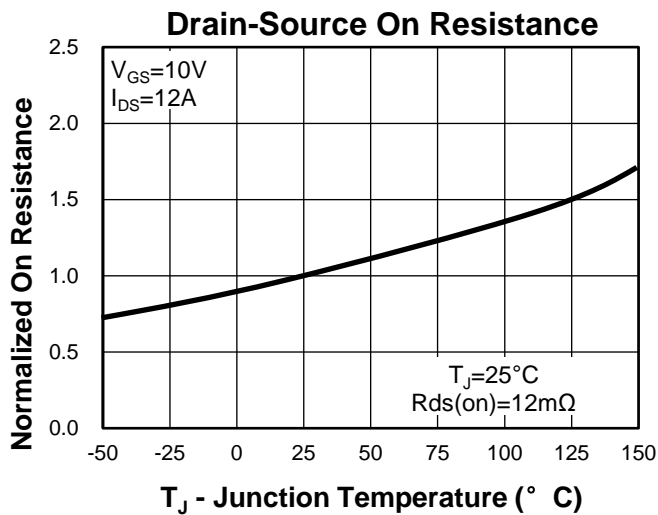
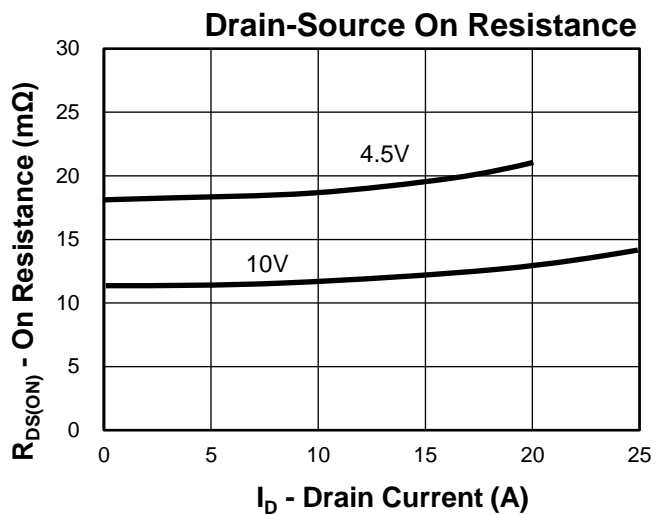
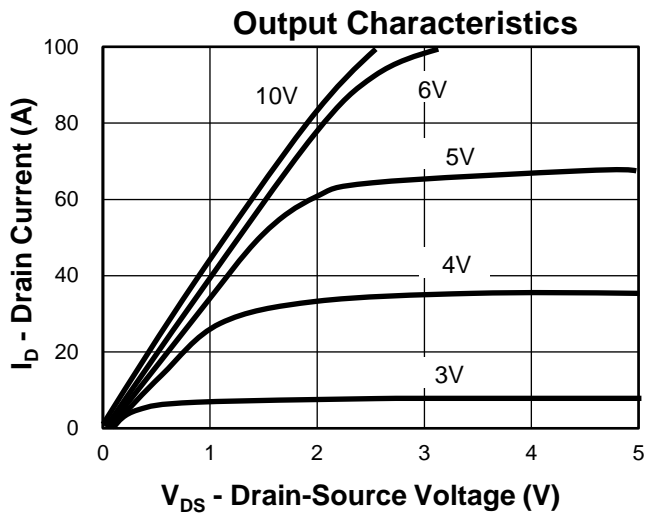


