



## UD606

Power MOSFET

### DUAL ENHANCEMENT MODE (N-CHANNEL/P-CHANNEL)

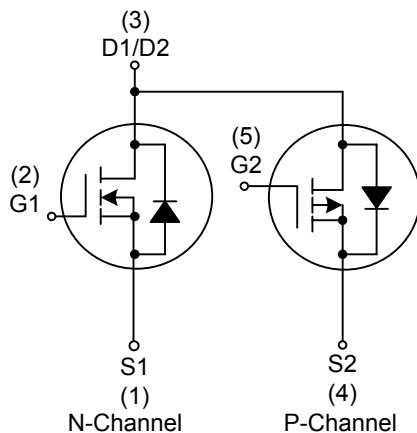
#### DESCRIPTION

The **UD606** can provide excellent  $R_{DS(ON)}$  and low gate charge by using advanced trench technology MOSFETs. The **UD606** may be used in H-bridge, inverters and other applications.

#### FEATURES

- \* N-Channel: 40V/8A  
 $R_{DS(ON)} = 33m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} = 47m\Omega @ V_{GS} = 4.5V$
- \* P-Channel: -40V/-8A  
 $R_{DS(ON)} = 50m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} = 70m\Omega @ V_{GS} = -4.5V$
- \* Super high dense cell design
- \* Reliable and rugged

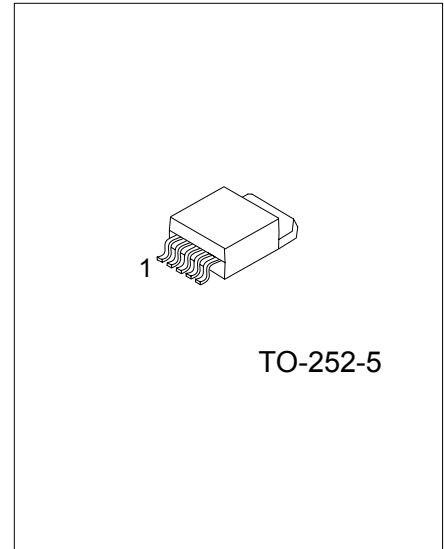
#### SYMBOL



#### ORDERING INFORMATION

| Ordering Number |                   | Package  | Pin Assignment |    |       |    |    | Packing   |
|-----------------|-------------------|----------|----------------|----|-------|----|----|-----------|
| Normal          | Lead Free Plating |          | 1              | 2  | 3     | 4  | 5  |           |
| UD606-TN5-R     | UD606L-TN5-R      | TO-252-5 | S1             | G1 | D1/D2 | S2 | G2 | Tape Reel |
| UD606-TN5-T     | UD606L-TN5-T      | TO-252-5 | S1             | G1 | D1/D2 | S2 | G2 | Tube      |

|                                                                                                                                         |  |                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------|
| <div>UD606L-TN5-R</div> <div><div></div><div></div><div></div></div> <div>(1)Packing Type<br/>(2)Package Type<br/>(3)Lead Plating</div> |  | (1) R: Tape Reel, T: Tube<br>(2) TN5: TO-252-5<br>(3) L: Lead Free Plating, Blank: Pb/Sn |
|-----------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------|



TO-252-5

\*Pb-free plating product number: UD606L

# ■ **ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

## **N-Channel:**

| PARAMETER                        | SYMBOL    | RATINGS    | UNIT             |
|----------------------------------|-----------|------------|------------------|
| Drain-Source Voltage             | $V_{DS}$  | 40         | V                |
| Gate-Source Voltage              | $V_{GS}$  | $\pm 20$   | V                |
| Continuous Drain Current (Note3) | $I_D$     | 8          | A                |
| Pulsed Drain Current (Note3)     | $I_{DM}$  | 30         | A                |
| Power Dissipation                | $P_D$     | 2          | W                |
| Junction Temperature             | $T_J$     | +175       | $^\circ\text{C}$ |
| Storage Temperature              | $T_{STG}$ | -55 ~ +175 | $^\circ\text{C}$ |

## **P-Channel:**

| PARAMETER                        | SYMBOL    | RATINGS    | UNIT             |
|----------------------------------|-----------|------------|------------------|
| Drain-Source Voltage             | $V_{DS}$  | -40        | V                |
| Gate-Source Voltage              | $V_{GS}$  | $\pm 20$   | V                |
| Continuous Drain Current (Note3) | $I_D$     | -8         | A                |
| Pulsed Drain Current (Note3)     | $I_{DM}$  | -30        | A                |
| Power Dissipation                | $P_D$     | 2.5        | W                |
| Junction Temperature             | $T_J$     | +175       | $^\circ\text{C}$ |
| Storage Temperature              | $T_{STG}$ | -55 ~ +175 | $^\circ\text{C}$ |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

