

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSIV)

## 2SK3566

### Switching Regulator Applications

- Low drain-source ON-resistance:  $R_{DS(ON)} = 5.6 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 2.0 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu\text{A}$  (max) ( $V_{DS} = 720 \text{ V}$ )
- Enhancement mode:  $V_{th} = 2.0$  to  $4.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristics                                      |                                       | Symbol    | Rating     | Unit             |
|------------------------------------------------------|---------------------------------------|-----------|------------|------------------|
| Drain-source voltage                                 |                                       | $V_{DSS}$ | 900        | V                |
| Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ ) |                                       | $V_{DGR}$ | 900        | V                |
| Gate-source voltage                                  |                                       | $V_{GSS}$ | $\pm 30$   | V                |
| Drain current                                        | DC (Note 1)                           | $I_D$     | 2.5        | A                |
|                                                      | Pulse ( $t = 1 \text{ ms}$ ) (Note 1) | $I_{DP}$  | 7.5        |                  |
| Drain power dissipation ( $T_c = 25^\circ\text{C}$ ) |                                       | $P_D$     | 40         | W                |
| Single pulse avalanche energy (Note 2)               |                                       | $E_{AS}$  | 216        | mJ               |
| Avalanche current                                    |                                       | $I_{AR}$  | 2.5        | A                |
| Repetitive avalanche energy (Note 3)                 |                                       | $E_{AR}$  | 4          | mJ               |
| Channel temperature                                  |                                       | $T_{ch}$  | 150        | $^\circ\text{C}$ |
| Storage temperature range                            |                                       | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

Note: 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).

### Thermal Characteristics

| Characteristics                        | Symbol         | Max   | Unit               |
|----------------------------------------|----------------|-------|--------------------|
| Thermal resistance, channel to case    | $R_{th(ch-c)}$ | 3.125 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 62.5  | $^\circ\text{C/W}$ |

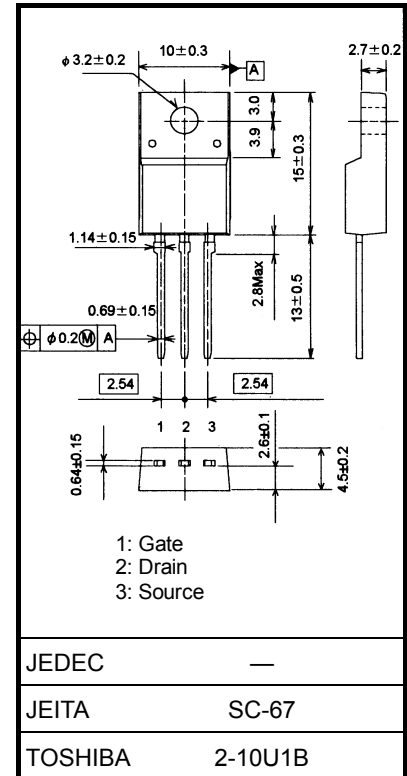
Note 1: Please use devices on conditions that the channel temperature is below  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ ,  $L = 63.4 \text{ mH}$ ,  $I_{AR} = 2.5 \text{ A}$ ,  $R_G = 25 \Omega$

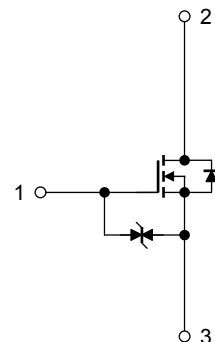
Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm

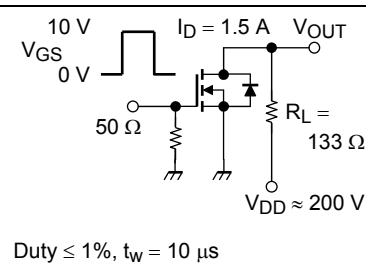


Weight : 1.7 g (typ.)



Start of commercial production  
2002-06

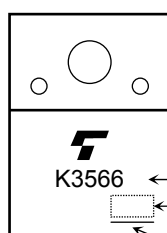
## Electrical Characteristics (Ta = 25°C)

