TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type (U-MOSⅤ)

# TPCC8103

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to a small and thin package
- Low drain-source ON-resistance:
  $R_{DS\ (ON)}$ = 9.4 mΩ (typ.) ($V_{GS}$ = −10 V)
- Low leakage current: $I_{DSS}$ = -10 μA (max) ($V_{DS}$ = -30 V)
- Enhancement mode: $V_{th}$ = -0.8 to -2.0 V ($V_{DS}$ = -10 V, $I_D$ = -1.0 mA)

## Absolute Maximum Ratings (Ta = 25°C)

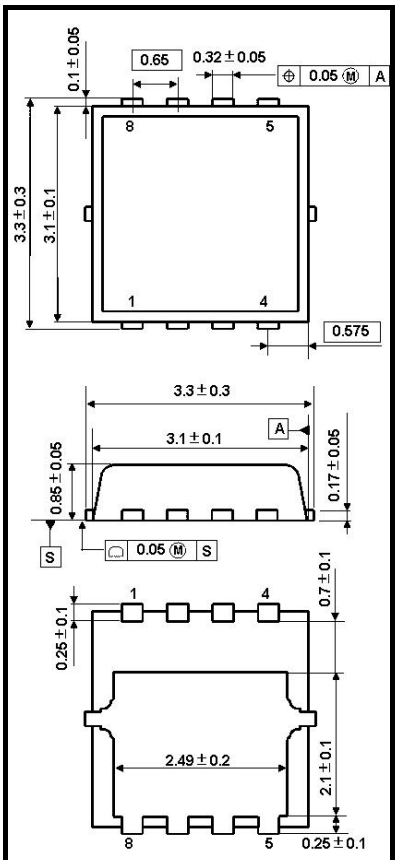
| Characteristic | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DSS}$ | −30 | V |
| Drain-gate voltage ($R_{GS}$ = 20 kΩ) | | $V_{DGR}$ | −30 | V |
| Gate-source voltage | | $V_{GSS}$ | ±20 | V |
| Drain current | DC (Note 1) | $I_D$ | −18 | A |
| | Pulsed (Note 1) | $I_{DP}$ | −54 | |
| Drain power dissipation (Tc = 25°C) | | $P_D$ | 27 | W |
| Drain power dissipation (t = 10 s) (Note 2a) | | $P_D$ | 1.9 | W |
| Drain power dissipation (t = 10 s) (Note 2b) | | $P_D$ | 0.7 | W |
| Single-pulse avalanche energy (Note 3) | | $E_{AS}$ | 84 | mJ |
| Avalanche current | | $I_{AR}$ | −18 | A |
| Repetitive avalanche energy (Tc = 25°C) (Note 4) | | $E_{AR}$ | 1.59 | mJ |
| Channel temperature | | $T_{ch}$ | 150 | °C |
| Storage temperature range | | $T_{stg}$ | −55 to 150 | °C |

Note: For Notes 1 to 4, refer to the next page.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm

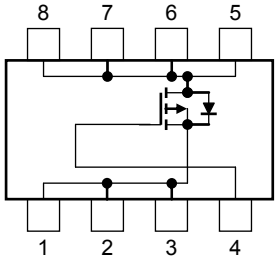



1,2,3:SOURCE 4:GATE
5,6,7,8:DRAIN

| | |
|---|---|
| JEDEC | ― |
| JEITA | ― |
| TOSHIBA | 2-3X1A |

Weight: 0.02 g (typ.)

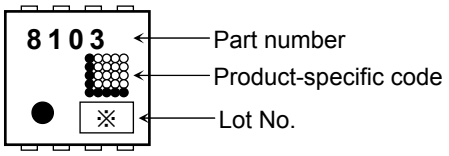
## Circuit Configuration



## Thermal Characteristics

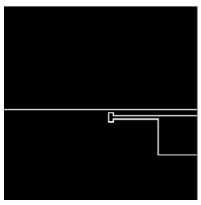
| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal resistance, channel to case (Tc = 25°C) | $R_{th\ (ch\text{-}c)}$ | 4.7 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2a) | $R_{th\ (ch\text{-}a)}$ | 66 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2b) | $R_{th\ (ch\text{-}a)}$ | 180 | °C/W |

