# STM8301

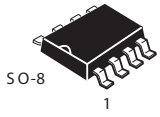
SamHop Microelectronics Corp.

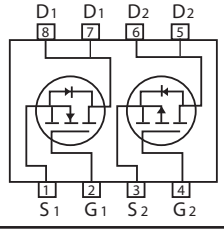
Apr.28 2005 ver1.1

## Dual Enhancement Mode Field Effect Transistor ( N and P Channel)

| PRODUCT (N-Channel) | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$ ( mΩ ) Max |
| 30V | 7A | 25 @ $V_{GS}$ = 10V |
| | | 42 @ $V_{GS}$ = 4.5V |

| PRODUCT SUMMARY (P-Channel) | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$ ( mΩ ) Max |
| -30V | -4.5A | 60 @ $V_{GS}$ = -10V |
| | | 80 @ $V_{GS}$ = -4.5V |




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

| Parameter | | Symbol | N-Channel | P-Channel | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | -30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Drain Current-Continuous [a] @ Ta | 25°C | $I_D$ | 7 | -4.5 | A |
| | 70°C | | 6 | -3.8 | A |
| -Pulsed [b] | | $I_{DM}$ | 29 | -18 | A |
| Drain-Source Diode Forward Current [a] | | $I_S$ | 1.7 | -1.7 | A |
| Maximum Power Dissipation [a] | Ta= 25°C | $P_D$ | 2 | | W |
| | Ta=70°C | | 1.44 | | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | | °C |

## THERMAL CHARACTERISTICS

| | | | |
|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient [a] | $R_{\theta JA}$ | 62.5 | °C/W |

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## N-Channel ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ [c] | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | uA |
| Gate-Body Leakage | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±100 | nA |
| **ON CHARACTERISTICS [b]** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 1 | 1.6 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=7A | | 20 | 25 | m ohm |
| | | $V_{GS}$=4.5V, $I_D$=5A | | 34 | 42 | m ohm |
| On-State Drain Current | $I_{D(ON)}$ | $V_{DS}$=10V, $V_{GS}$=10V | 29 | | | A |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V, $I_D$=7A | | 10 | | S |
| **DYNAMIC CHARACTERISTICS [c]** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{DS}$=15V, $V_{GS}$=0V<br>f=1.0MHz | | 792 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 133 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 87 | | pF |
| **SWITCHING CHARACTERISTICS [c]** | | | | | | |
| Turn-On Delay Time | $t_{D(ON)}$ | $V_{DD}$=15V<br>$I_D$=1A<br>$V_{GS}$=10V<br>$R_{GEN}$=6 ohm | | 6.5 | | ns |
| Rise Time | $t_r$ | | | 12.9 | | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 17.9 | | ns |
| Fall Time | $t_f$ | | | 5.2 | | ns |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V, $I_D$=7A, $V_{GS}$=10V | | 13.6 | | nC |
| | | $V_{DS}$=15V, $I_D$=7A, $V_{GS}$=4.5V | | 6.8 | | nC |
| Gate-Source Charge | $Q_{gs}$ | $V_{DS}$=15V, $I_D$=7A,<br>$V_{GS}$=10V | | 2.0 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 3.5 | | nC |