| Characteristics                |               | Symbol         | Test Condition                                                                     | Min      | Typ. | Max      | Unit          |
|--------------------------------|---------------|----------------|------------------------------------------------------------------------------------|----------|------|----------|---------------|
| Gate leakage current           |               | $I_{GSS}$      | $V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$                                  | —        | —    | $\pm 10$ | $\mu\text{A}$ |
| Gate-source breakdown voltage  |               | $V_{(BR) GSS}$ | $I_G = \pm 10 \mu\text{A}, V_{DS} = 0 \text{ V}$                                   | $\pm 30$ | —    | —        | V             |
| Drain cut-off current          |               | $I_{DSS}$      | $V_{DS} = 720 \text{ V}, V_{GS} = 0 \text{ V}$                                     | —        | —    | 100      | $\mu\text{A}$ |
| Drain-source breakdown voltage |               | $V_{(BR) DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                        | 900      | —    | —        | V             |
| Gate threshold voltage         |               | $V_{th}$       | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$                                        | 2.0      | —    | 4.0      | V             |
| Drain-source ON-resistance     |               | $R_{DS(ON)}$   | $V_{GS} = 10 \text{ V}, I_D = 1.5 \text{ A}$                                       | —        | 5.6  | 6.4      | $\Omega$      |
| Forward transfer admittance    |               | $ Y_{fs} $     | $V_{DS} = 20 \text{ V}, I_D = 1.5 \text{ A}$                                       | 1.0      | 2.0  | —        | S             |
| Input capacitance              |               | $C_{iss}$      | $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                   | —        | 470  | —        | pF            |
| Reverse transfer capacitance   |               | $C_{rss}$      |                                                                                    | —        | 10   | —        |               |
| Output capacitance             |               | $C_{oss}$      |                                                                                    | —        | 50   | —        |               |
| Switching time                 | Rise time     | $t_r$          |  | —        | 20   | —        | ns            |
|                                | Turn-on time  | $t_{on}$       |                                                                                    | —        | 60   | —        |               |
|                                | Fall time     | $t_f$          |                                                                                    | —        | 30   | —        |               |
|                                | Turn-off time | $t_{off}$      |                                                                                    | —        | 100  | —        |               |
| Total gate charge              |               | $Q_g$          | $V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 2.5 \text{ A}$         | —        | 12   | —        | nC            |
| Gate-source charge             |               | $Q_{gs}$       |                                                                                    | —        | 7    | —        |               |
| Gate-drain charge              |               | $Q_{gd}$       |                                                                                    | —        | 5    | —        |               |

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

| Characteristics                              | Symbol    | Test Condition                                  | Min | Typ. | Max  | Unit          |
|----------------------------------------------|-----------|-------------------------------------------------|-----|------|------|---------------|
| Continuous drain reverse current<br>(Note 1) | $I_{DR}$  | —                                               | —   | —    | 2.5  | A             |
| Pulse drain reverse current<br>(Note 1)      | $I_{DRP}$ | —                                               | —   | —    | 7.5  | A             |
| Forward voltage (diode)                      | $V_{DSF}$ | $I_{DR} = 2.5 \text{ A}, V_{GS} = 0 \text{ V}$  | —   | —    | -1.7 | V             |
| Reverse recovery time                        | $t_{rr}$  | $I_{DR} = 2.5 \text{ A}, V_{GS} = 0 \text{ V},$ | —   | 720  | —    | ns            |
| Reverse recovery charge                      | $Q_{rr}$  | $dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$        | —   | 3.6  | —    | $\mu\text{C}$ |

## Marking



Part No. (or abbreviation code)  
Lot No.

