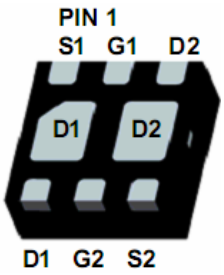
# WCM2001

## N- and P-Channel Complementary, 20V, Power MOSFET

http://www.omnivision-group.com/

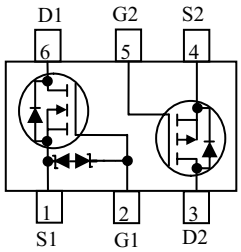
| $V_{DS}$ (V) | Max. $R_{DS(on)}$ (mΩ) |
|---|---|
| N-Channel 20 | 500@ $V_{GS}$=4.5V |
| | 835@ $V_{GS}$=2.5V |
| ESD Rating:2000V HBM | |
| P-Channel -20 | 106@ $V_{GS}$=-4.5V |
| | 155@ $V_{GS}$=-2.5V |




**DFN2x2-6L**

## Descriptions

The WCM2001 is the N-Channel and P-Channel enhancement MOS Field Effect Transistor as a single package for DC-DC converter or level shift applications, uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Standard Product WCM2001 is Pb-free and Halogen-free.




**Pin configuration (Top view)**

## Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Package DFN2x2-6L


WLSI = Company Code
3J = Device Code
WW = Week Code

**Marking**

## Applications

- Driver: Relays, Solenoids, Lamps, Hammers
- Power supply converters circuit
- Load/Power Switching for portable device

**Order information**

| Device | Package | Shipping |
|---|---|---|
| WCM2001-6/TR | DFN2x2-6L | 3000/Tape&Reel |

## Absolute Maximum ratings

| Parameter | | Symbol | N-Channel | P-Channel | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | -20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±10 | ±8 | |
| Continuous Drain Current | $T_A$=25°C | $I_D$ | 1.2 | -3.6 | A |
| | $T_A$=70°C | | 0.9 | -2.9 | A |
| Pulsed Drain Current [d] | | $I_{DM}$ | 2 | -6 | A |
| Power Dissipation [c] | $T_A$=25°C | $P_D$ | 1.1 | 2.0 | W |
| | $T_A$=70°C | | 0.7 | 1.3 | |
| Operating Junction Temperature | | $T_J$ | -55 to 150 | | °C |
| Storage Temperature Range | | $T_{STG}$ | -55 to 150 | | °C |

## Thermal resistance ratings

| Single Operation (N-Channel) | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Typical** | **Maximum** | **Unit** |
| Junction-to-Ambient Thermal Resistance [a] | t ≤ 10 s | $R_{\theta JA}$ | 74 | 113 | °C/W |
| | Steady State | | 102 | 122 | |
| Junction-to-Ambient Thermal Resistance [b] | t ≤ 10 s | $R_{\theta JA}$ | 156 | 188 | |
| | Steady State | | 223 | 268 | |
| **Single Operation (P-Channel)** | | | | | |
| **Parameter** | | **Symbol** | **Typical** | **Maximum** | **Unit** |
| Junction-to-Ambient Thermal Resistance [a] | t ≤ 10 s | $R_{\theta JA}$ | 51 | 61 | °C/W |
| | Steady State | | 77 | 92 | |
| Junction-to-Ambient Thermal Resistance [b] | t ≤ 10 s | $R_{\theta JA}$ | 138 | 165 | |
| | Steady State | | 199 | 239 | |

**Note:**

a. FR-4 board (38mm X 38mm X t1.6mm, 70um Copper) partially covered with copper (645mm$^2$ area)

b. FR-4 board (38mm X 38mm X t1.6mm, 70um Copper) minimum pad covered with copper

c. The power dissipation $P_D$ is based on Junction-to-Ambient thermal resistance $R_{\theta JA}$ t≤10s value and the $T_{J(MAX)}$=150°C.

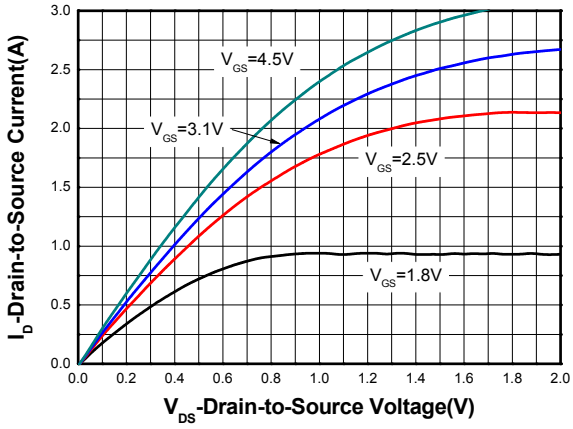
d. Repetitive rating, ~10us pulse width, duty cycle ~1%, keep initial $T_J$ =25°C, the maximum allowed junction temperature of 150°C.

e. The static characteristics are obtained using ~380us pulses, duty cycle ~1%.