## Marking (Note 5)



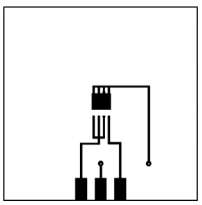

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



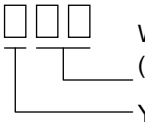
FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(b)

Note 3: $V_{DD}$ = −24 V, $T_{ch}$ = 25°C (initial), L = 200 μH, $R_G$ = 25 Ω, $I_{AR}$ = −18 A

Note 4: Repetitive rating: pulse width limited by maximum channel temperature

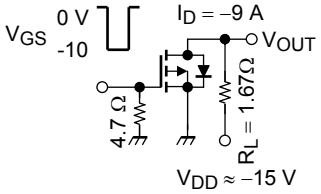
Note 5: * Weekly code: (Three digits)



Week of manufacture
(01 for the first week of the year, continuing up to 52 or 53)

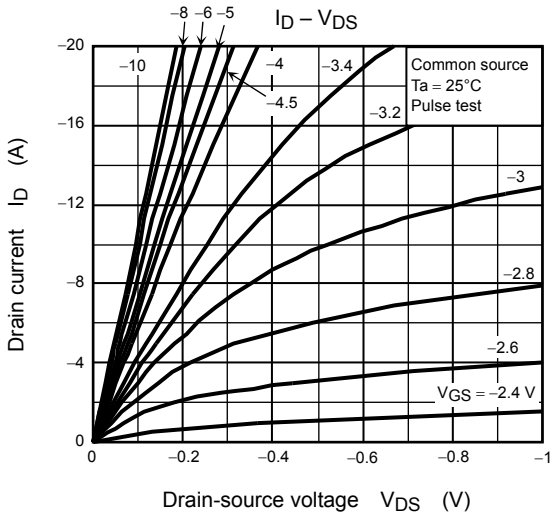
Year of manufacture
(The last digit of the year)

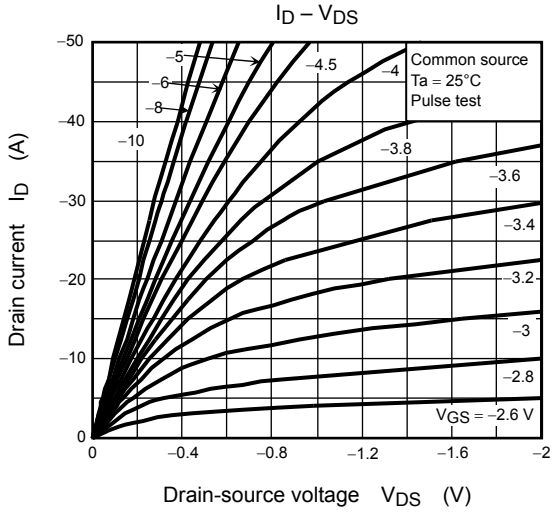
## Electrical Characteristics (Ta = 25°C)