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## P-Channel ELECTRICAL CHARACTERISTICS ($T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ[C] | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=-250uA | -30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-24V, $V_{GS}$=0V | | | -1 | uA |
| Gate-Body Leakage | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±100 | nA |
| **ON CHARACTERISTICS[b]** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-250uA | -1 | -1.5 | -2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V, $I_D$=-4.5A | | 50 | 60 | m ohm |
| | | $V_{GS}$=-4.5V, $I_D$=-3A | | 70 | 80 | m ohm |
| On-State Drain Current | $I_{D(ON)}$ | $V_{DS}$=-10V, $V_{GS}$=-10V | -18 | | | A |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-10V, $I_D$=-4.5A | | 9 | | S |
| **DYNAMIC CHARACTERISTICS[c]** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{DS}$=-15V, $V_{GS}$=0V<br>f=1.0MHz | | 586 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 122 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 78 | | pF |
| **SWITCHING CHARACTERISTICS[c]** | | | | | | |
| Turn-On Delay Time | $t_{D(ON)}$ | $V_{DD}$=-15V<br>$I_D$=-1A<br>$V_{GEN}$=-10V<br>$R_{GEN}$=6 ohm | | 5.6 | | ns |
| Rise Time | $t_r$ | | | 4.7 | | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 51.8 | | ns |
| Fall Time | $t_f$ | | | 33.5 | | ns |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-15V,$I_D$=-4.5A,$V_{GS}$=-10V | | 11.2 | | nC |
| | | $V_{DS}$=-15V,$I_D$=-4.5A,$V_{GS}$=-4.5V | | 5.4 | | nC |
| Gate-Source Charge | $Q_{gs}$ | $V_{DS}$=-15V, $I_D$=-4.5A,<br>$V_{GS}$=-10V | | 1.4 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 2.7 | | nC |

## ELECTRICAL CHARACTERISTICS ($T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Condition | | Min | Typ [c] | Max | Unit |
|---|---|---|---|---|---|---|---|
| DRAIN-SOURCE DIODE CHARACTERISTICS [b] | | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0V, Is =1.7A | N-Ch | | 0.79 | 1.2 | V |
| | | $V_{GS}$ = 0V, Is =-1.7A | P-Ch | | -0.8 | -1.2 | |

Notes

a.Surface Mounted on FR4 Board, t≤10sec.

* $R\theta_{JA}$ is 62.5°C/W when mounted on 1in$^2$ FR-4 board with 2oz Copper

* $R\theta_{JA}$ is 125°C/W when mounted on 0.02 in$^2$ FR-4 board with 2oz Copper

b.Pulse Test:Pulse Width≤300 μs, Duty Cycle≤2%.

c.Guaranteed by design, not subject to production testing.