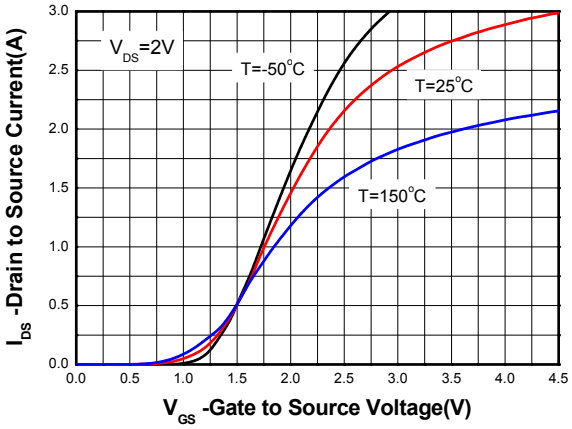
## N-Channel Electronics Characteristics (Ta=25°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-to-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250uA | 20 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ =16V, $V_{GS}$ = 0V | | | 1 | uA |
| Gate-to-source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±10V | | | ±10 | uA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 250uA | 0.45 | 0.7 | 1.0 | V |
| Drain-to-source On-resistance | $R_{DS(on)}$ | $V_{GS}$ = 4.5V, $I_D$ =800mA | | 334 | 500 | mΩ |
| | | $V_{GS}$ = 3.1V, $I_D$ =600mA | | 377 | 660 | |
| | | $V_{GS}$ = 2.5V, $I_D$ =300mA | | 417 | 835 | |
| | | $V_{GS}$ = 1.8V, $I_D$ =200mA | | 553 | 1380 | |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1.0MHz, $V_{DS}$ = 10 V | | 29 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 11 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 4 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 10 V, $I_D$ =550mA | | 0.42 | | nC |
| Gate-to-Source Charge | $Q_{GS}$ | | | 0.1 | | |
| Gate-to-Drain Charge | $Q_{GD}$ | | | 0.16 | | |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-On Delay Time | $td_{(ON)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 10 V, $I_D$=550mA, $R_G$=6Ω | | 5.9 | | ns |
| Rise Time | tr | | | 4.8 | | |
| Turn-Off Delay Time | $td_{(OFF)}$ | | | 15.5 | | |
| Fall Time | tf | | | 3.9 | | |
| **BODY DIODE CHARACTERISTICS** | | | | | | |
| Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 800mA | | 0.9 | 1.2 | V |

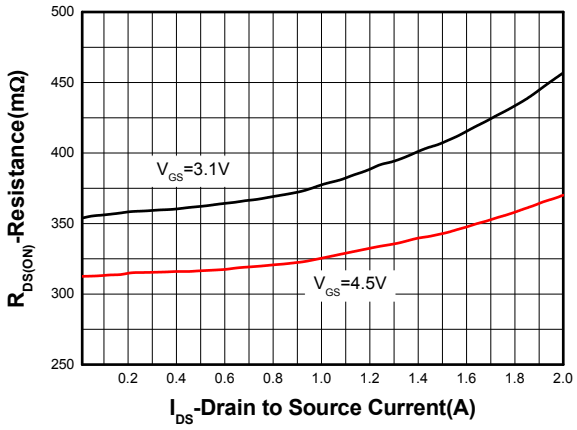
## Typical Characteristics (Ta=25°C, unless otherwise noted)



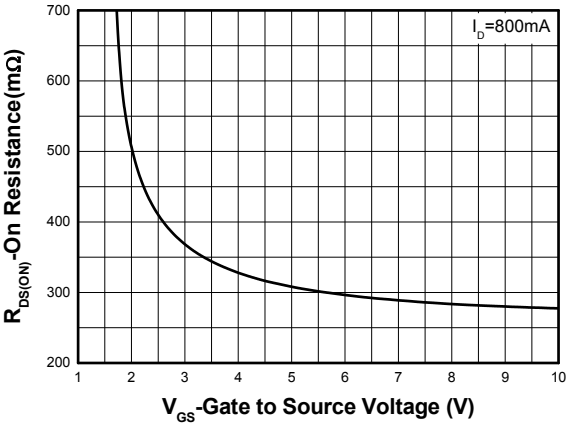

Output Characteristics [d]