# ■ **THERMAL DATA**

| PARAMETER           | SYMBOL    | MIN           | TYP | MAX | UNIT               |
|---------------------|-----------|---------------|-----|-----|--------------------|
| Junction to Ambient | N-Channel | $\theta_{JA}$ | 50  | 60  | $^\circ\text{C/W}$ |
|                     | P-Channel |               | 40  | 50  | $^\circ\text{C/W}$ |

# ■ **ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

## **N-CHANNEL**

| PARAMETER                                       | SYMBOL              | TEST CONDITIONS                                                                      | MIN | TYP  | MAX  | UNIT |
|-------------------------------------------------|---------------------|--------------------------------------------------------------------------------------|-----|------|------|------|
| OFF CHARACTERISTICS                             |                     |                                                                                      |     |      |      |      |
| Drain-Source Breakdown Voltage                  | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                           | 40  |      |      | V    |
| Drain-Source Leakage Current                    | I <sub>DSS</sub>    | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V                                            |     |      | 1    | uA   |
| Gate-Source Leakage Current                     | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                           |     |      | ±100 | nA   |
| ON CHARACTERISTICS                              |                     |                                                                                      |     |      |      |      |
| Gate Threshold Voltage                          | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                             | 1   | 2.3  | 3    | V    |
| Drain-Source On-State Resistance (Note2)        | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =8A                                             |     | 27   | 33   | mΩ   |
|                                                 |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A                                            |     | 37   | 47   | mΩ   |
| DYNAMIC CHARACTERISTICS                         |                     |                                                                                      |     |      |      |      |
| Input Capacitance                               | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1MHz                                    |     | 404  |      | pF   |
| Output Capacitance                              | C <sub>OSS</sub>    |                                                                                      |     | 95   |      | pF   |
| Reverse Transfer Capacitance                    | C <sub>RSS</sub>    |                                                                                      |     | 37   |      | pF   |
| SWITCHING CHARACTERISTICS                       |                     |                                                                                      |     |      |      |      |
| Turn-ON Delay Time (Note2)                      | t <sub>D(ON)</sub>  | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω, R <sub>L</sub> =2.5Ω |     | 3.5  |      | ns   |
| Turn-ON Rise Time                               | t <sub>R</sub>      |                                                                                      |     | 6    |      | ns   |
| Turn-OFF Delay Time                             | t <sub>D(OFF)</sub> |                                                                                      |     | 13.2 |      | ns   |
| Turn-OFF Fall Time                              | t <sub>F</sub>      | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =8A                       |     | 3.5  |      | ns   |
| Total Gate Charge (Note2)                       | Q <sub>G</sub>      |                                                                                      |     | 9.2  |      | nC   |
| Gate-Source Charge                              | Q <sub>GS</sub>     |                                                                                      |     | 1.6  |      | nC   |
| Gate-Drain Charge                               | Q <sub>GD</sub>     |                                                                                      |     | 2.6  |      | nC   |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |                     |                                                                                      |     |      |      |      |
| Drain-Source Diode Forward Voltage(Note2)       | V <sub>SD</sub>     | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                              |     | 0.76 | 1    | V    |
| Diode Continuous Forward Current                | I <sub>S</sub>      |                                                                                      |     |      | 8    | A    |
| Reverse Recovery Time                           | t <sub>RR</sub>     | I <sub>F</sub> =8A, dI/dt=100A/μs                                                    |     | 22.9 |      | ns   |
| Reverse Recovery Charge                         | Q <sub>RR</sub>     |                                                                                      |     | 18.3 |      | nC   |

