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P1 98.2

# MOS FIELD EFFECT POWER TRANSISTOR

## 2SK1295

### SWITCHING

### N-CHANNEL POWER MOS FET

### INDUSTRIAL USE

#### DESCRIPTION

The 2SK1295 is N-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

#### FEATURES

- Low On-state Resistance  
 $R_{DS(on)} \leq 50 \text{ m}\Omega$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 15 \text{ A}$ )  
 $R_{DS(on)} \leq 70 \text{ m}\Omega$  ( $V_{GS} = 4 \text{ V}$ ,  $I_D = 15 \text{ A}$ )
- Low  $C_{iss}$   $C_{iss} = 3\ 300 \text{ pF TYP.}$
- Built-in G-S Gate Protection Diodes

#### QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

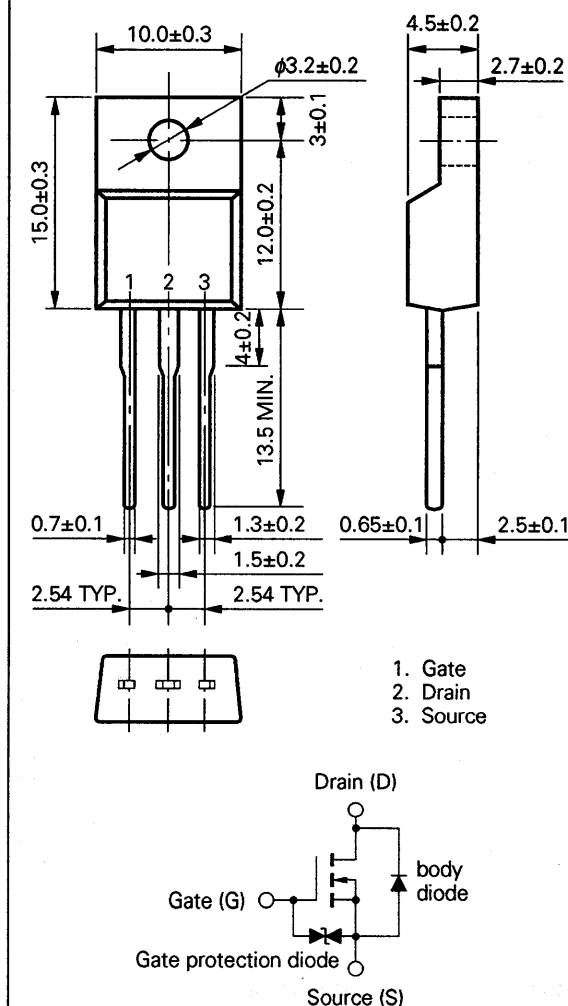
#### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

|                                                      |                  |             |                  |
|------------------------------------------------------|------------------|-------------|------------------|
| Drain to Source Voltage                              | $V_{DSS}$        | 100         | V                |
| Gate to Source Voltage (AC)                          | $V_{GSS(AC)}$    | $\pm 20$    | V                |
| Gate to Source Voltage (DC)                          | $V_{GSS(DC)}$    | +20, -10    | V                |
| Drain Current (DC)                                   | $I_{D(DC)}$      | $\pm 30$    | A                |
| Drain Current (pulse)                                | $I_{D(pulse)}^*$ | $\pm 120$   | A                |
| Total Power Dissipation ( $T_a = 25^\circ\text{C}$ ) | $P_{T1}$         | 2.0         | W                |
| Total Power Dissipation ( $T_c = 25^\circ\text{C}$ ) | $P_{T2}$         | 35          | W                |
| Channel Temperature                                  | $T_{ch}$         | 150         | $^\circ\text{C}$ |
| Storage Temperature                                  | $T_{stg}$        | -55 to +150 | $^\circ\text{C}$ |

