30V N-Channel MOSFETs

# PDB3810H

## General Description

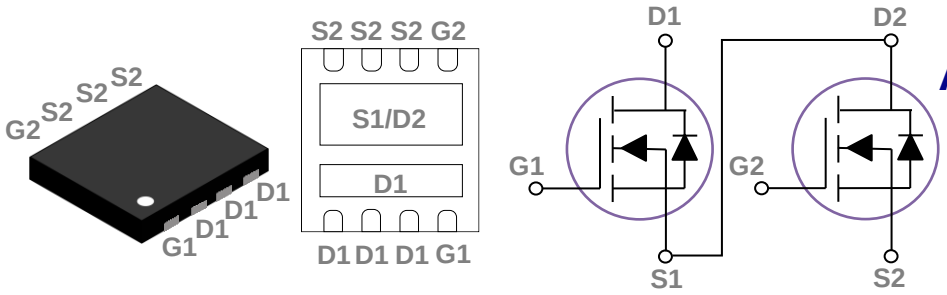
*These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.*

| | BVDSS | RDSON | ID |
|---|---|---|---|
| Q1 | 30V | 10.5mΩ | 19.5A |
| Q2 | 30V | 10.5mΩ | 19.5A |

## Features

- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Halogen free*

## DFN3x3 Asymmetric Dual Pin Configuration




## Applications

- *MB / VGA / Vcore*
- *POL Buck Applications*
- *SMPS 2nd SR*

## Absolute Maximum Ratings Tc=25℃ unless otherwise noted

| Symbol | Parameter | Q1 | Q2 | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 30 | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | ±20 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25℃) | 19.5 | 19.5 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 12.3 | 12.3 | A |
| | Drain Current – Continuous ($T_A$=25℃) | 10.8 | 10.8 | A |
| | Drain Current – Continuous ($T_A$=100℃) | 6.8 | 6.8 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | 78 | 78 | A |
| EAS | Single Pulse Avalanche Energy[2] | 13 | 13 | mJ |
| IAS | Single Pulse Avalanche Current[2] | 16 | 16 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 27 | 27 | W |
| | Power Dissipation – Derate above 25℃ | 0.01 | 0.01 | W/℃ |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | | ℃ |

## Thermal Characteristics

| Symbol | | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $R_{\theta JA}$ | Q1 | Thermal Resistance Junction to ambient | --- | 62 | ℃/W |
| $R_{\theta JA}$ | Q2 | | --- | 62 | ℃/W |
| $R_{\theta JC}$ | Q1 | Thermal Resistance Junction to Case | --- | 4.6 | ℃/W |
| $R_{\theta JC}$ | Q2 | | --- | 4.6 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

### Static State Characteristics

| Symbol | Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | Q1 | 30 | --- | --- | V |
| | | | Q2 | 30 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | Q1 | --- | 0.04 | --- | V/℃ |
| | | | Q2 | --- | 0.04 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=30V , $V_{GS}$=0V , $T_J$=25℃ | Q1 | --- | --- | 1 | uA |
| | | | Q2 | --- | --- | 1 | uA |
| | | $V_{DS}$=24V , $V_{GS}$=0V , $T_J$=125℃ | Q1 | --- | --- | 10 | uA |
| | | | Q2 | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | Q1 | --- | --- | ±100 | nA |
| | | | Q2 | --- | --- | ±100 | nA |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[3] | $V_{GS}$=10V , $I_D$=10A | Q1 | --- | 8.5 | 10.5 | mΩ |
| | | $V_{GS}$=10V , $I_D$=10A | Q2 | --- | 8.5 | 10.5 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=5A | Q1 | --- | 11 | 14 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=5A | Q2 | --- | 11 | 14 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | Q1 | 1.2 | 1.6 | 2.5 | V |
| | | | Q2 | 1.2 | 1.6 | 2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | Q1 | --- | -4 | --- | mV/℃ |
| | | | Q2 | --- | -4 | --- | mV/℃ |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=5A | Q1 | --- | 12 | --- | S |
| | | $V_{DS}$=5V , $I_D$=5A | Q2 | --- | 12 | --- | S |