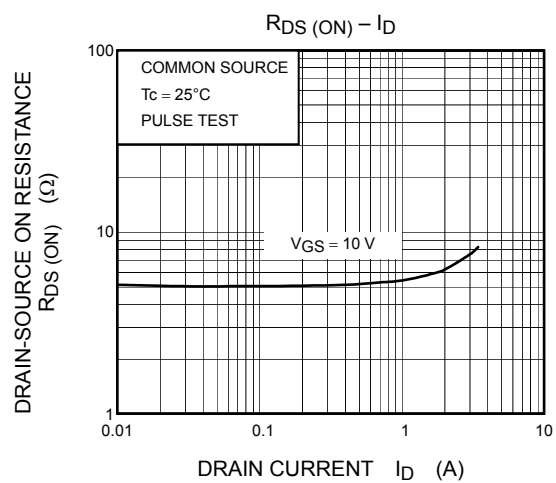
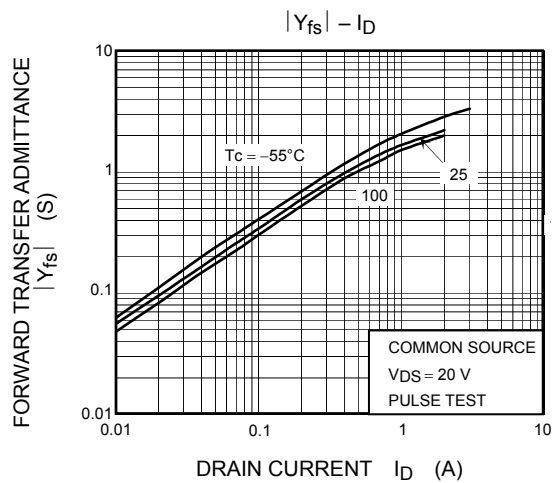
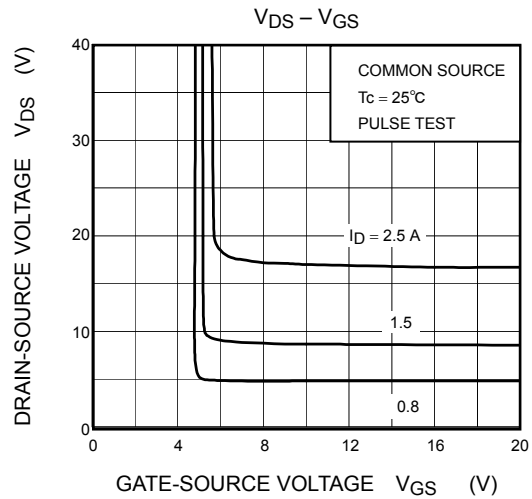
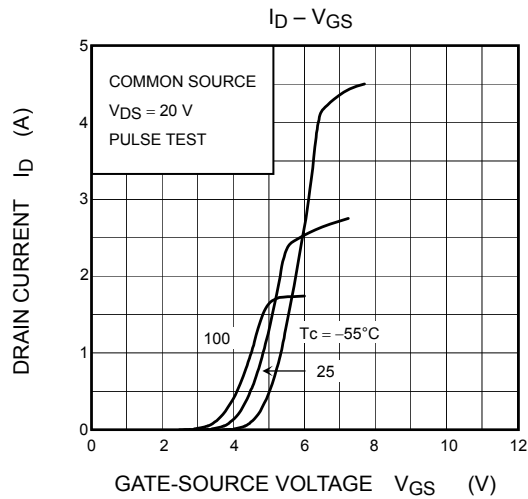
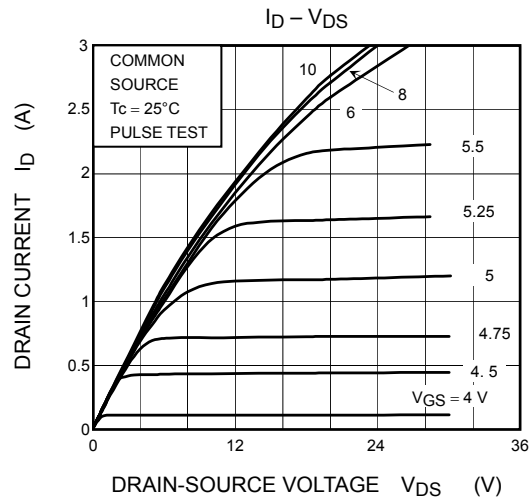
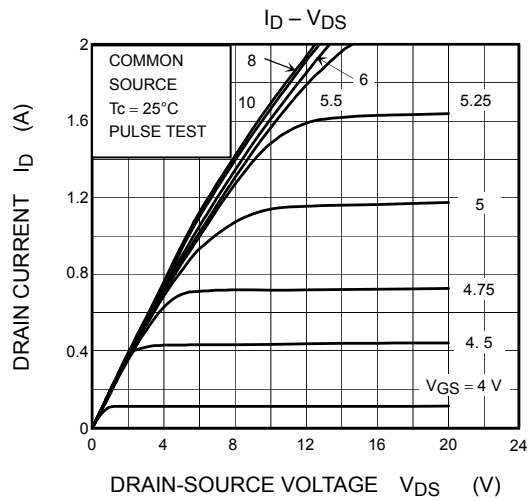
Note 4