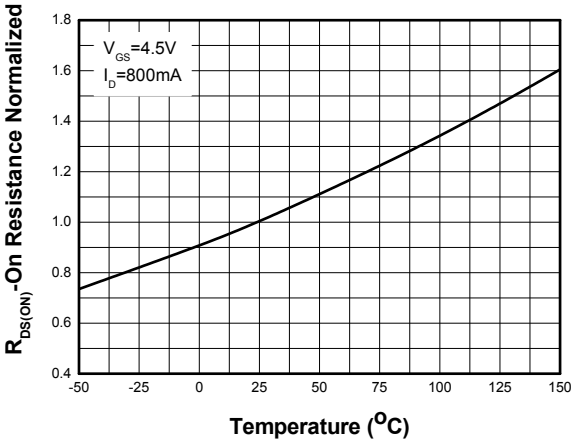

Transfer Characteristics [d]



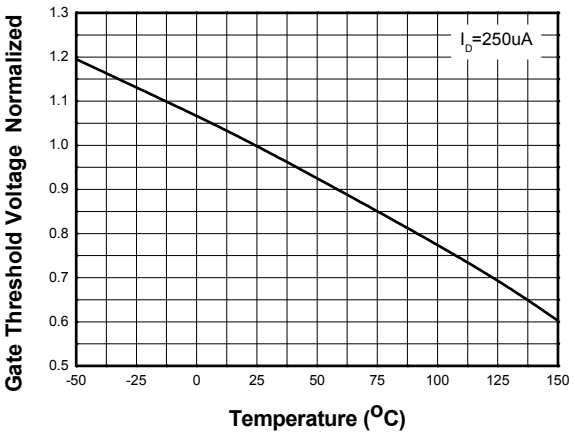

On-Resistance vs. Drain Current [d]



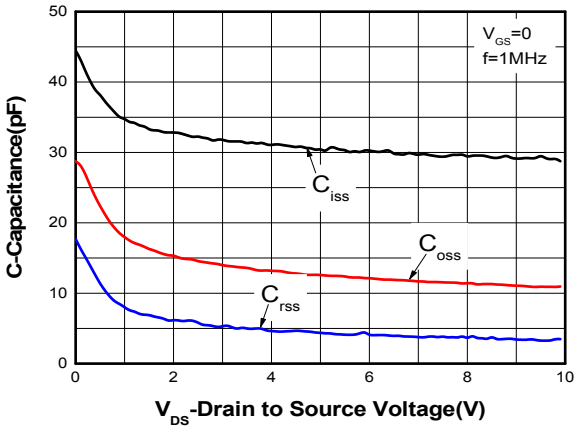

On-Resistance vs. Gate-to-Source Voltage [d]



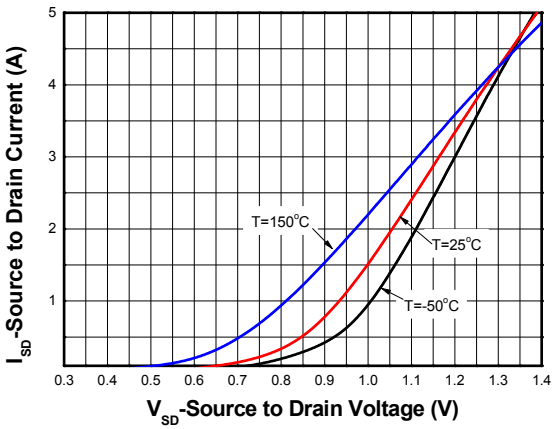

On-Resistance vs. Junction Temperature [d]