N-Channel

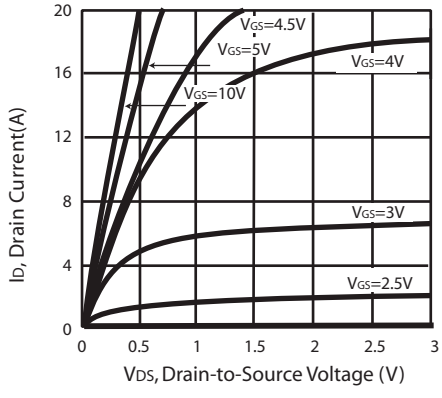



Figure 1. Output Characteristics

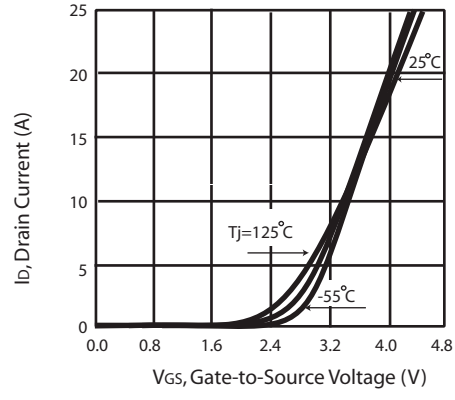



Figure 2. Transfer Characteristics

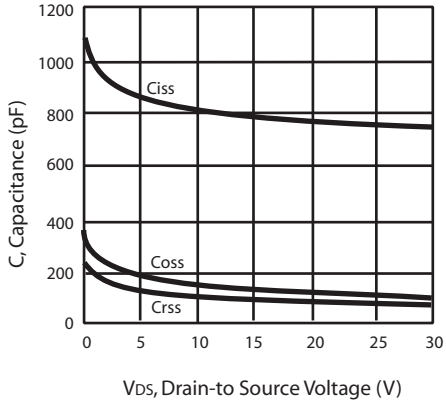



Figure 3. Capacitance

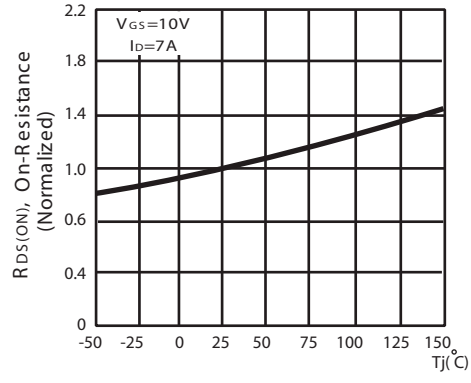



Figure 4. On-Resistance Variation with Drain Current and Temperature

## N-Channel

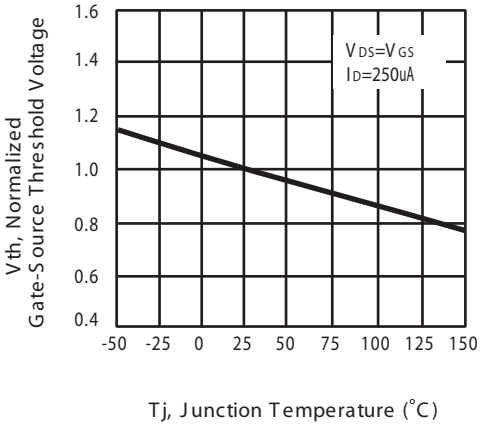



Figure 5. Gate Threshold Variation with Temperature

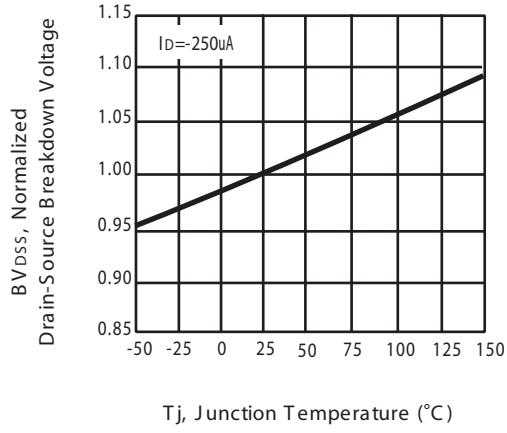