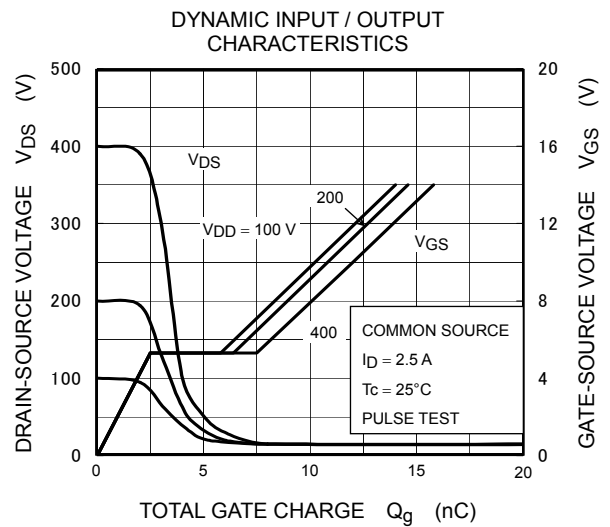
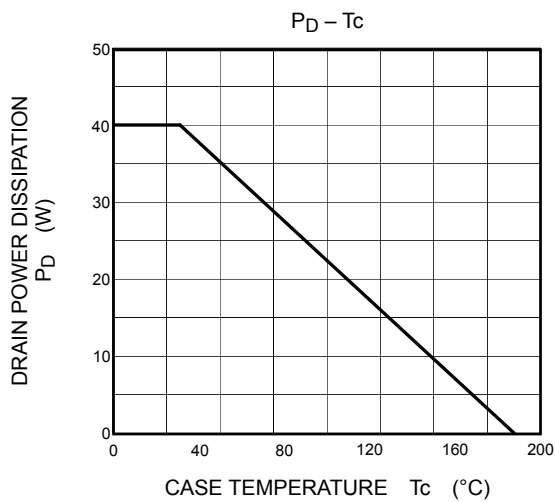
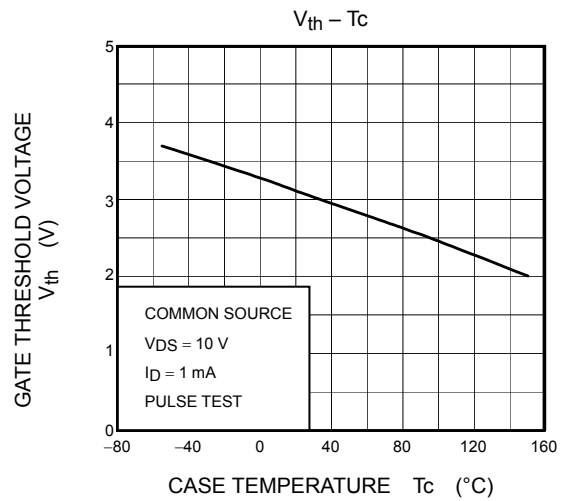
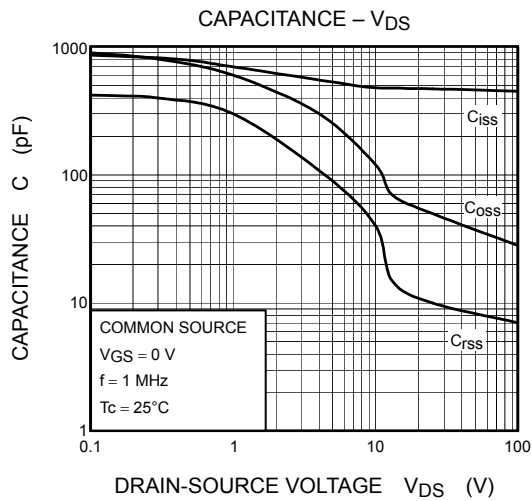
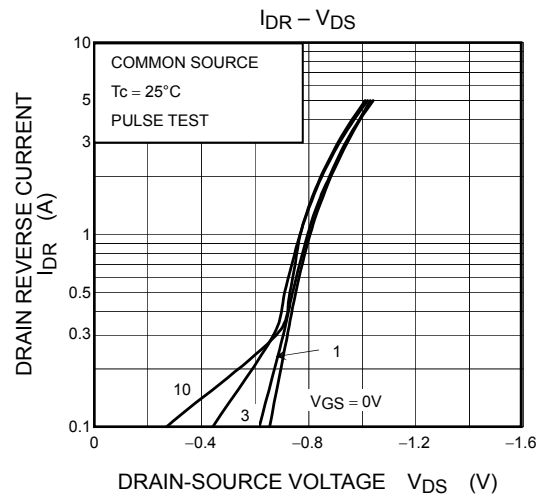
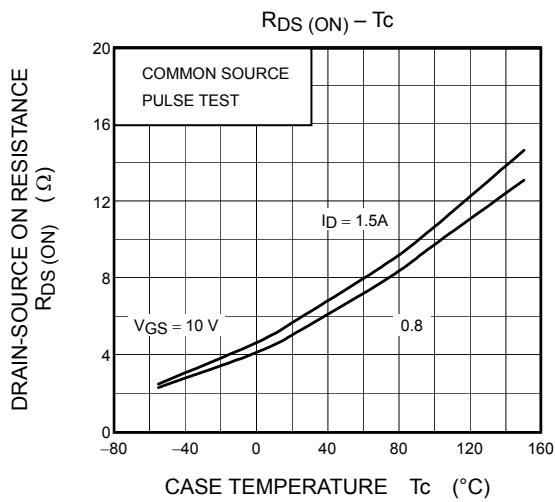
Note 4: A line under a Lot No. identifies the indication of product Labels.