\*  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

#### PACKAGE DIMENSIONS

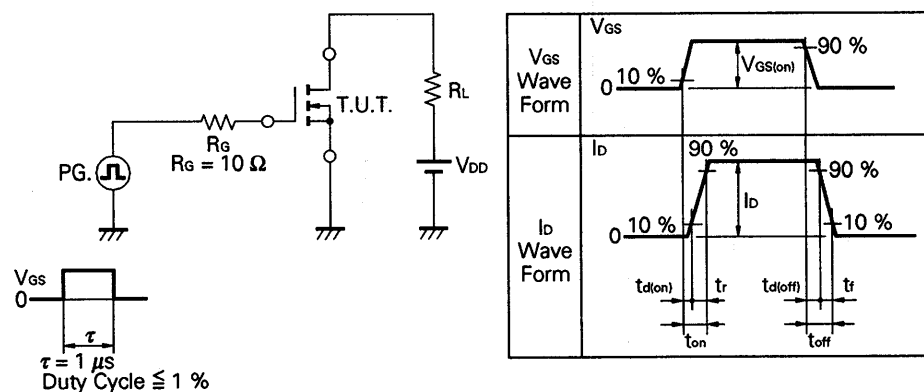
(in millimeters)



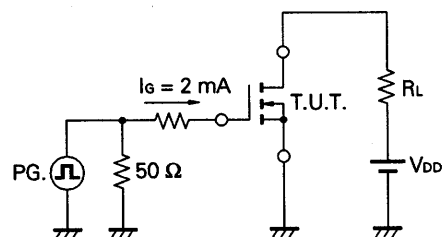
**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**

| CHARACTERISTIC                      | SYMBOL               | MIN. | TYP.  | MAX. | UNIT | TEST CONDITIONS                                                                                                                |
|-------------------------------------|----------------------|------|-------|------|------|--------------------------------------------------------------------------------------------------------------------------------|
| Drain to Source On-state Resistance | R <sub>DS(on)</sub>  |      | 42    | 50   | mΩ   | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A                                                                                  |
| Drain to Source On-state Resistance | R <sub>DS(on)</sub>  |      | 50    | 70   | mΩ   | V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 15 A                                                                                 |
| Gate to Source Cutoff Voltage       | V <sub>GS(off)</sub> | 1.0  |       | 2.5  | V    | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA                                                                                  |
| Forward Transfer Admittance         | y <sub>fs</sub>      | 12   |       |      | S    | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 15 A                                                                                  |
| Drain Leakage Current               | I <sub>DSS</sub>     |      |       | 10   | μA   | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0                                                                                    |
| Gate to Source Leakage Current      | I <sub>GSS</sub>     |      |       | ±10  | μA   | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0                                                                                   |
| Input Capacitance                   | C <sub>iss</sub>     |      | 3 300 |      | pF   | V <sub>DS</sub> = 10 V<br>V <sub>GS</sub> = 0<br>f = 1 MHz                                                                     |
| Output Capacitance                  | C <sub>oss</sub>     |      | 800   |      | pF   |                                                                                                                                |
| Reverse Transfer Capacitance        | C <sub>res</sub>     |      | 200   |      | pF   |                                                                                                                                |
| Turn-On Delay Time                  | t <sub>d(on)</sub>   |      | 40    |      | ns   | V <sub>GS(on)</sub> = 10 V<br>V <sub>DD</sub> = 50 V<br>I <sub>D</sub> = 15 A, R <sub>G</sub> = 10 Ω<br>R <sub>L</sub> = 3.3 Ω |
| Rise Time                           | t <sub>r</sub>       |      | 180   |      | ns   |                                                                                                                                |
| Turn-Off Delay Time                 | t <sub>d(off)</sub>  |      | 220   |      | ns   |                                                                                                                                |
| Fall Time                           | t <sub>f</sub>       |      | 110   |      | ns   |                                                                                                                                |
| Total Gate Charge                   | Q <sub>G</sub>       |      | 85    |      | nC   | V <sub>GS</sub> = 10 V<br>I <sub>D</sub> = 30 A<br>V <sub>DD</sub> = 80 V                                                      |
| Gate to Source Charge               | Q <sub>GS</sub>      |      | 10    |      | nC   |                                                                                                                                |
| Gate to Drain Charge                | Q <sub>GD</sub>      |      | 30    |      | nC   |                                                                                                                                |
| Diode Forward Voltage               | V <sub>SD</sub>      |      | 1.1   |      | V    | I <sub>SD</sub> = 30 A, V <sub>GS</sub> = 0                                                                                    |
| Reverse Recovery Time               | t <sub>rr</sub>      |      | 200   |      | ns   | I <sub>F</sub> = 30 A, V <sub>GS</sub> = 0<br>di/dt = 50 A/μs                                                                  |
| Reverse Recovery Charge             | Q <sub>rr</sub>      |      | 550   |      | nC   |                                                                                                                                |