Figure 6. Breakdown Voltage Variation with Temperature

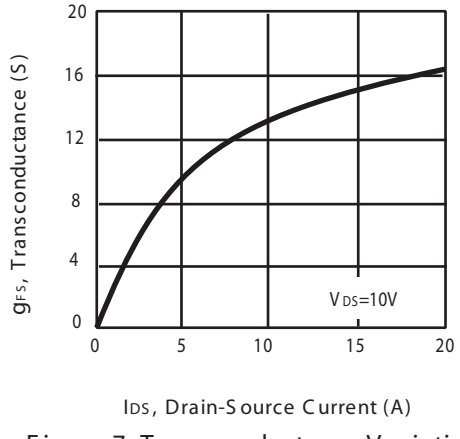



Figure 7. Transconductance Variation with Drain Current

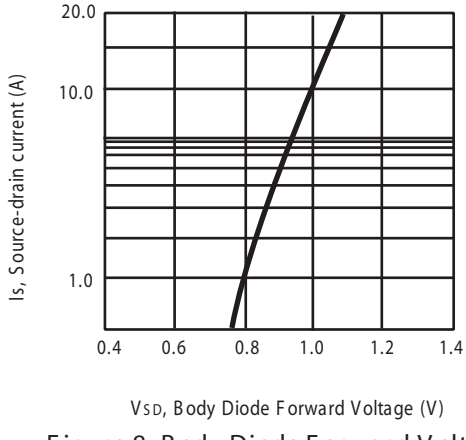



Figure 8. Body Diode Forward Voltage Variation with Source Current

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## P-Channel

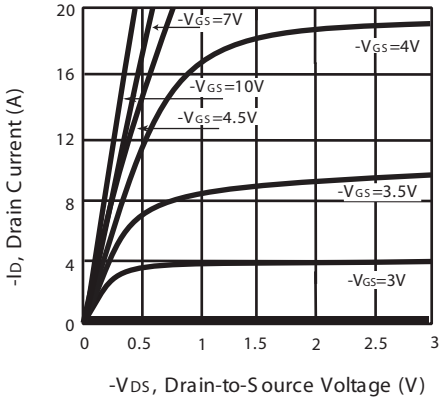



Figure 1. Output Characteristics

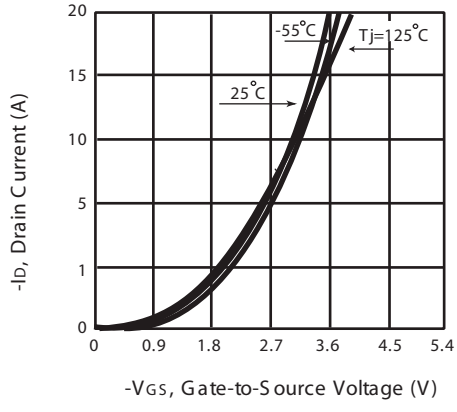



Figure 2. Transfer Characteristics

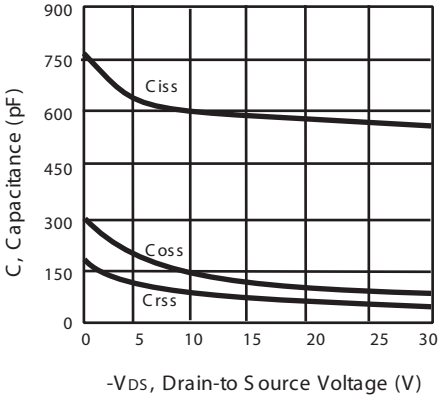



Figure 3. Capacitance