### Dynamic Characteristics

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[3,4] | $V_{DS}$=15V , $V_{GS}$=10V , $I_D$=5A | Q1 | --- | 15.6 | 31 | nC |
| | | | Q2 | --- | 15.6 | 31 | |
| $Q_{gs}$ | Gate-Source Charge[3,4] | | Q1 | --- | 2.3 | 5 | |
| | | | Q2 | --- | 2.3 | 5 | |
| $Q_{gd}$ | Gate-Drain Charge[3,4] | | Q1 | --- | 3 | 6 | |
| | | | Q2 | --- | 3 | 6 | |
| $T_{d(on)}$ | Turn-On Delay Time[3,4] | $V_{DD}$=15V , $V_{GS}$=10V , $R_G$=6Ω $I_D$=1A | Q1 | --- | 3.8 | 7 | ns |
| | | | Q2 | --- | 3.8 | 7 | |
| $T_r$ | Rise Time[3,4] | | Q1 | --- | 10 | 19 | |
| | | | Q2 | --- | 10 | 19 | |
| $T_{d(off)}$ | Turn-Off Delay Time[3,4] | | Q1 | --- | 22 | 42 | |
| | | | Q2 | --- | 22 | 42 | |
| $T_f$ | Fall Time[3,4] | | Q1 | --- | 6.6 | 13 | |
| | | | Q2 | --- | 6.6 | 13 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{DS}$=25V , $V_{GS}$=0V , F=1MHz | Q1 | --- | 620 | 900 | pF |
| | | | Q2 | --- | 620 | 900 | |
| $C_{oss}$ | Output Capacitance | | Q1 | --- | 85 | 125 | |
| | | | Q2 | --- | 85 | 125 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | Q1 | --- | 60 | 90 | |
| | | | Q2 | --- | 60 | 90 | |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, F=1MHz | Q1 | --- | 2.8 | 5.6 | Ω |
| | | | Q2 | --- | 2.8 | 5.6 | Ω |

## Drain-Source Diode Characteristics

| Symbol | Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | $V_G$=$V_D$=0V , Force Current | Q1 | --- | --- | 19.5 | A |
| | | | Q2 | --- | --- | 19.5 | A |
| $I_{SM}$ | Pulsed Source Current[3] | | Q1 | --- | --- | 39 | A |
| | | | Q2 | --- | --- | 39 | A |
| $V_{SD}$ | Diode Forward Voltage[3] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | Q1 | --- | --- | 1 | V |
| | | | Q2 | --- | --- | 1 | V |

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}$=25V,$V_{GS}$=10V,L=0.1mH,Q1:$I_{AS}$=16A,Q2:$I_{AS}$=16A,$R_G$=25Ω,Starting $T_J$=25℃.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.