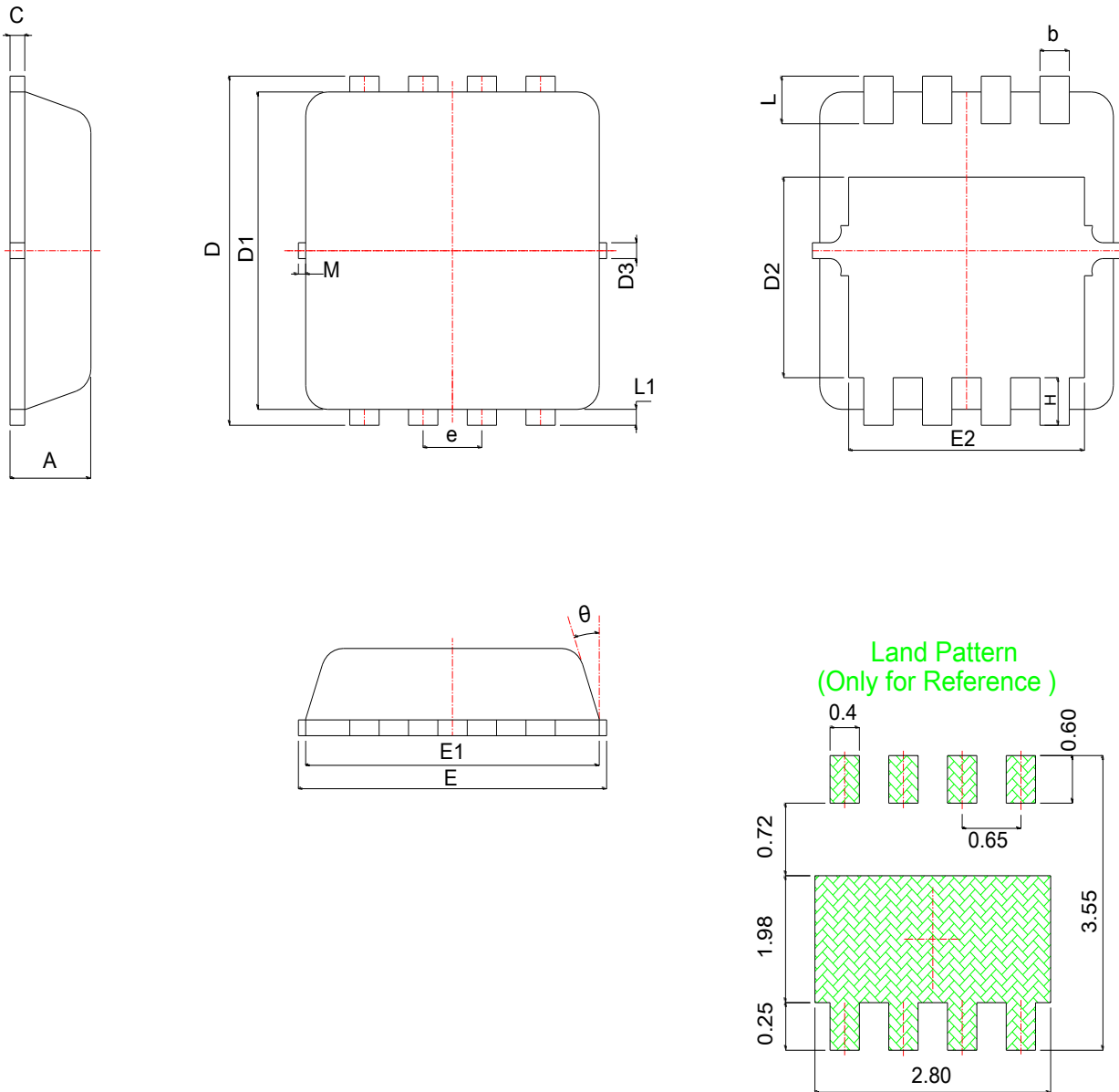
Y        =Year,2017-A,2018-B,etc.  
 WW      =Week.  
 XXX     =Lot number.

### Typical Characteristics



### Typical Characteristics



**Package Information**
**PDFN3333**


| SYMBOL | MM   |      |      | INCH  |       |       | SYMBOL | MM      |      |      | INCH     |       |       |
|--------|------|------|------|-------|-------|-------|--------|---------|------|------|----------|-------|-------|
|        | MIN  | NOM  | MAX  | MIN   | NOM   | MAX   |        | MIN     | NOM  | MAX  | MIN      | NOM   | MAX   |
| A      | 0.67 | 0.78 | 0.88 | 0.026 | 0.031 | 0.035 | E1     | 3.05    | 3.15 | 3.25 | 0.120    | 0.124 | 0.128 |
| b      | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 | E2     | 2.25    | 2.45 | 2.65 | 0.089    | 0.096 | 0.104 |
| c      | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 | e      | 0.65BSC |      |      | 0.026BSC |       |       |
| D      | 3.15 | 3.35 | 3.55 | 0.124 | 0.132 | 0.140 | H      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D1     | 3.00 | 3.10 | 3.20 | 0.118 | 0.122 | 0.126 | L      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D2     | 1.53 | 1.73 | 1.93 | 0.060 | 0.068 | 0.076 | L1     | *       | 0.13 | *    | *        | 0.005 | *     |
| D3     | *    | 0.13 | *    | *     | 0.005 | *     | theta  | *       | 10°  | 12°  | *        | 10°   | 12°   |
| E      | 3.10 | 3.30 | 3.50 | 0.122 | 0.130 | 0.138 | M      | *       | *    | 0.15 | *        | *     | 0.006 |

### 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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