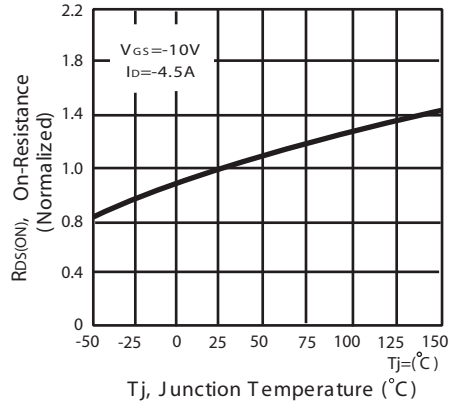



Figure 4. On-Resistance Variation with Temperature

## P-Channel

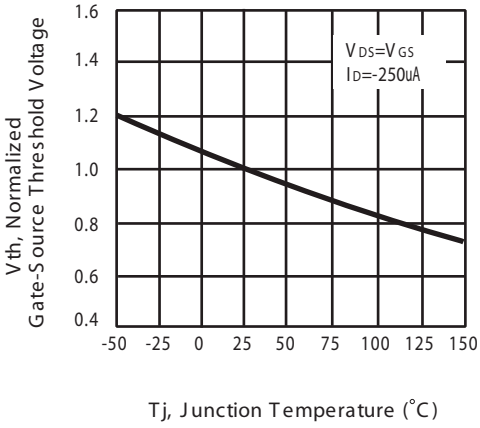



Figure 5. Gate Threshold Variation with Temperature

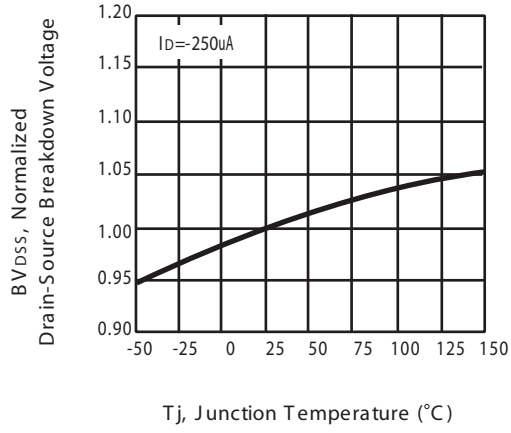



Figure 6. Breakdown Voltage Variation with Temperature

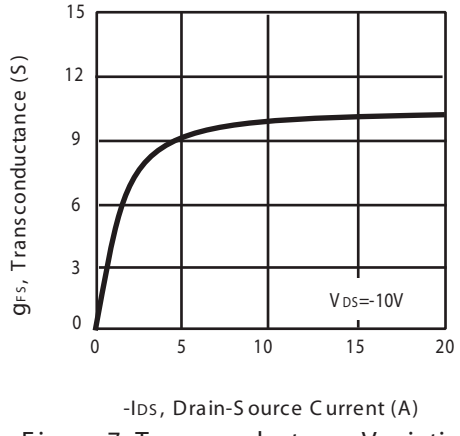



Figure 7. Transconductance Variation with Drain Current

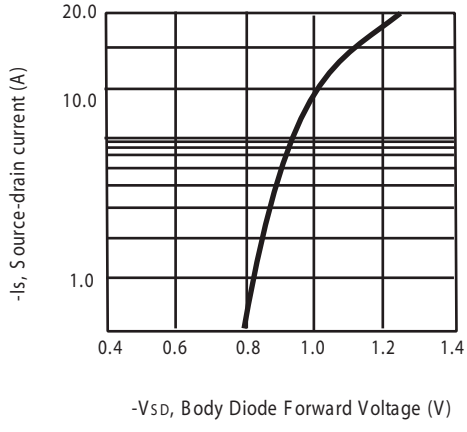



Figure 8. Body Diode Forward Voltage Variation with Source Current