# ■ ELECTRICAL CHARACTERISTICS(Cont.)

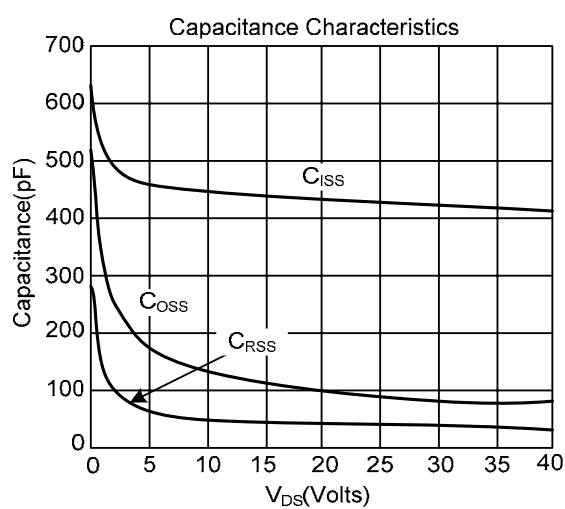
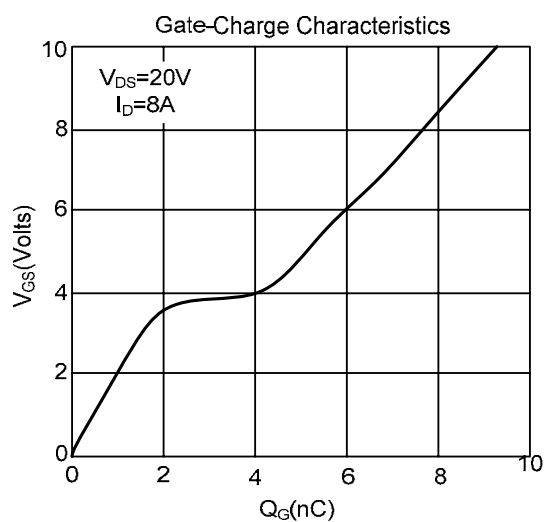
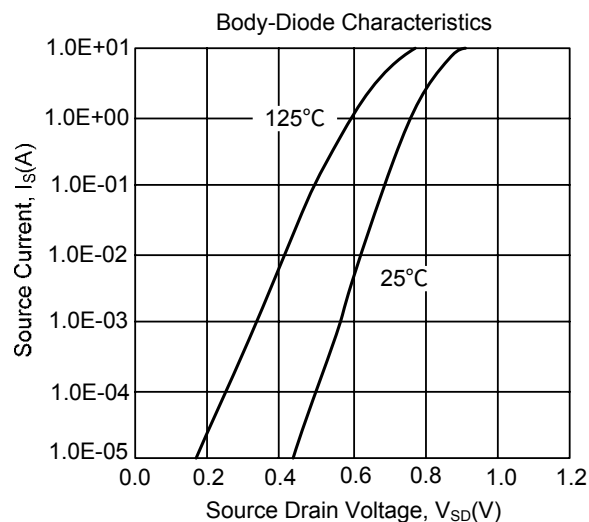
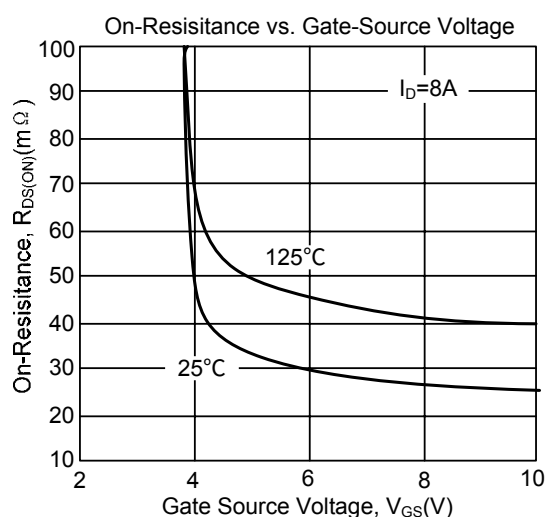
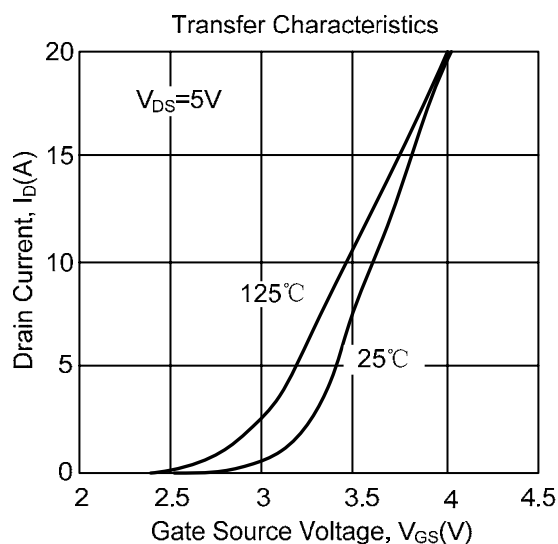
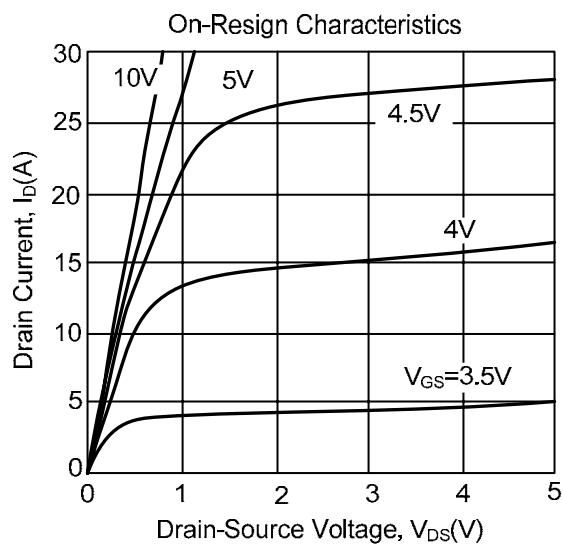
## P-CHANNEL