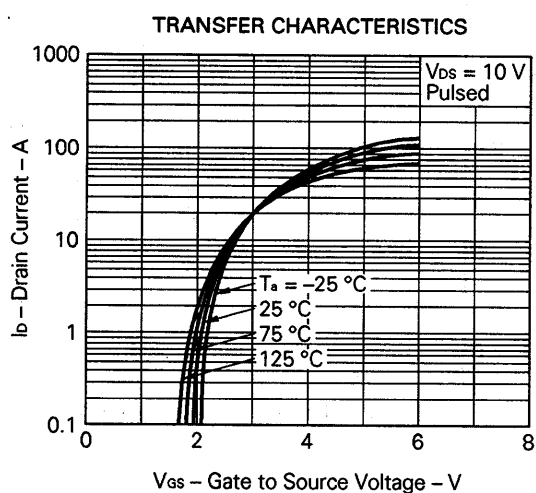
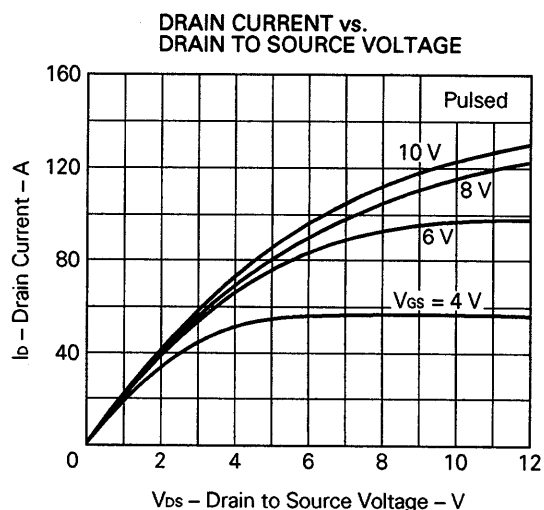
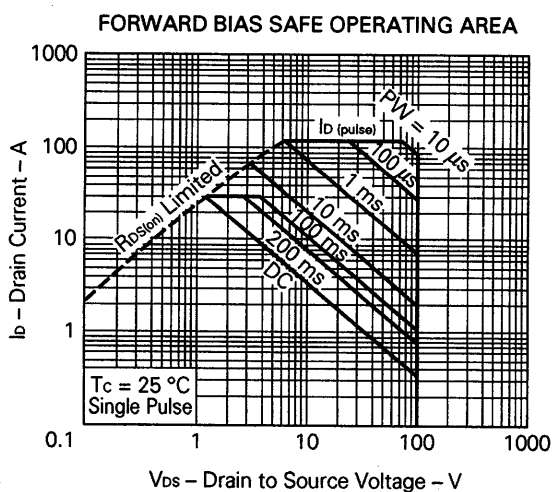
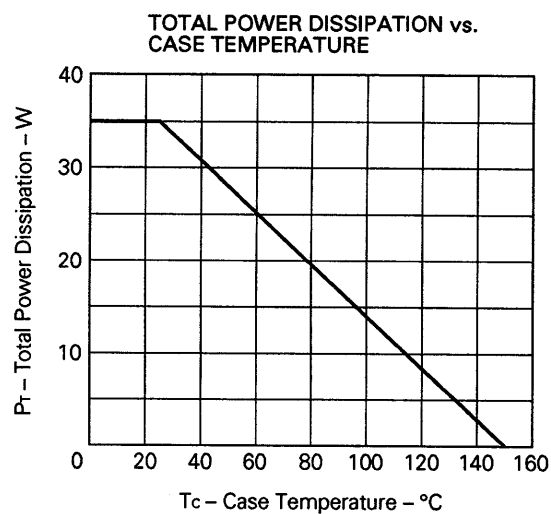
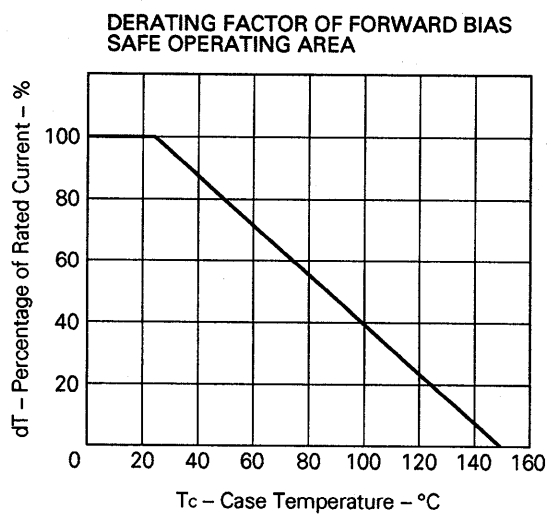
**Test Circuit 1: Switching Time**