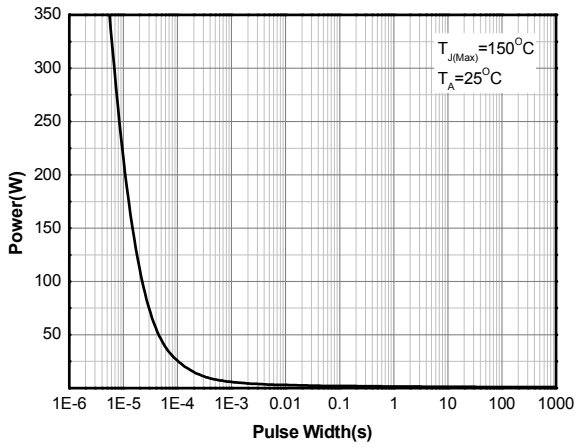

Threshold Voltage vs. Temperature



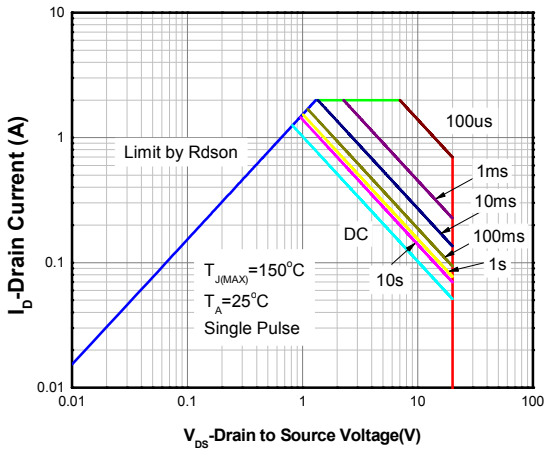

Capacitance



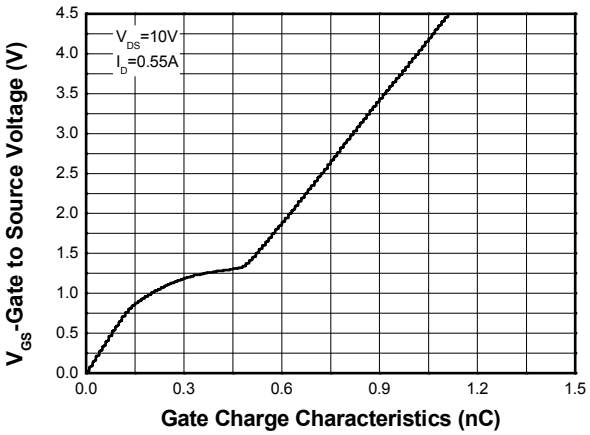

Body Diode Forward Voltage [d]