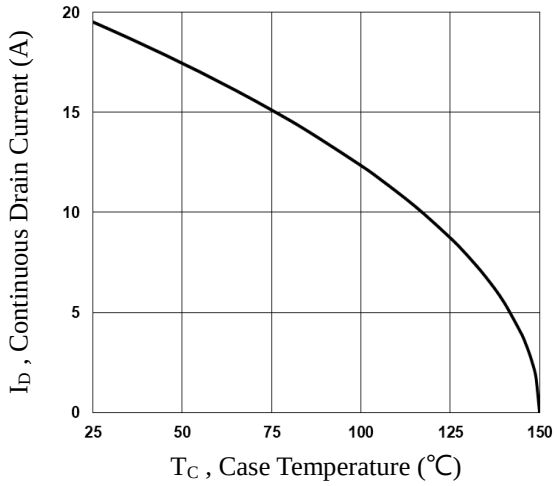



**Fig.1 Q1 Continuous Drain Current vs. $T_C$**

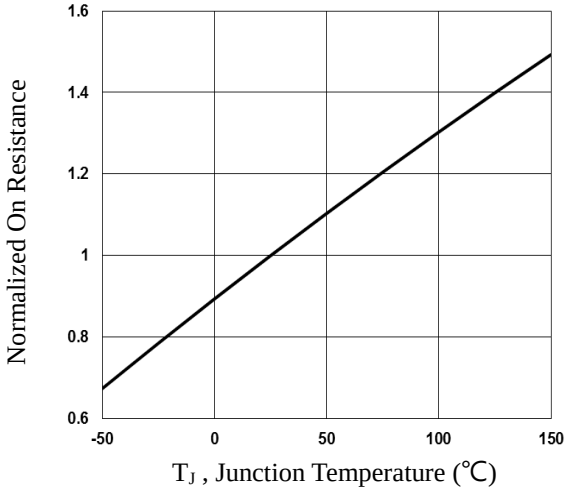



**Fig.2 Q1 Normalized RDSON vs. $T_J$**

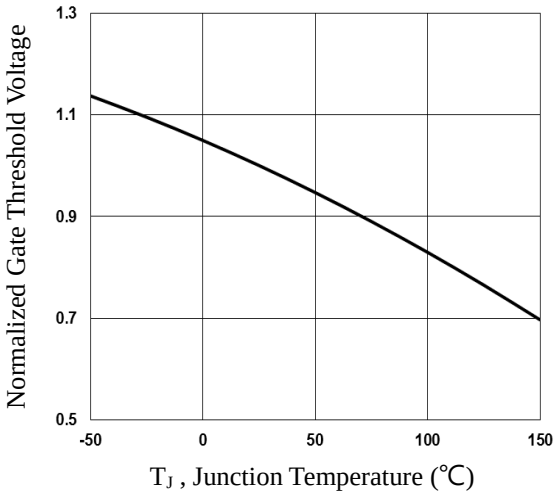



**Fig.3 Q1 Normalized $V_{th}$ vs. $T_J$**

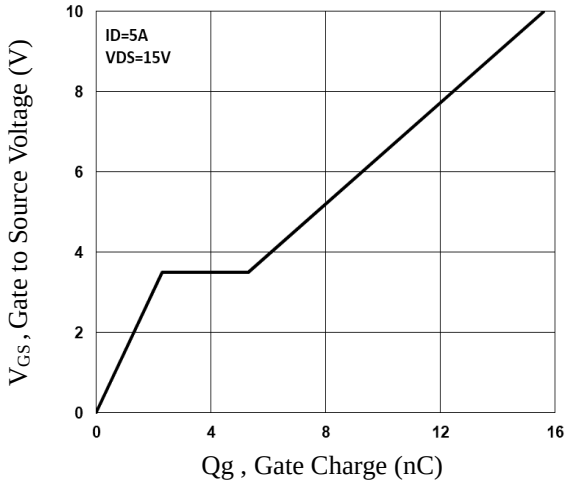



**Fig.4 Q1 Gate Charge Waveform**

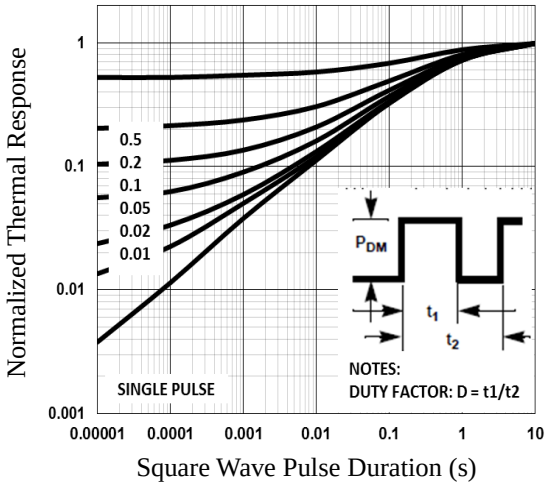



**Fig.5 Q1 Normalized Transient Impedance**

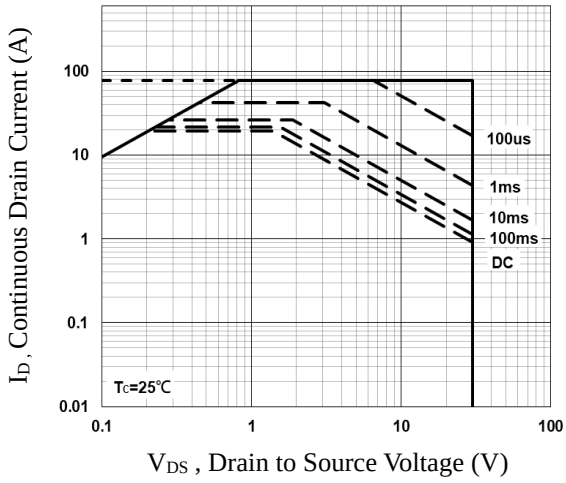