| PARAMETER                                       | SYMBOL              | TEST CONDITIONS                                                                        | MIN | TYP   | MAX  | UNIT |
|-------------------------------------------------|---------------------|----------------------------------------------------------------------------------------|-----|-------|------|------|
| OFF CHARACTERISTICS                             |                     |                                                                                        |     |       |      |      |
| Drain-Source Breakdown Voltage                  | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                            | -40 |       |      | V    |
| Drain-Source Leakage Current                    | I <sub>DSS</sub>    | V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V                                             |     |       | -1   | uA   |
| Gate-Source Leakage Current                     | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                             |     |       | ±100 | nA   |
| ON CHARACTERISTICS                              |                     |                                                                                        |     |       |      |      |
| Gate Threshold Voltage                          | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA                              | -1  | -1.8  | -3   | V    |
| Drain-Source On-State Resistance (Note2)        | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-8A                                             |     | 35    | 50   | mΩ   |
|                                                 |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                                            |     | 55    | 70   | mΩ   |
| DYNAMIC CHARACTERISTICS                         |                     |                                                                                        |     |       |      |      |
| Input Capacitance                               | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1.0MHz                                   |     | 657   |      | pF   |
| Output Capacitance                              | C <sub>OSS</sub>    |                                                                                        |     | 143   |      | pF   |
| Reverse Transfer Capacitance                    | C <sub>RSS</sub>    |                                                                                        |     | 63    |      | pF   |
| SWITCHING CHARACTERISTICS                       |                     |                                                                                        |     |       |      |      |
| Turn-ON Delay Time (Note2)                      | t <sub>D(ON)</sub>  | V <sub>DS</sub> =-20V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω, R <sub>L</sub> =2.5Ω |     | 8     |      | ns   |
| Turn-ON Rise Time                               | t <sub>R</sub>      |                                                                                        |     | 12.2  |      | ns   |
| Turn-OFF Delay Time                             | t <sub>D(OFF)</sub> |                                                                                        |     | 24    |      | ns   |
| Turn-OFF Fall Time                              | t <sub>F</sub>      |                                                                                        |     | 12.5  |      | ns   |
| Total Gate Charge (Note2)                       | Q <sub>G</sub>      | V <sub>DS</sub> =-20V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-8A                      |     | 14.1  |      | nC   |
| Gate-Source Charge                              | Q <sub>GS</sub>     |                                                                                        |     | 2.2   |      | nC   |
| Gate-Drain Charge                               | Q <sub>GD</sub>     |                                                                                        |     | 4.1   |      | nC   |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |                     |                                                                                        |     |       |      |      |
| Drain-Source Diode Forward Voltage(Note2)       | V <sub>SD</sub>     | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                               |     | -0.75 | -1   | V    |
| Diode Continuous Forward Current                | I <sub>S</sub>      |                                                                                        |     |       | -8   | A    |
| Reverse Recovery Time                           | t <sub>RR</sub>     | I <sub>F</sub> =-8A, dI/dt=100A/μs                                                     |     | 23.2  |      | ns   |
| Reverse Recovery Charge                         | Q <sub>RR</sub>     |                                                                                        |     | 18.2  |      | nC   |