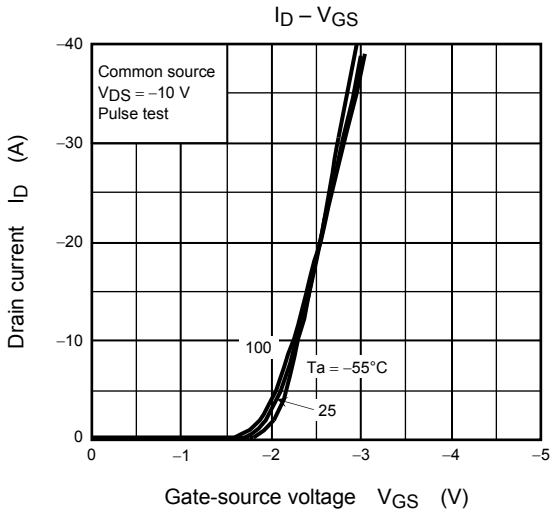
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Gate leakage current | | $I_{GSS}$ | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | — | — | ±100 | nA |
| Drain cutoff current | | $I_{DSS}$ | $V_{DS}$ = −30 V, $V_{GS}$ = 0 V | — | — | −10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)\ DSS}$ | $I_D$ = −10 mA, $V_{GS}$ = 0 V | −30 | — | — | V |
| | | $V_{(BR)\ DSX}$ | $I_D$ = −10 mA, $V_{GS}$ = 20 V | −13 | — | — | |
| Gate threshold voltage | | $V_{th}$ | $V_{DS}$ = −10 V, $I_D$ = −1.0 mA | −0.8 | — | −2.0 | V |
| Drain-source ON-resistance | | $R_{DS\ (ON)}$ | $V_{GS}$ = −4 V, $I_D$ = −9 A | — | 17 | 25 | mΩ |
| | | | $V_{GS}$ = −10 V, $I_D$ = −9 A | — | 9.4 | 12 | |
| Forward transfer admittance | | $\|Y_{fs}\|$ | $V_{DS}$ = −10 V, $I_D$ = −9 A | 15 | 30 | — | S |
| Input capacitance | | $C_{iss}$ | $V_{DS}$ = −10 V, $V_{GS}$ = 0 V, f = 1 MHz | — | 1600 | — | pF |
| Reverse transfer capacitance | | $C_{rss}$ | | — | 340 | — | |
| Output capacitance | | $C_{oss}$ | | — | 490 | — | |
| Switching time | Rise time | $t_r$ |   | — | 9.3 | — | ns |
| | Turn-on time | $t_{on}$ | | — | 16 | — | |
| | Fall time | $t_f$ | | — | 68 | — | |
| | Turn-off time | $t_{off}$ | Duty ≤ 1%, $t_w$ = 10 μs | — | 175 | — | |
| Total gate charge (gate-source plus gate-drain) | | $Q_g$ | $V_{DD}$ ≈ −24 V, $V_{GS}$ = −10 V, $I_D$ = −18 A | — | 38 | — | nC |
| Gate-source charge 1 | | $Q_{gs1}$ | | — | 4.5 | — | |
| Gate-drain (“Miller”) charge | | $Q_{gd}$ | | — | 11 | — | |

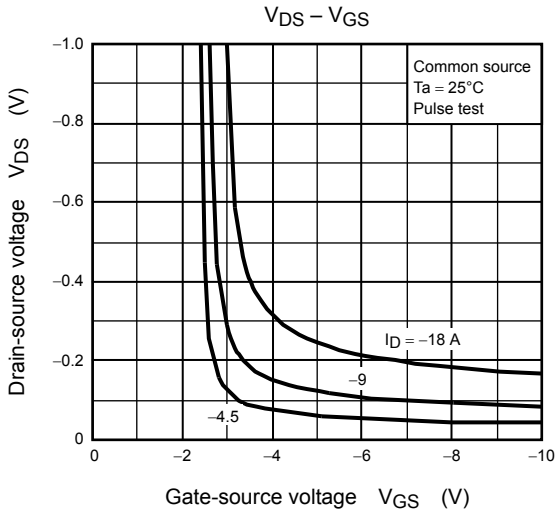
## Source-Drain Ratings and Characteristics (Ta = 25°C)

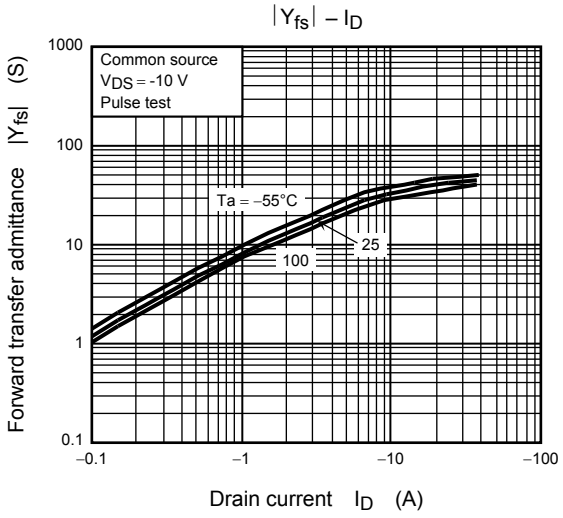
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Drain reverse current | Pulse (Note 1) | $I_{DRP}$ | — | — | — | −54 | A |
| Forward voltage (diode) | | $V_{DSF}$ | $I_{DR}$ = −18 A, $V_{GS}$ = 0 V | — | — | 1.2 | V |