**Fig.6 Q1 Maximum Safe Operation Area**

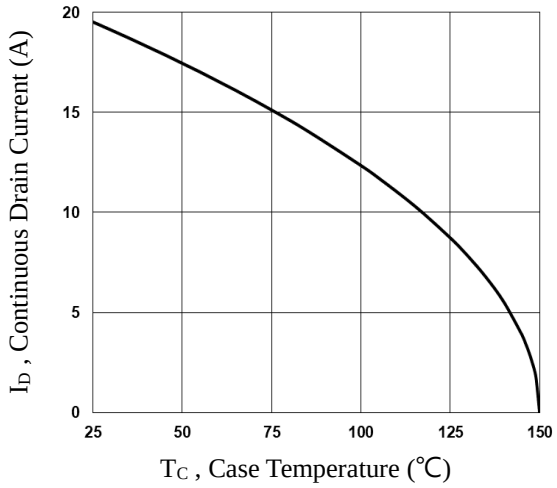



**Fig.7 Q2 Continuous Drain Current vs. $T_C$**

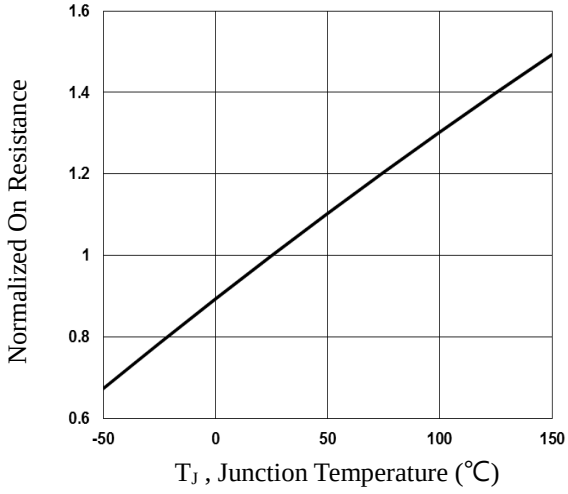



**Fig.8 Q2 Normalized RDSON vs. $T_J$**

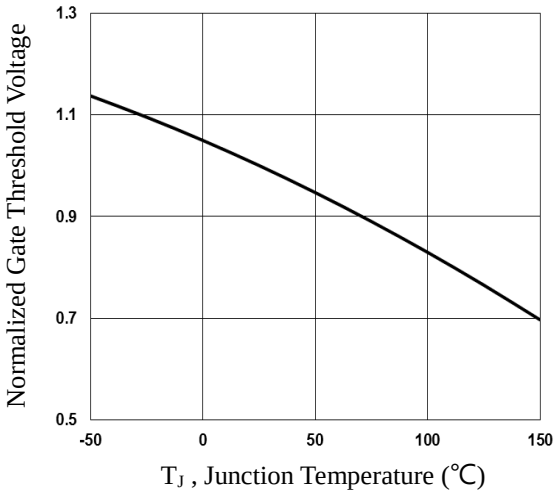



**Fig.9 Q2 Normalized $V_{th}$ vs. $T_J$**

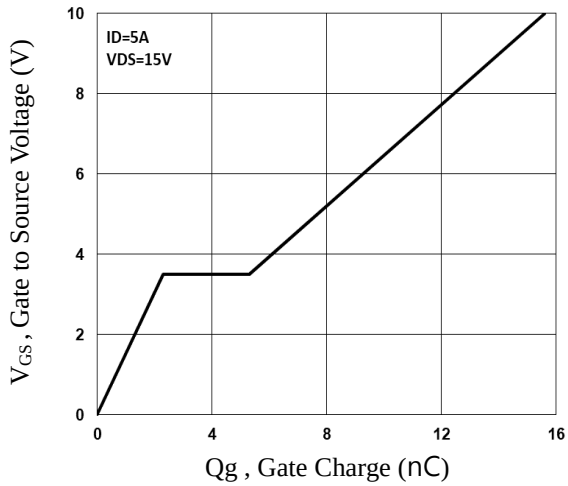



**Fig.10 Q2 Gate Charge Waveform**

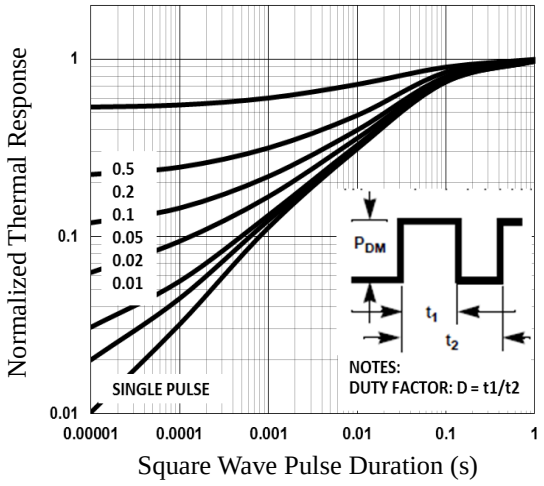