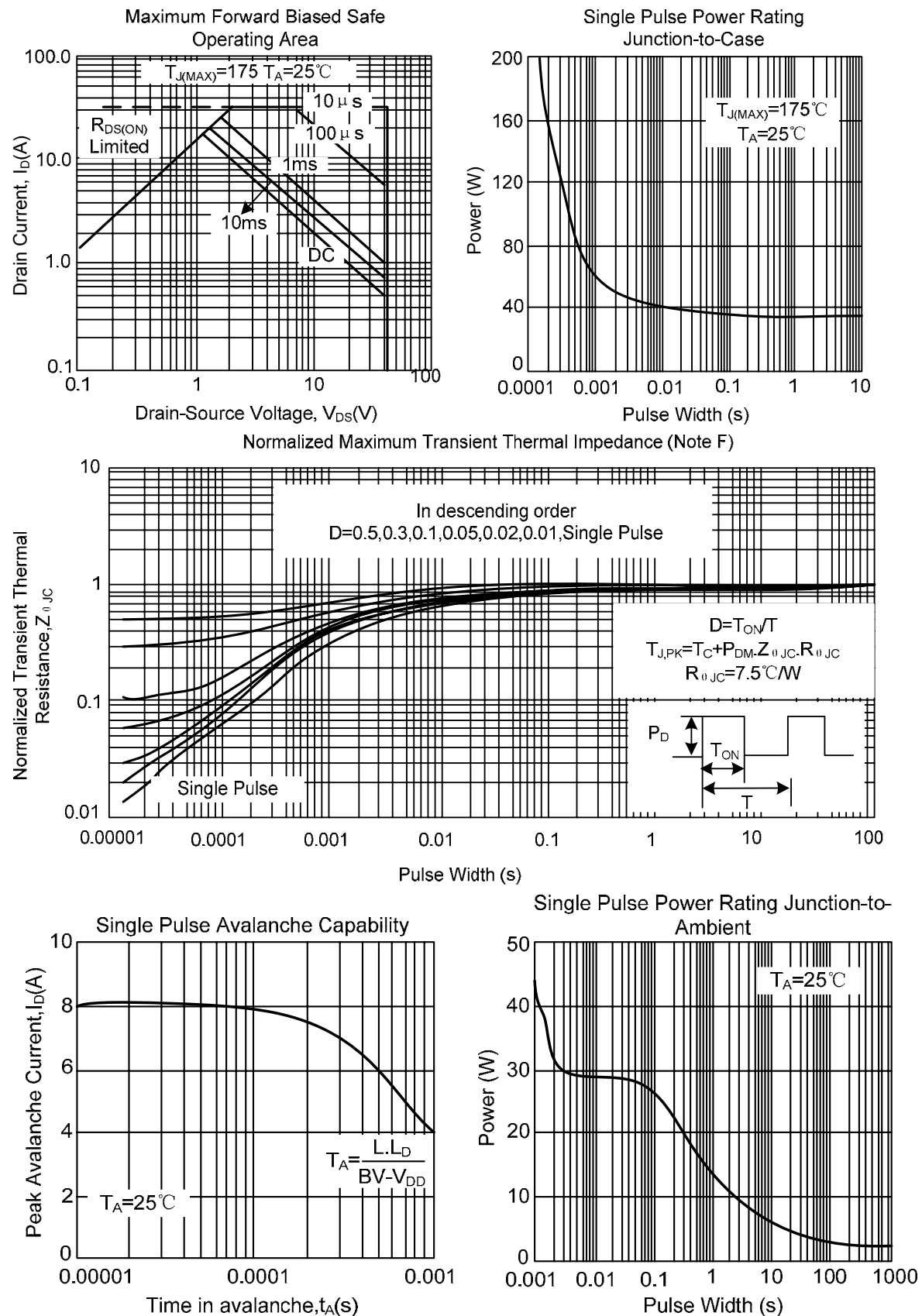
Notes: 1. Pulse width limited by  $T_{J(MAX)}$   
 2. Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 0.5\%$ .  
 3. Surface Mounted on  $1in^2$  pad area,  $t \leq 10sec$ .

## ■ TYPICAL CHARACTERISTICS

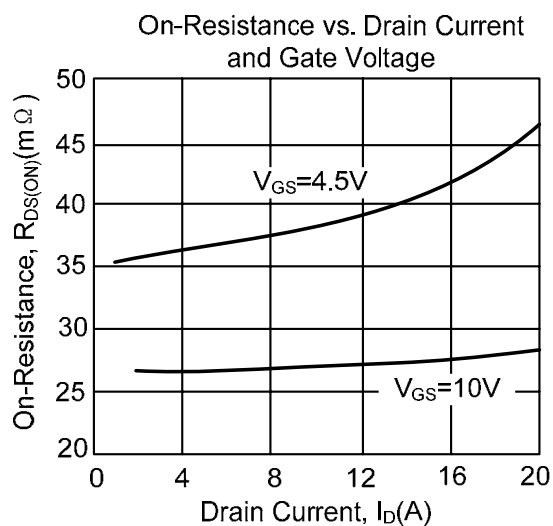
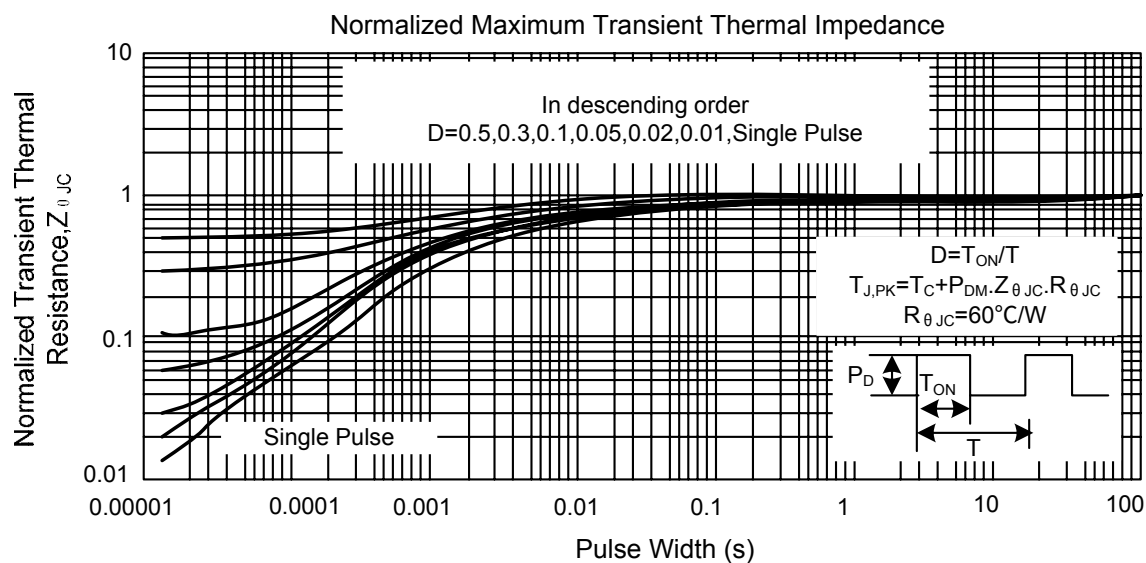
### N-CHANNEL