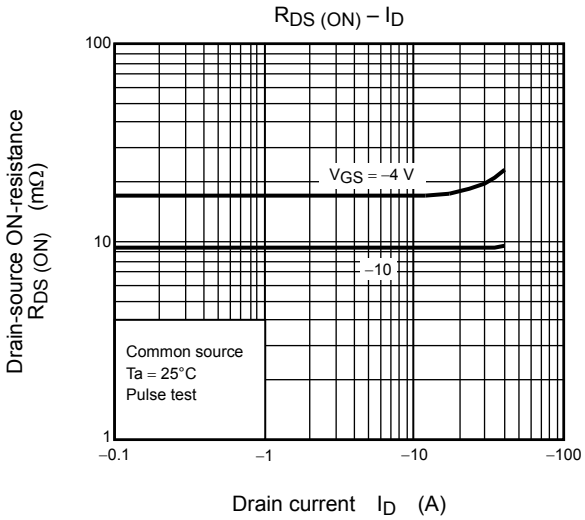

$I_D - V_{DS}$
Common source
Ta = 25°C
Pulse test
−8 −6 −5
−10
−4
−4.5
−3.4
−3.2
−3
−2.8
−2.6
$V_{GS}$ = −2.4 V
Drain current $I_D$ (A)
Drain-source voltage $V_{DS}$ (V)


$I_D - V_{DS}$
Common source
Ta = 25°C
Pulse test
−5
−6
−8
−10
−4.5
−4
−3.8
−3.6
−3.4
−3.2
−3
−2.8
$V_{GS}$ = −2.6 V
Drain current $I_D$ (A)
Drain-source voltage $V_{DS}$ (V)

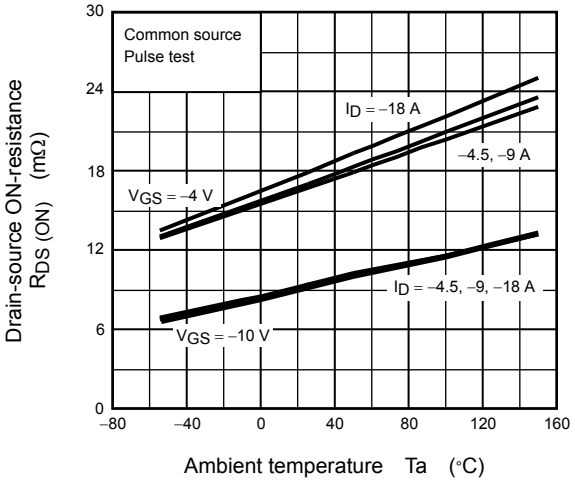

$I_D - V_{GS}$
Common source
$V_{DS}$ = −10 V
Pulse test
100
Ta = −55°C
25
Drain current $I_D$ (A)
Gate-source voltage $V_{GS}$ (V)


$V_{DS} - V_{GS}$
Common source
Ta = 25°C
Pulse test
$I_D$ = −18 A
−9
−4.5
Drain-source voltage $V_{DS}$ (V)
Gate-source voltage $V_{GS}$ (V)

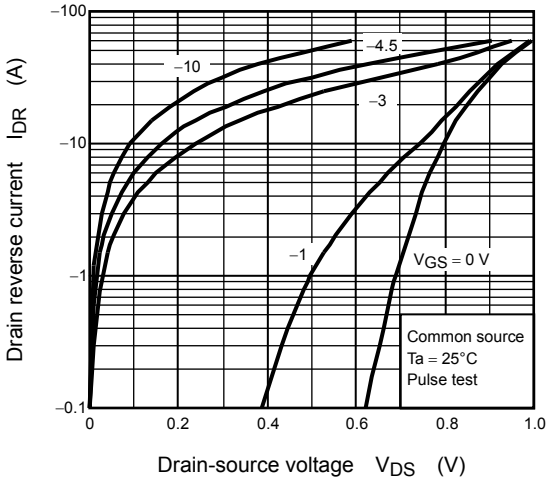

$|Y_{fs}| - I_D$
Common source
$V_{DS}$ = -10 V
Pulse test
Ta = −55°C
25
100
Forward transfer admittance $|Y_{fs}|$ (S)
Drain current $I_D$ (A)