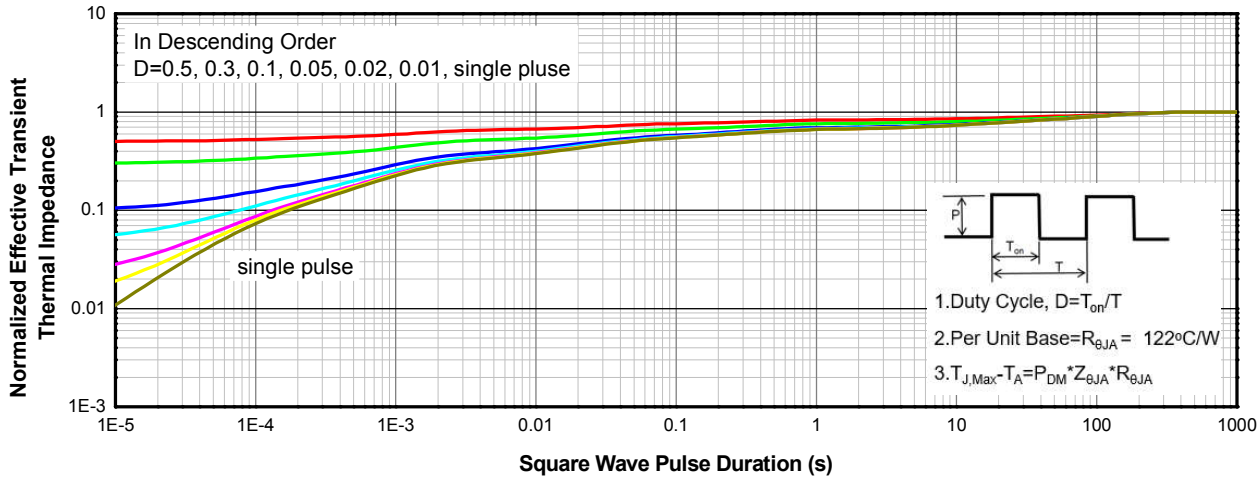

Single Pulse power




Safe Operating Power




Gate Charge Characteristics

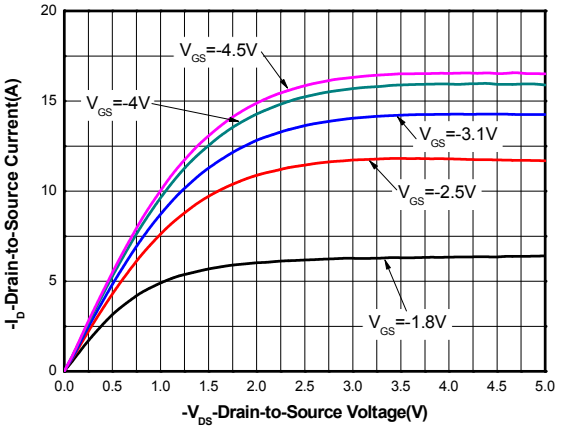



**Transient thermal response (Junction-to-Ambient)**

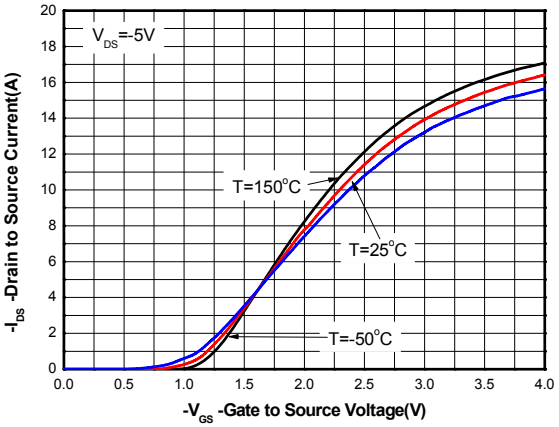
## P-Channel Electronics Characteristics (Ta=25°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-to-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = -250uA | -20 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ =-16V, $V_{GS}$ = 0V | | | -1 | uA |
| Gate-to-source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±8V | | | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = -250uA | -0.45 | -0.7 | -1 | V |
| Drain-to-source On-resistance | $R_{DS(on)}$ | $V_{GS}$ = -4.5V, $I_D$ = -2.7A | | 85 | 106 | mΩ |
| | | $V_{GS}$ = -2.5V, $I_D$ = -2.2A | | 107 | 155 | |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1.0MHz, $V_{DS}$ = -10V | | 290 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 64 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 48 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$=-4.5 V, $V_{DS}$ =-10 V, $I_D$ =-2.3 A | | 5.9 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.4 | | |
| Gate-to-Source Charge | $Q_{GS}$ | | | 0.8 | | |
| Gate-to-Drain Charge | $Q_{GD}$ | | | 1.4 | | |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-On Delay Time | td(ON) | $V_{GS}$ = -4.5 V, $V_{DS}$ =-6 V, $I_D$=-1A, $R_G$=6Ω | | 8.5 | | ns |
| Rise Time | tr | | | 11 | | |
| Turn-Off Delay Time | td(OFF) | | | 34.6 | | |
| Fall Time | tf | | | 10 | | |
| **BODY DIODE CHARACTERISTICS** | | | | | | |
| Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = -1A | | -0.85 | -1.5 | V |

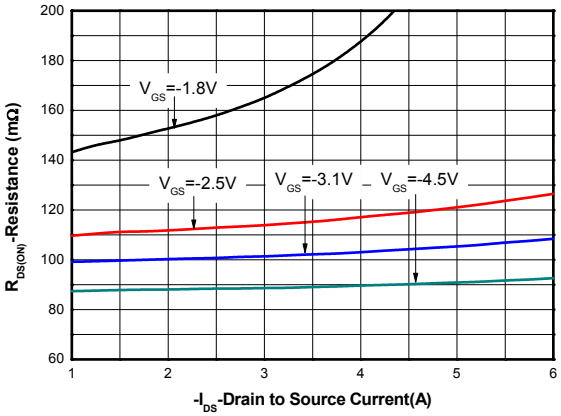
## Typical Characteristics (Ta=25°C, unless otherwise noted)