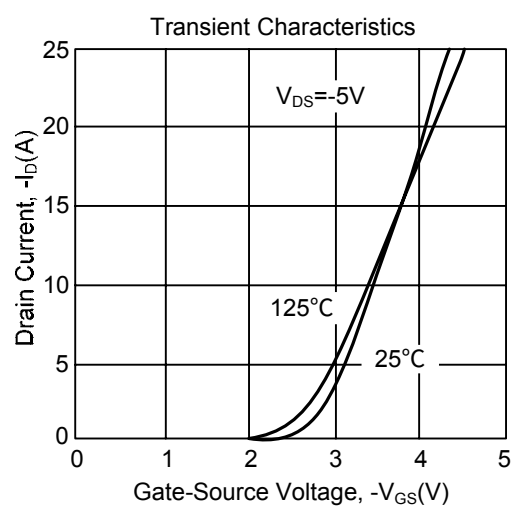
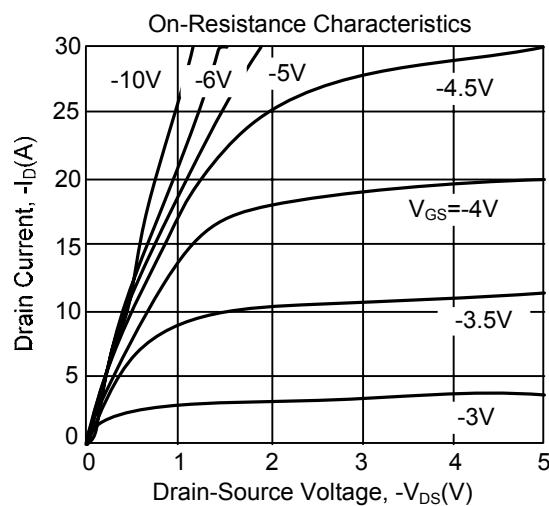
# ■ TYPICAL CHARACTERISTICS(Cont.)