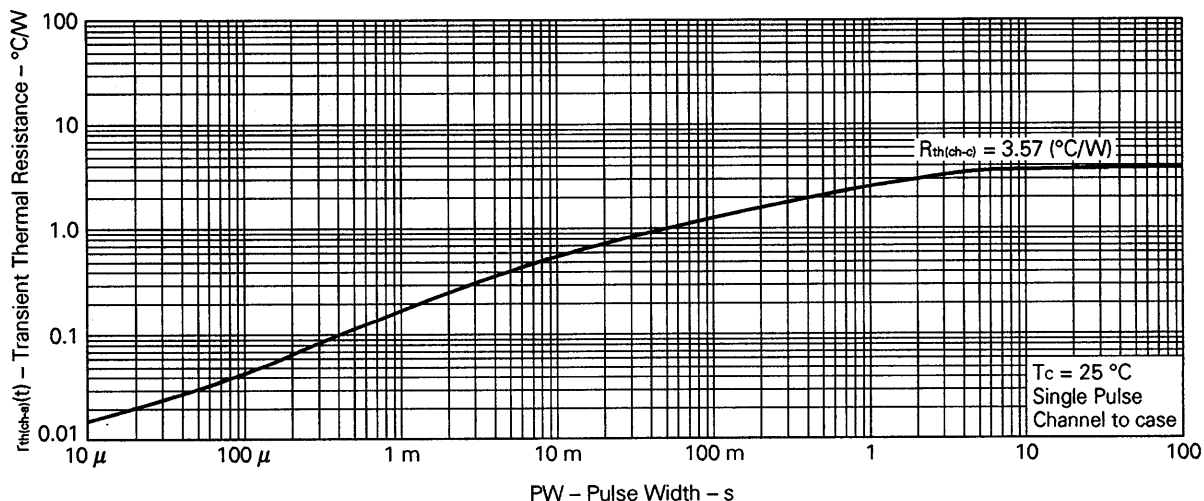
**Test Circuit 2: Gate Charge**



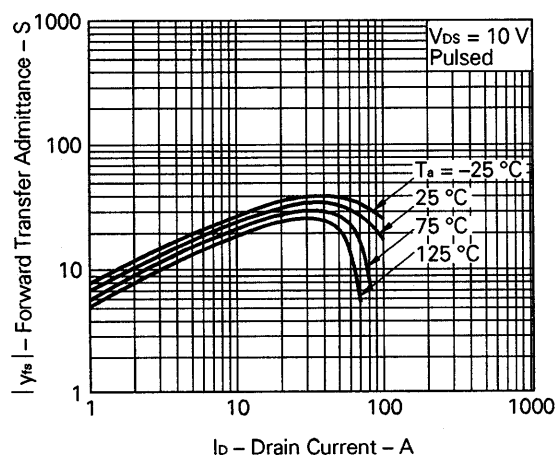
TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



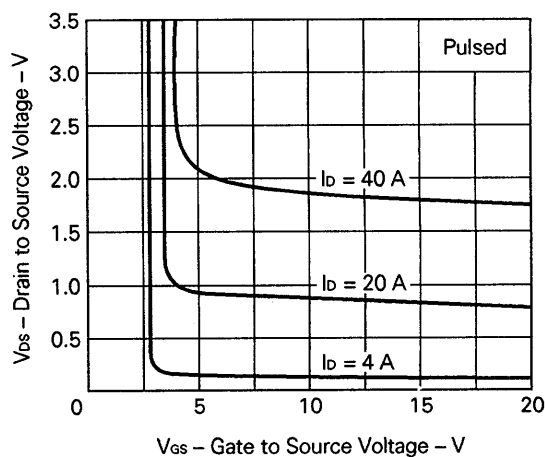
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