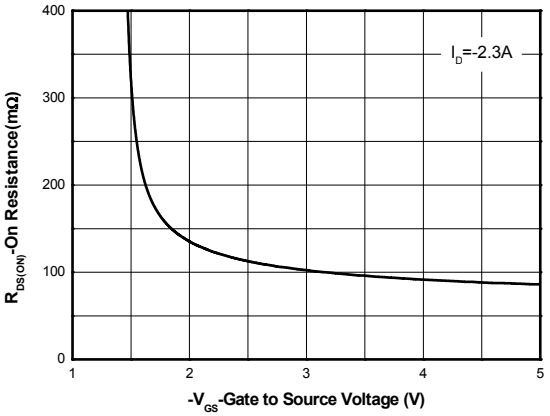

**Output Characteristics** [d]



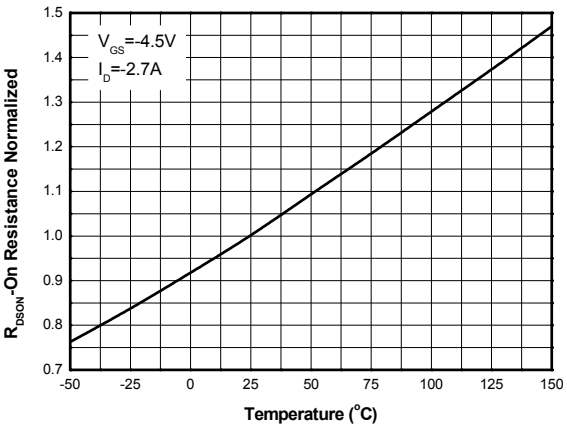

**Transfer Characteristics** [d]



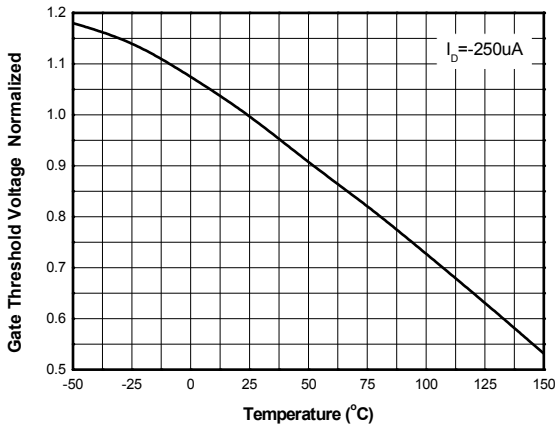

**On-Resistance vs. Drain Current** [d]



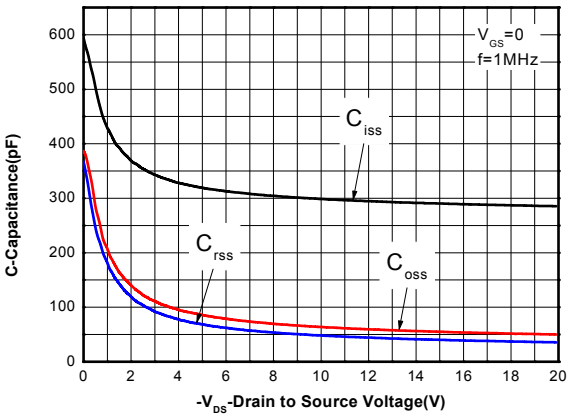

**On-Resistance vs. Gate-to-Source Voltage** [d]



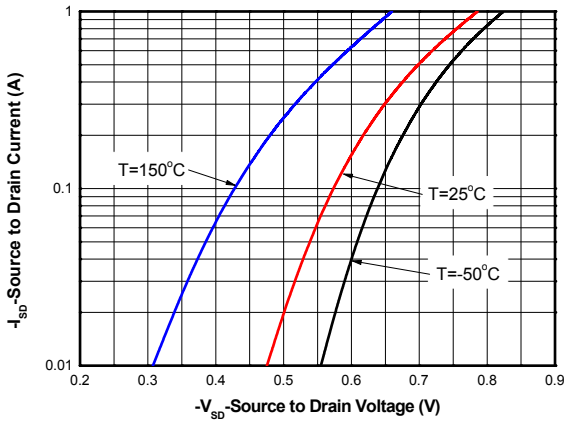

**On-Resistance vs. Junction Temperature** [d]



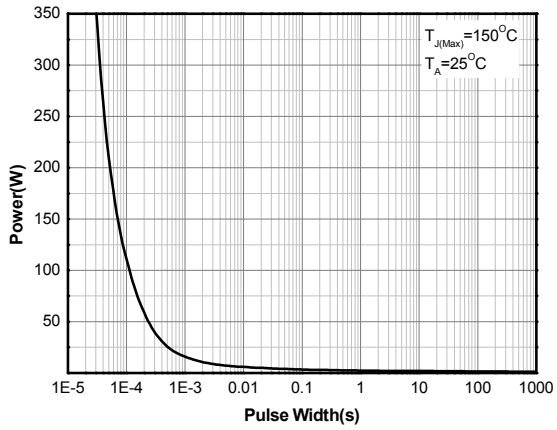

**Threshold Voltage vs. Temperature**



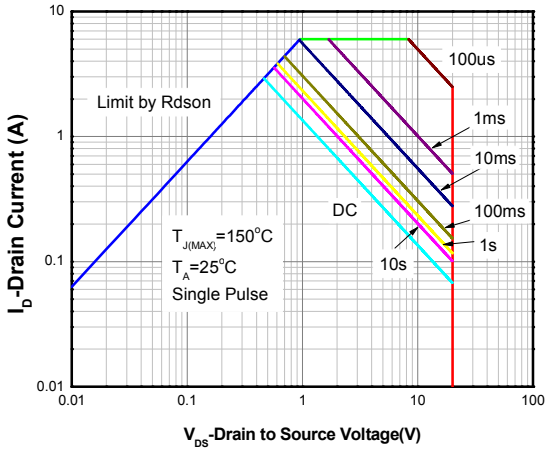

**Capacitance**



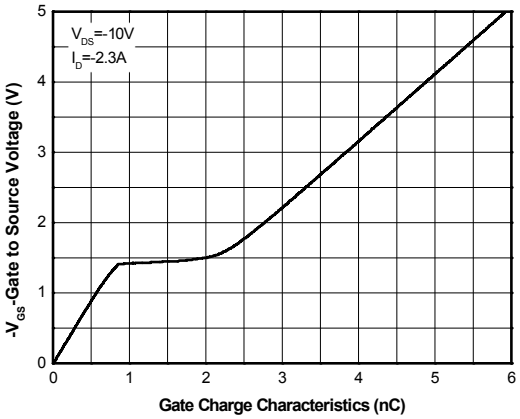

**Body Diode Forward Voltage** [d]



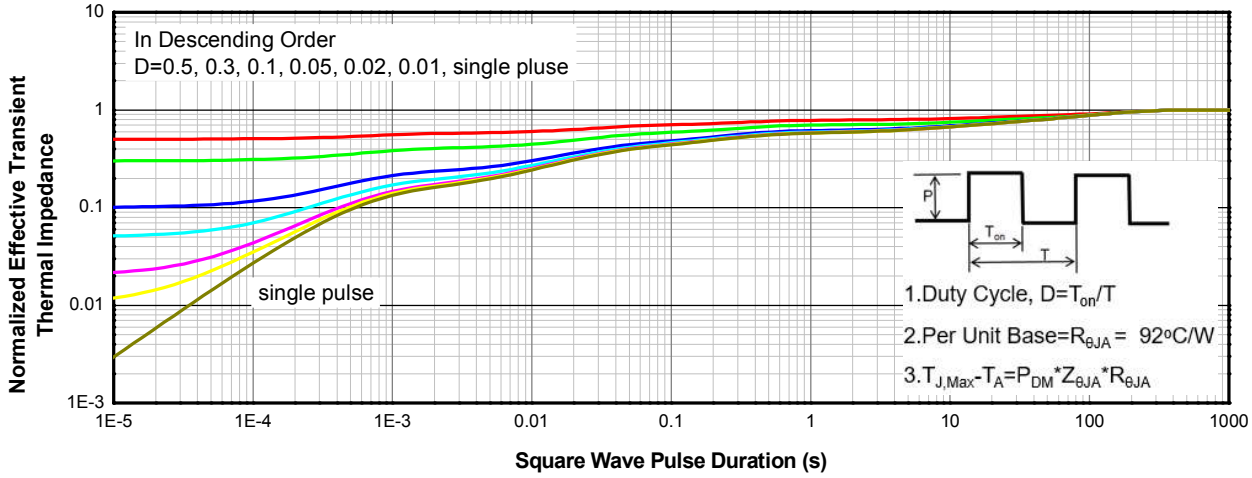