**Fig.11 Q2 Normalized Transient Impedance**

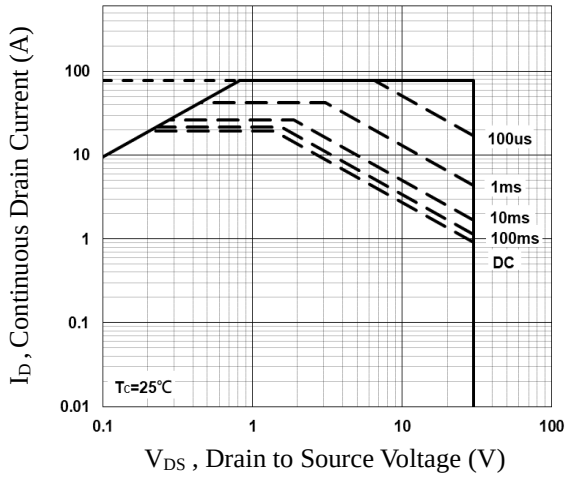



**Fig.12 Q2 Maximum Safe Operation Area**

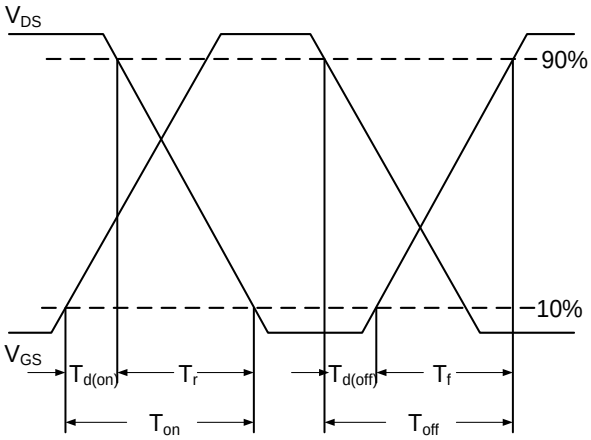



**Fig.13 Switching Time Waveform**

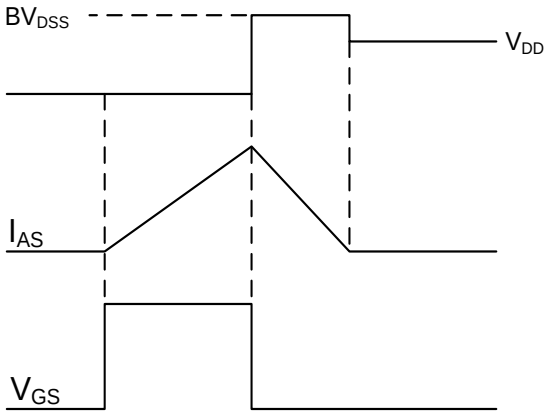
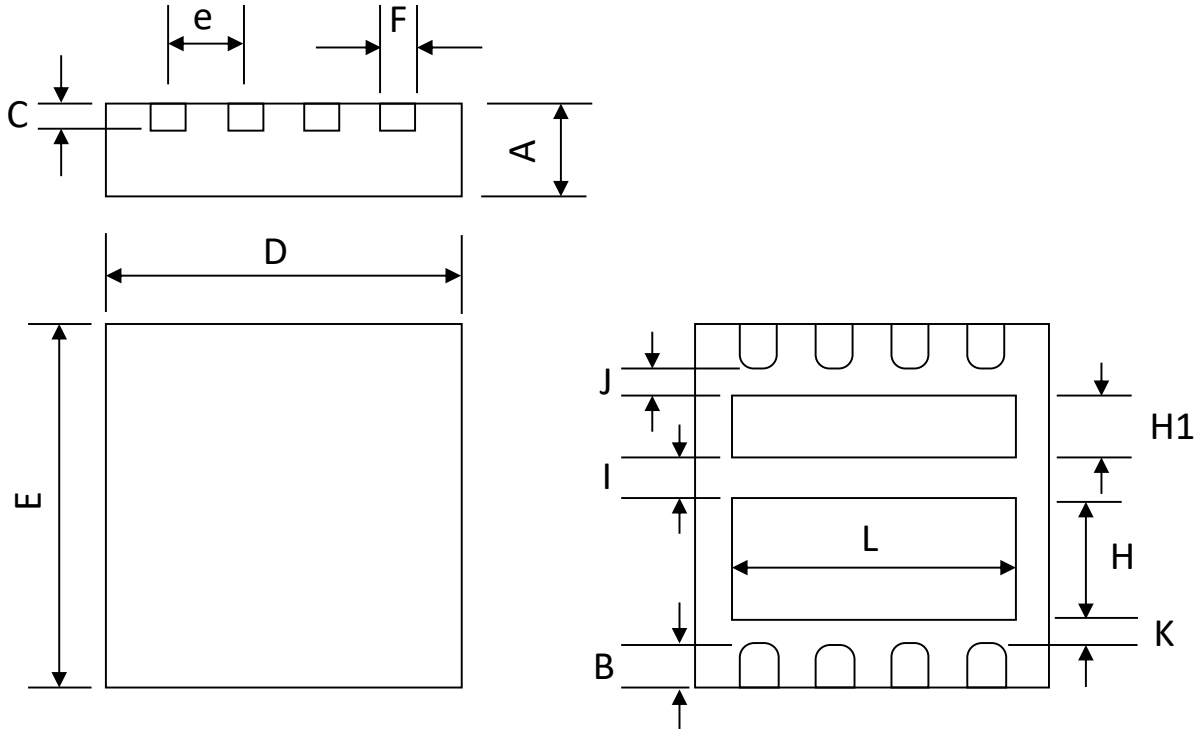



**Fig.14 EAS Waveform**

# DFN3x3 Asymmetric Dual Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Max | Min | Max | Min |
| A | 0.900 | 0.700 | 0.035 | 0.028 |
| B | 0.400 | 0.250 | 0.016 | 0.010 |
| C | 0.255 | 0.150 | 0.010 | 0.006 |
| D | 3.100 | 2.900 | 0.122 | 0.114 |
| E | 3.100 | 2.900 | 0.122 | 0.114 |
| e | 0.700 | 0.600 | 0.028 | 0.024 |
| F | 0.450 | 0.250 | 0.018 | 0.010 |
| H | 1.100 | 0.850 | 0.043 | 0.033 |
| H1 | 0.650 | 0.400 | 0.026 | 0.016 |
| I | 0.450 | 0.250 | 0.018 | 0.010 |
| J | 0.350 | 0.150 | 0.014 | 0.006 |
| K | 0.350 | 0.150 | 0.014 | 0.006 |
| L | 2.500 | 2.300 | 0.098 | 0.091 |

# RECOMMENDED LAND PATTERN

## DFN3X3 (Asymmetric Dual)