$R_{DS\ (ON)} - I_D$
$V_{GS}$ = −4 V
−10
Common source
Ta = 25°C
Pulse test
Drain-source ON-resistance $R_{DS\ (ON)}$ (mΩ)
Drain current $I_D$ (A)

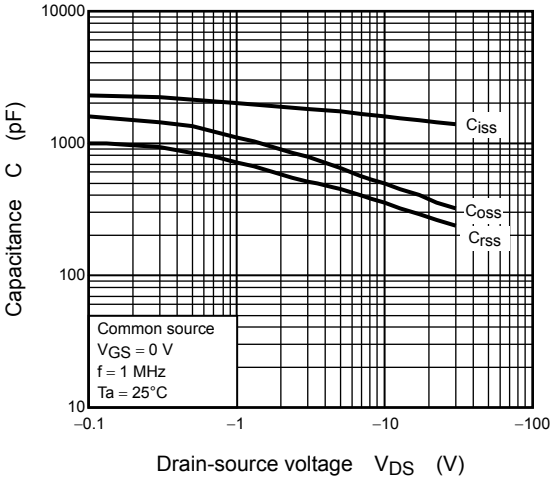
$R_{DS\ (ON)}$ – Ta



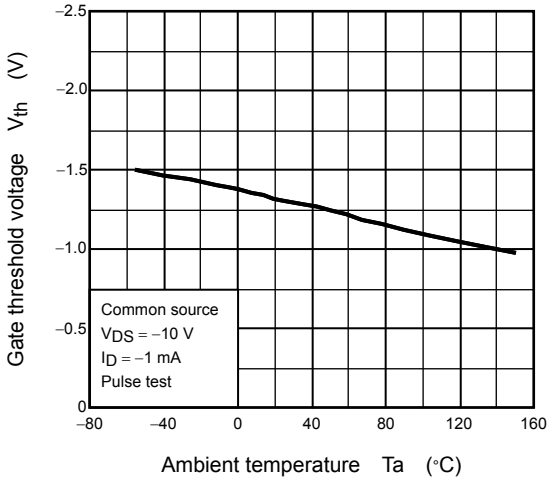

$I_{DR}$ – $V_{DS}$



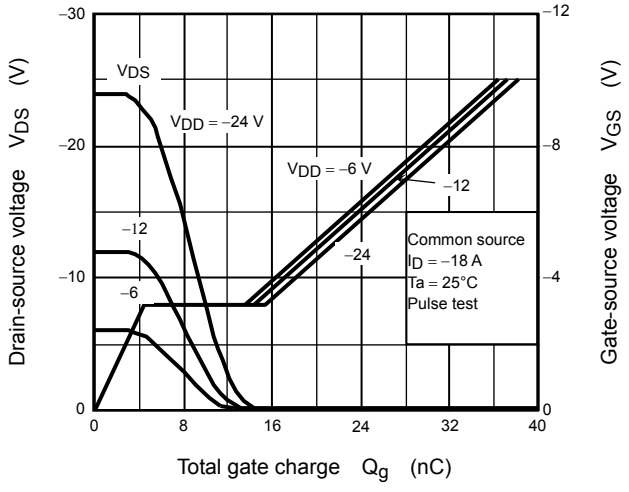

Capacitance – $V_{DS}$