**Single Pulse power**




**Safe Operating Power**



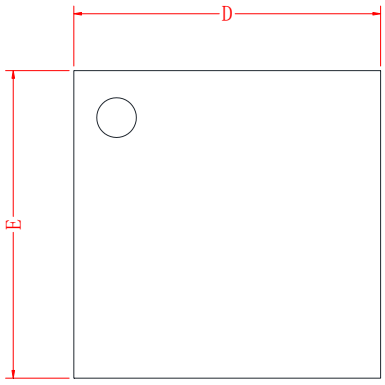

**Gate Charge Characteristics**



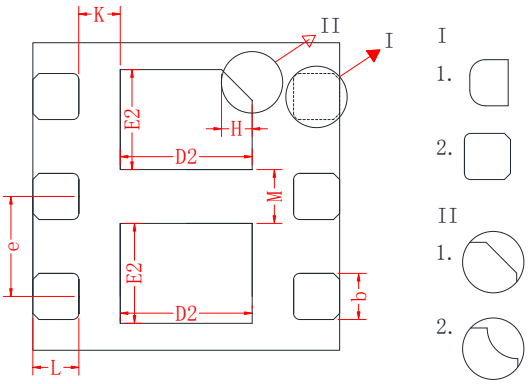

**Transient thermal response (Junction-to-Ambient)**

## PACKAGE OUTLINE DIMENSIONS

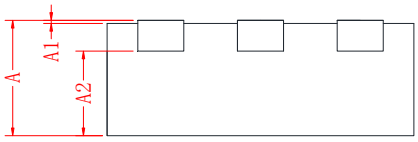
### DFN2x2-6L



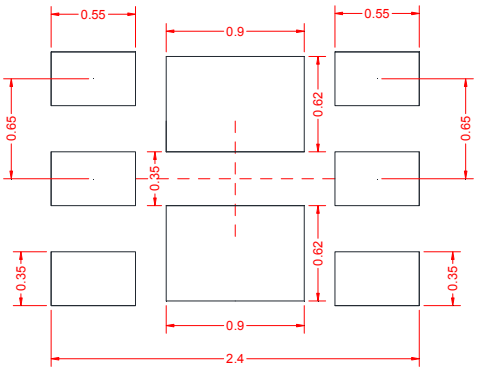

TOP VIEW




BOTTOM VIEW




SIDE VIEW

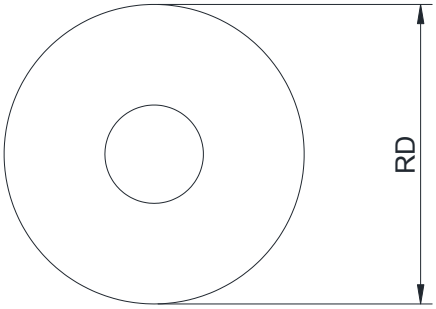



RECOMMENDED LAND PATTERN(Unit:mm)

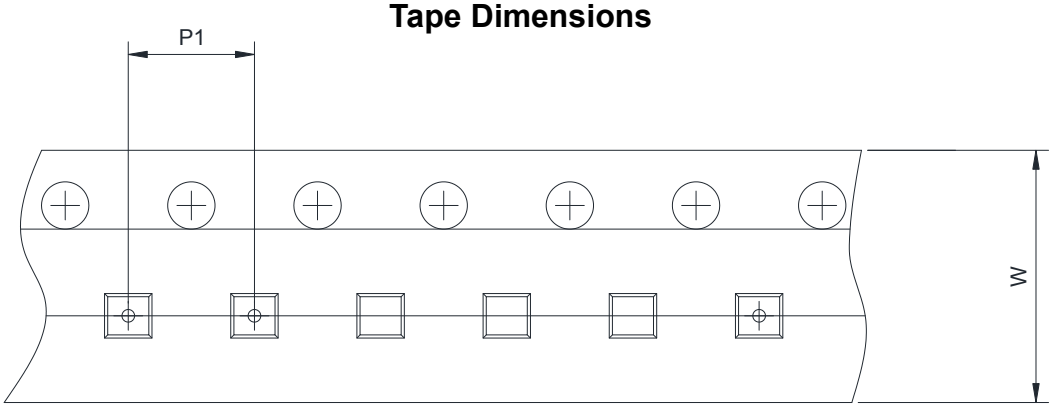
| Symbol | Dimensions in Millimeters | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | - | 0.05 |
| A2 | | 0.203 Ref | |
| D | 1.90 | 2.00 | 2.10 |