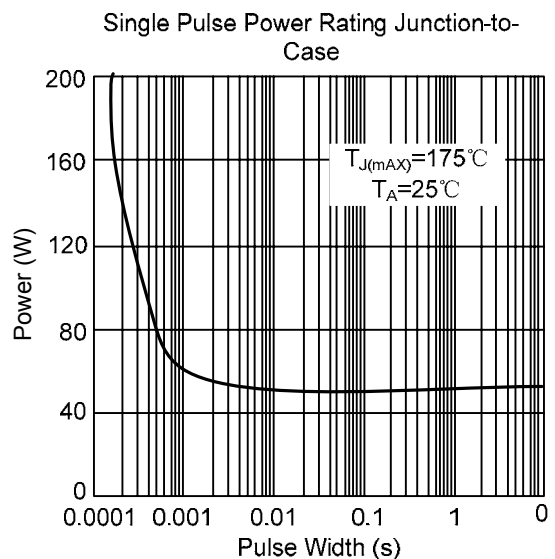
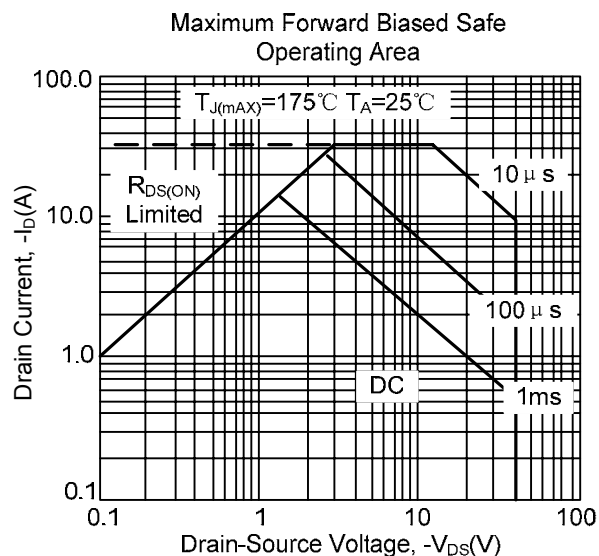
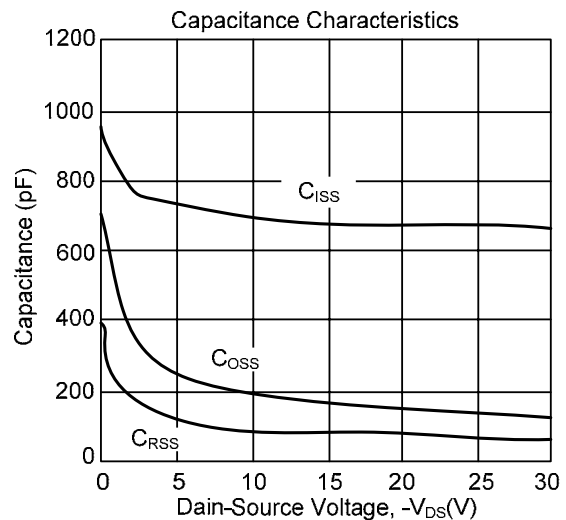
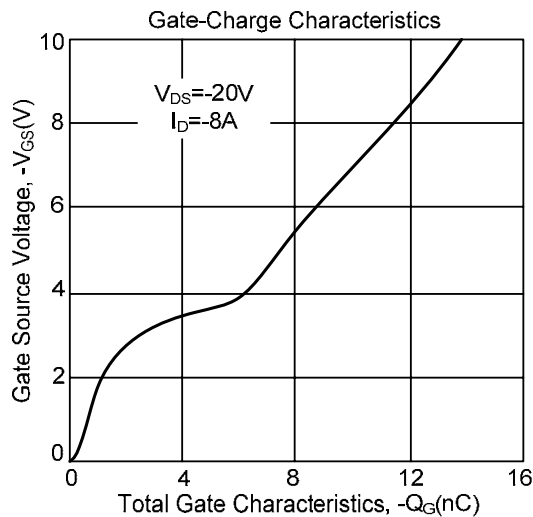
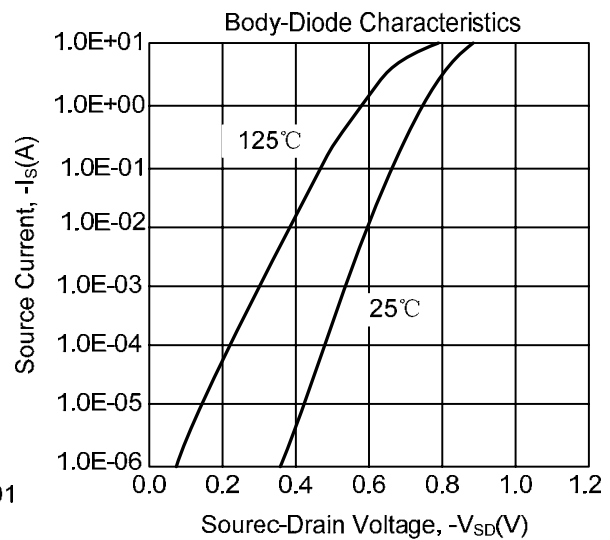
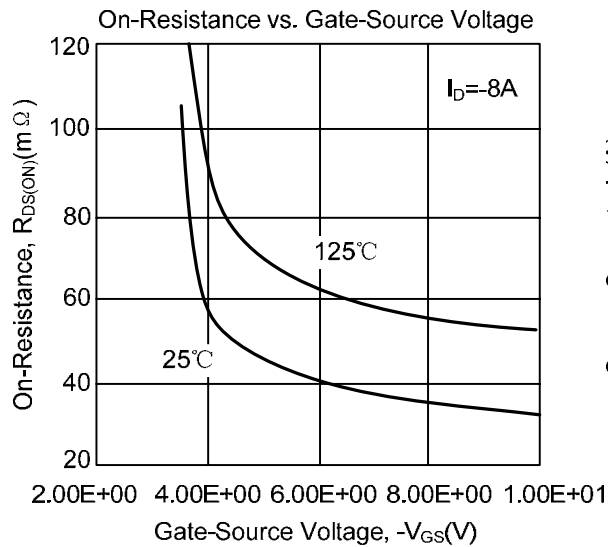