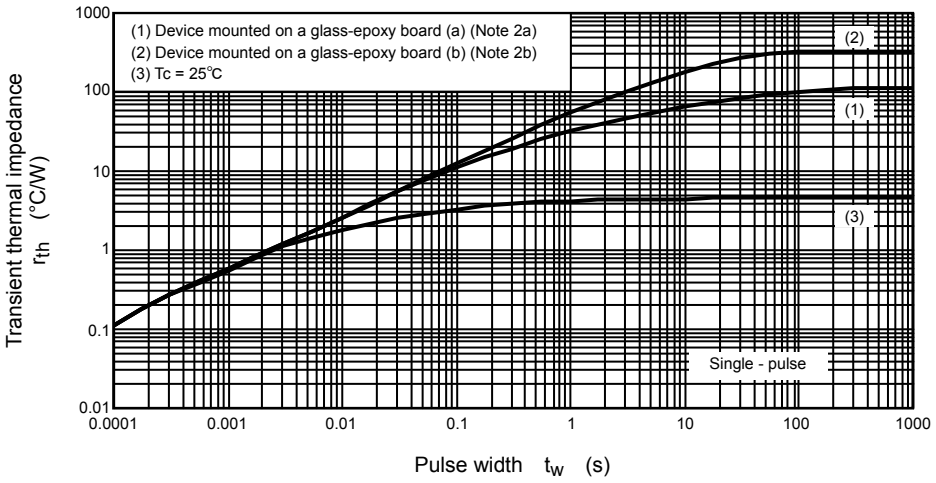

$V_{th}$ – Ta



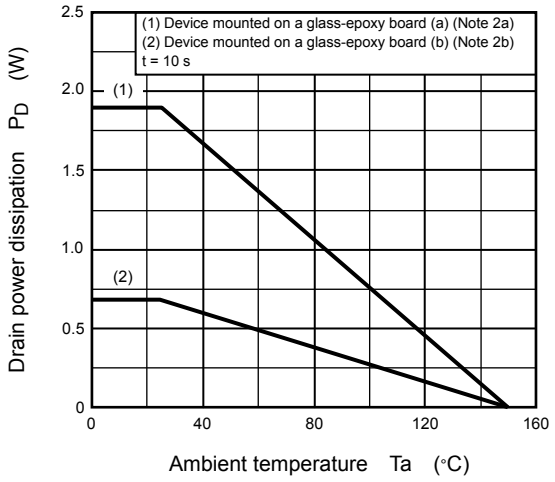

Dynamic input/output characteristics



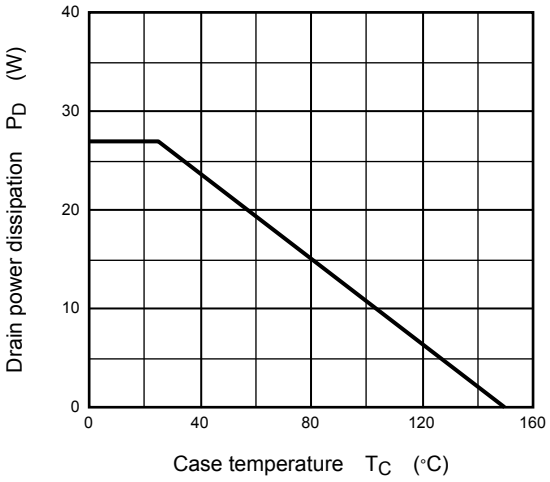
$r_{th} - t_w$



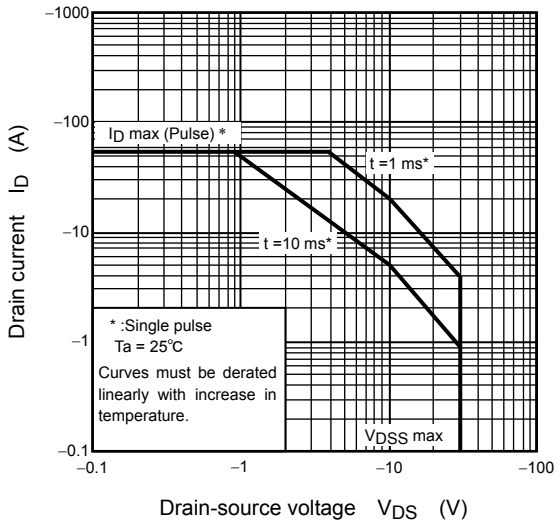

$P_D - Ta$




$P_D - Tc$




Safe operating area



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