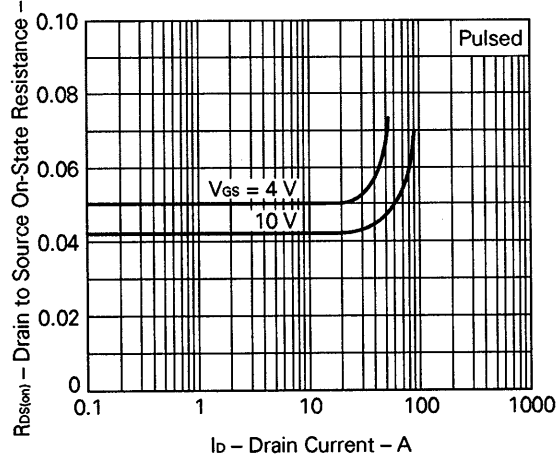
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



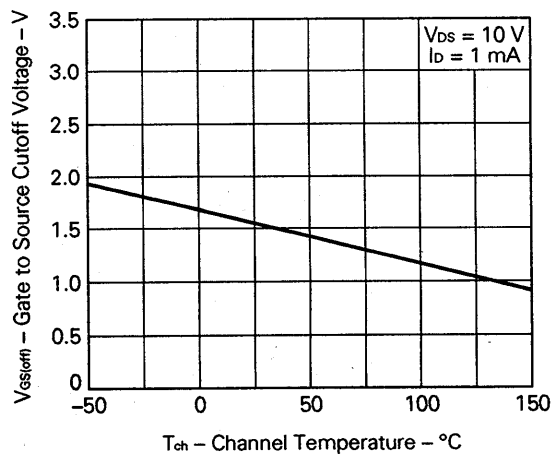
DRAIN TO SOURCE VOLTAGE vs. GATE TO SOURCE VOLTAGE