# STM8301

## N-Channel

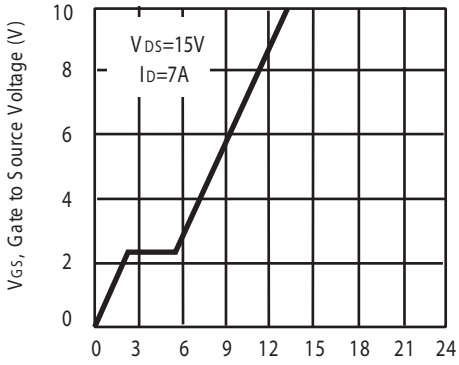



Figure 9. Gate Charge

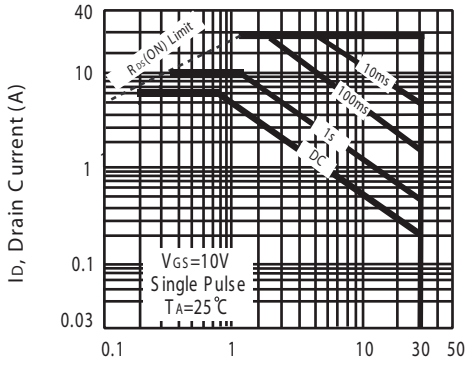



Figure 10. Maximum Safe Operating Area

## P-Channel

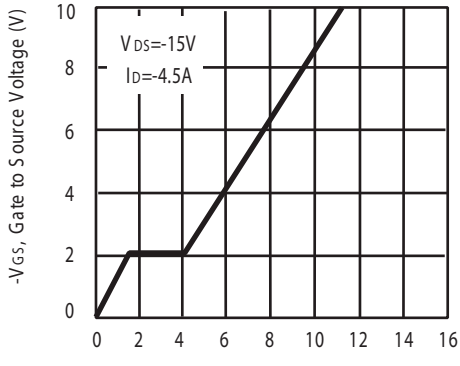



Figure 9. Gate Charge

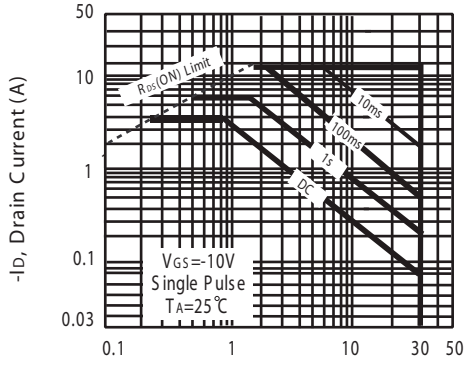



Figure 10. Maximum Safe Operating Area

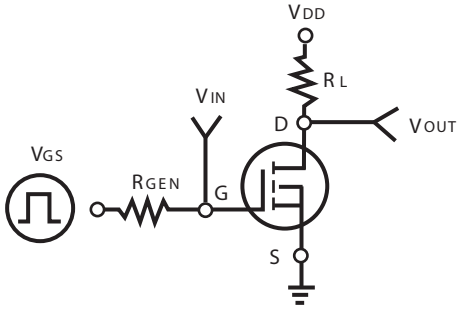



Figure 11. Switching Test Circuit

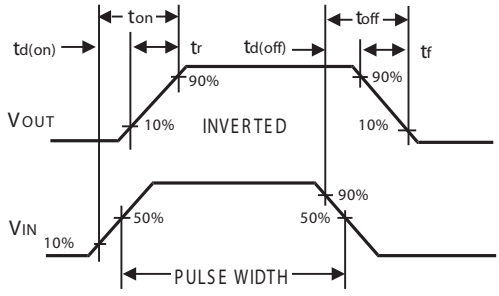
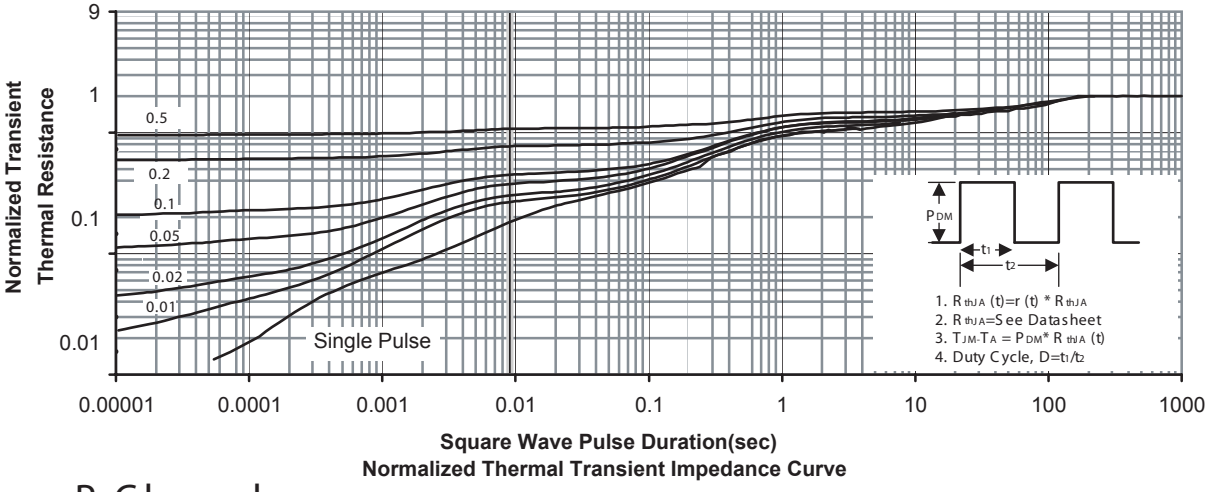
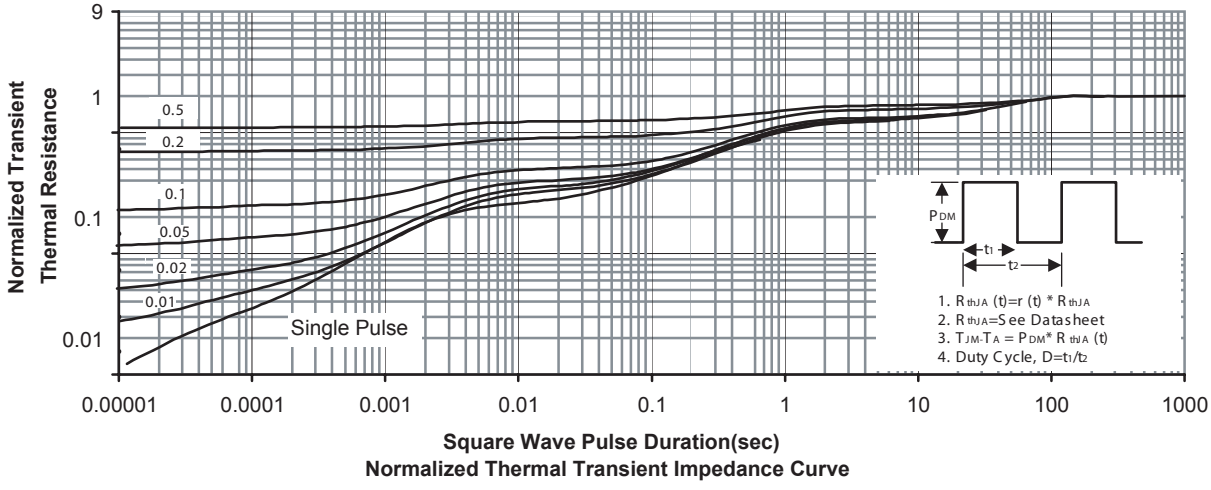