| E | 1.90 | 2.00 | 2.10 |
| D2 | 0.76 | 0.93 | 1.10 |
| E2 | 0.44 | 0.60 | 0.75 |
| b | 0.20 | 0.28 | 0.35 |
| L | 0.17 | 0.28 | 0.38 |
| K | 0.17 | 0.27 | 0.37 |
| H | | 0.2 Ref | |
| M | 0.25 | 0.35 | 0.45 |
| e | | 0.65 BSC | |

## TAPE AND REEL INFORMATION

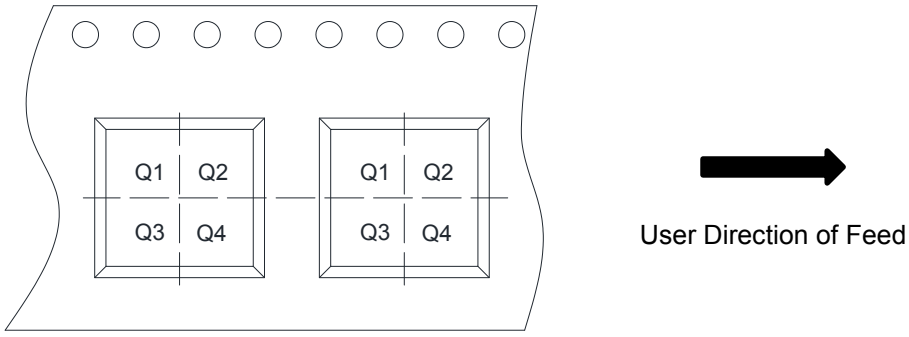
### Reel Dimensions




### Tape Dimensions




### Quadrant Assignments For PIN1 Orientation In Tape




| | | | | | |
|---|---|---|---|---|---|
| RD | Reel Dimension | ☑ 7inch | ☐ 13inch | | |
| W | Overall width of the carrier tape | ☑ 8mm | ☐ 12mm | ☐ 16mm | |
| P1 | Pitch between successive cavity centers | ☐ 2mm | ☑ 4mm | ☐ 8mm | |
| Pin1 | Pin1 Quadrant | ☑ Q1 | ☐ Q2 | ☐ Q3 | ☐ Q4 |