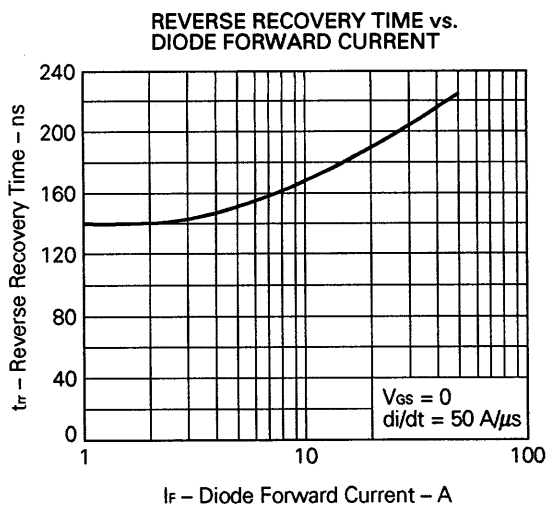
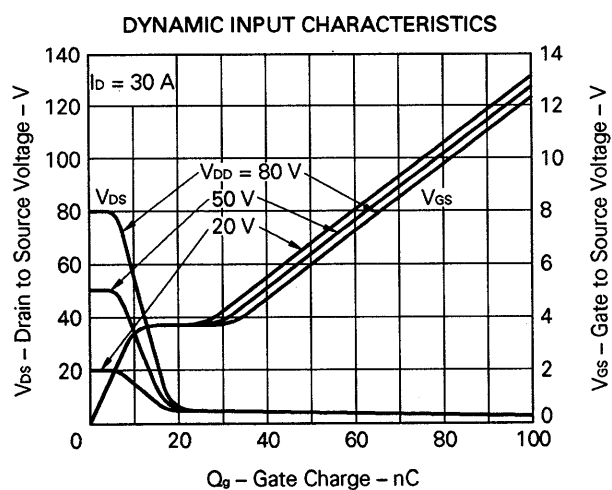
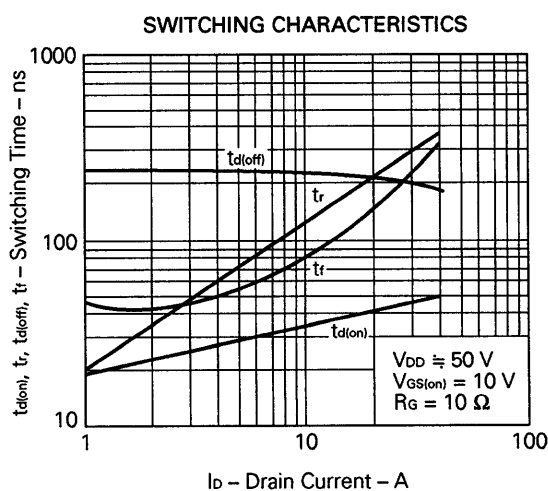
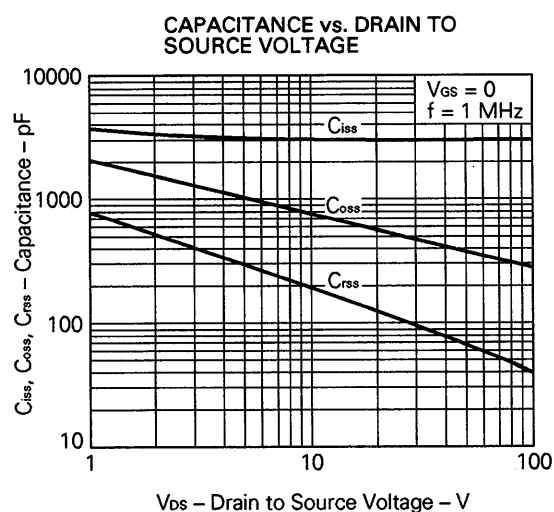
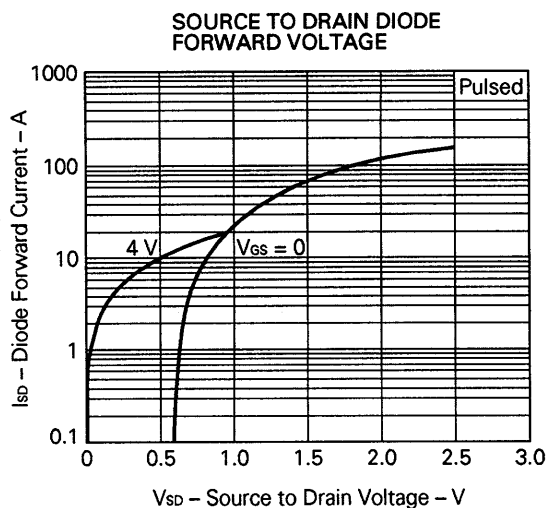
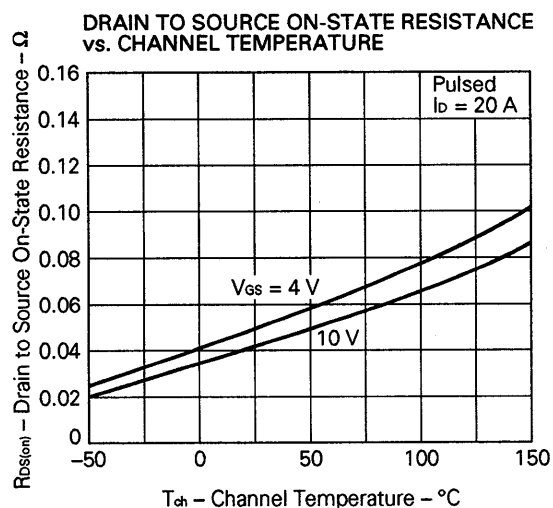


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE





**Reference**

| Application note name                            | No.      |
|--------------------------------------------------|----------|
| Safe operating area of Power MOS FET.            | TEA-1034 |
| Application circuit using Power MOS FET.         | TEA-1035 |
| Quality control of NEC semiconductors devices.   | TEI-1202 |
| Quality control guide of semiconductors devices. | MEI-1202 |
| Assembly manual of semiconductors devices.       | IEI-1207 |

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