Figure 12. Switching Waveforms

## N-Channel



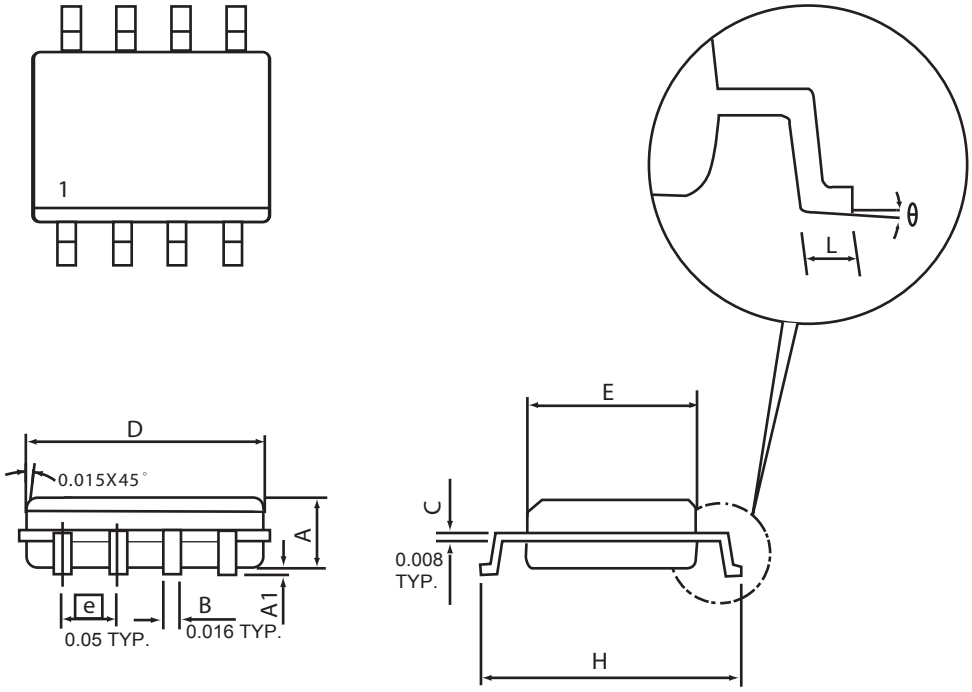

## P-Channel



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## PACKAGE OUTLINE DIMENSIONS