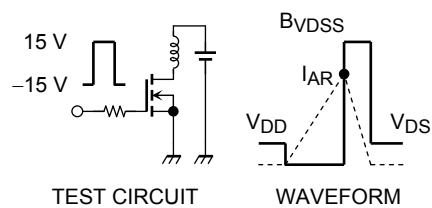
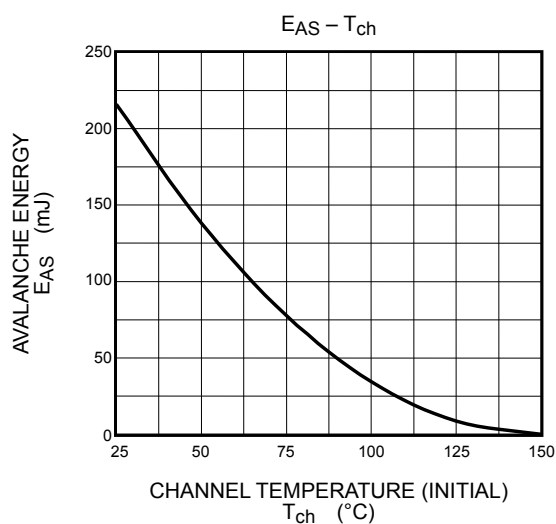
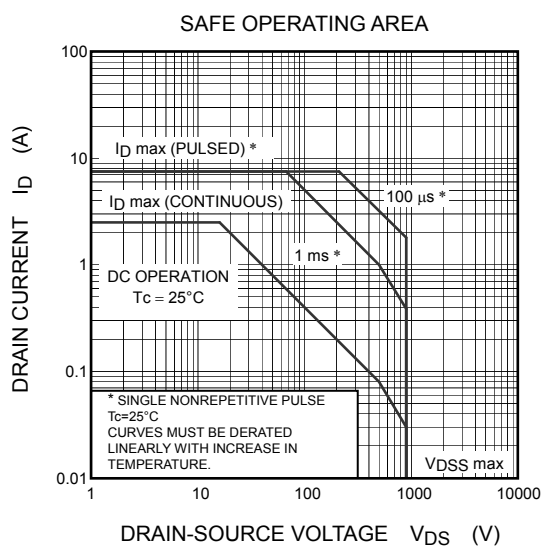
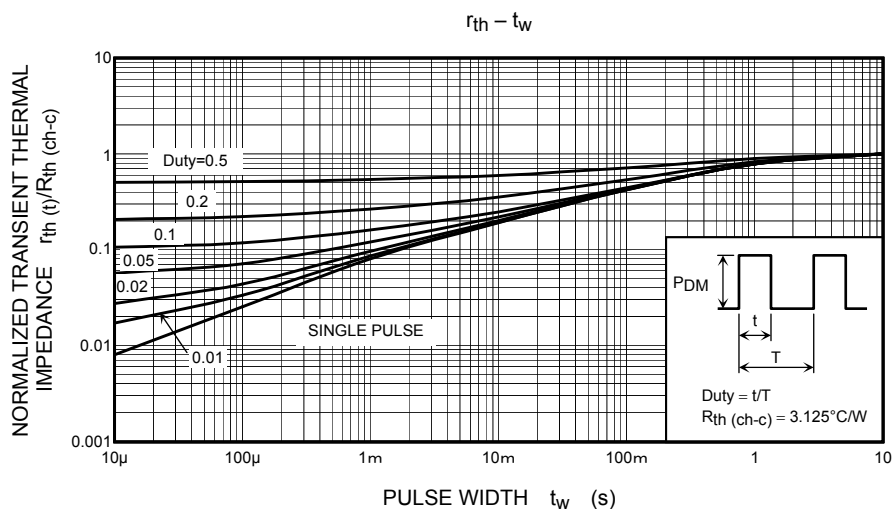
Not underlined:  $[[Pb]]/INCLUDES > MCV$

Underlined:  $[[G]]/RoHS \text{ COMPATIBLE}$  or  $[[G]]/RoHS [[Pb]]$

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$$R_G = 25 \, \Omega$$

$$V_{DD} = 90 \, V, L = 63.4 \, mH$$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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