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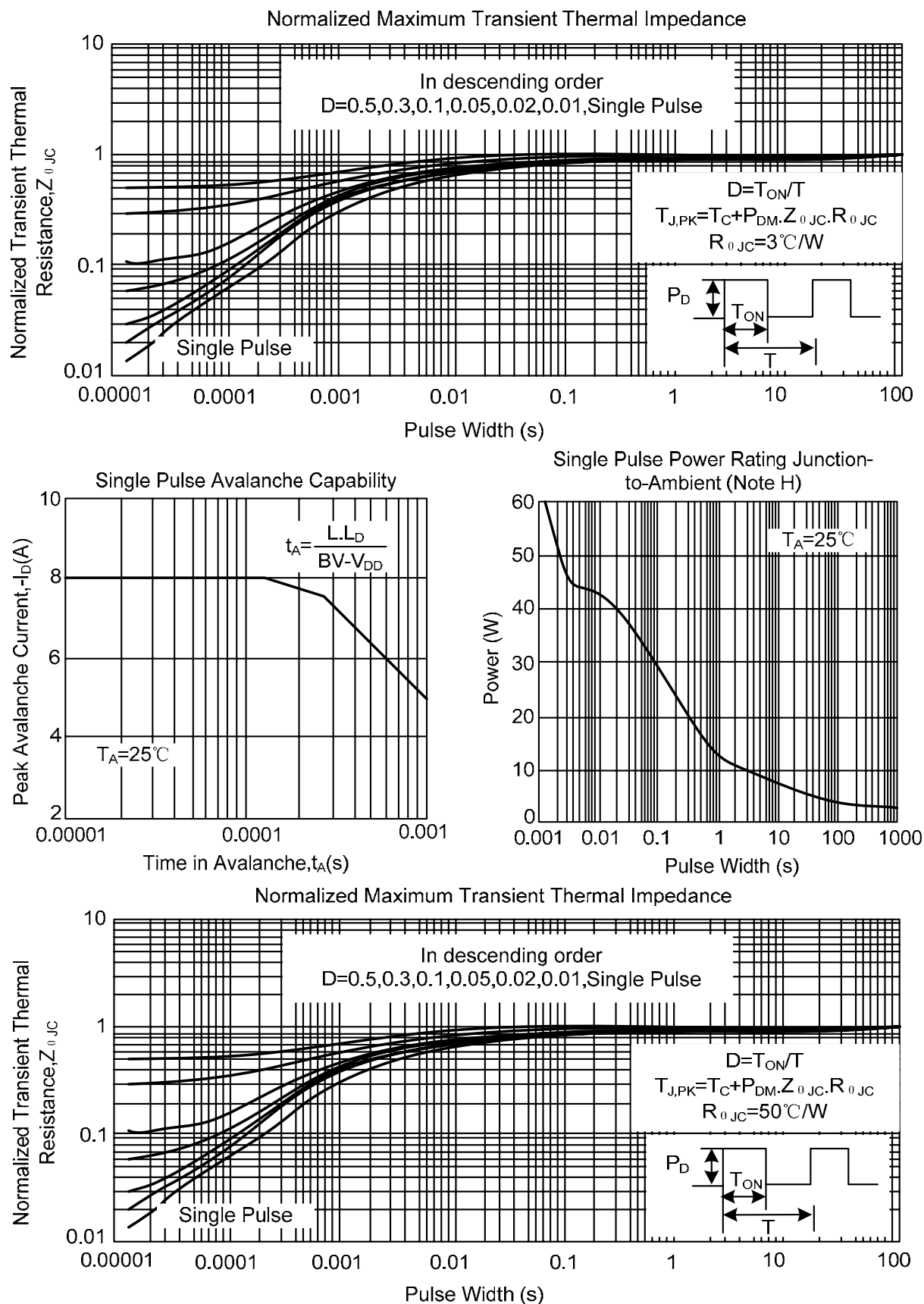
## P-CHANNEL:



# TYPICAL CHARACTERISTICS(Cont.)

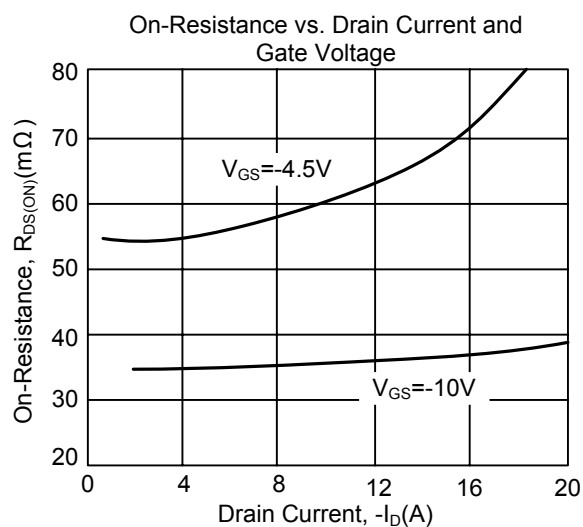


# TYPICAL CHARACTERISTICS(Cont.)





# ■ TYPICAL CHARACTERISTICS(Cont.)



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