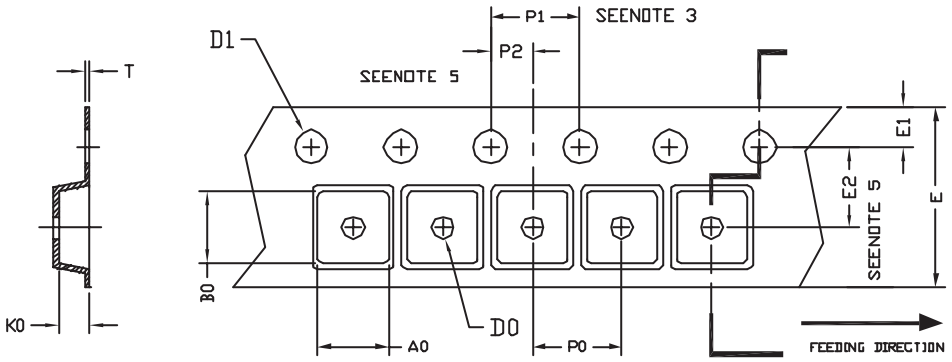
### SO-8




| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |
| D | 4.80 | 4.98 | 0.189 | 0.196 |
| E | 3.81 | 3.99 | 0.150 | 0.157 |
| H | 5.79 | 6.20 | 0.228 | 0.244 |
| L | 0.41 | 1.27 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

## SO-8 Tape and Reel Data

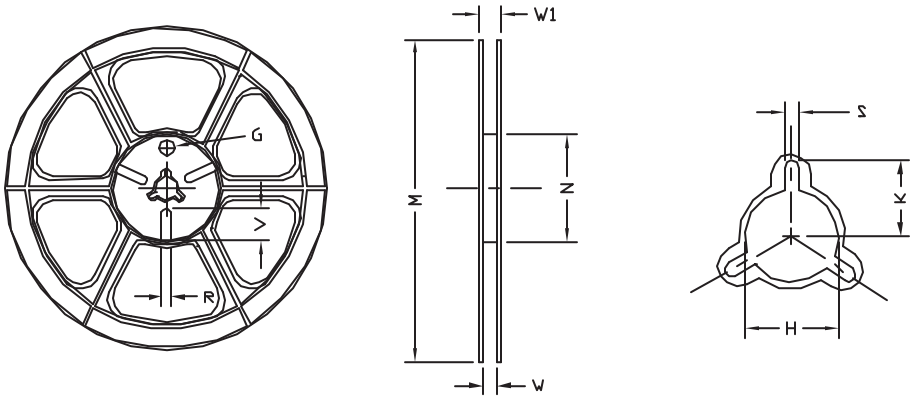
### SO-8 Carrier Tape




unit:mm

| PACKAGE | A0 | B0 | K0 | D0 | D1 | E | E1 | E2 | P0 | P1 | P2 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOP 8N 150mil | 6.40 | 5.20 | 2.10 | $\phi$1.5 (MIN) | $\phi$1.5 + 0.1 - 0.0 | 12.0 ±0.3 | 1.75 | 5.5 ±0.05 | 8.0 | 4.0 | 2.0 ±0.05 | 0.3 ±0.05 |

### SO-8 Reel




UNIT:mm

| TAPE SIZE | REEL SIZE | M | N | W | W1 | H | K | S | G | R | V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 mm | $\phi$330 | 330 ± 1 | 62 ±1.5 | 12.4 + 0.2 | 16.8 - 0.4 | $\phi$12.75 + 0.15 | --- | 2.0 ±0.15 | --- | --- | --- |