To our customers,

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Old Company Name in Catalogs and Other Documents

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April 1\textsuperscript{st}, 2010
Renesas Electronics Corporation

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DESCRIPTION
The 2SK3793 is N-channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES
- Super low on-state resistance
  \[ R_{DS(on)} = 125 \text{ m}\Omega \text{ MAX.} \ (V_{GS} = 10 \text{ V}, \ Io = 6 \text{ A}) \]
  \[ R_{DS(on)} = 148 \text{ m}\Omega \text{ MAX.} \ (V_{GS} = 4.5 \text{ V}, \ Io = 6 \text{ A}) \]
- Low \( C_{iss} \): \( C_{iss} = 900 \text{ pF TYP.} \)
- Built-in gate protection diode

ABSOLUTE MAXIMUM RATINGS (\( T_A = 25^\circ\text{C} \))
- Drain to Source Voltage (\( V_{GS} = 0 \text{ V} \)) \( V_{DSS} \) 100 V
- Gate to Source Voltage (\( V_{DS} = 0 \text{ V} \)) \( V_{GSS} \) ±20 V
- Drain Current (DC) (\( T_C = 25^\circ\text{C} \)) \( I_{D(DC)} \) ±12 A
- Drain Current (pulse) Note1 \( I_{D(pulse)} \) ±22 A
- Total Power Dissipation (\( T_C = 25^\circ\text{C} \)) \( P_{T1} \) 20 W
- Total Power Dissipation (\( T_A = 25^\circ\text{C} \)) \( P_{T2} \) 2.0 W
- Channel Temperature \( T_{ch} \) 150 °C
- Storage Temperature \( T_{stg} \) −55 to +150 °C
- Single Avalanche Current Note2 \( I_{AS} \) 10 A
- Single Avalanche Energy Note2 \( E_{AS} \) 10 mJ

Notes
1. PW ≤ 10 \( \mu \text{s} \), Duty Cycle ≤ 1%
2. Starting \( T_{ch} = 25^\circ\text{C} \), \( V_{DD} = 50 \text{ V} \), \( R_0 = 25 \Omega \), \( V_{GS} = 20 \to 0 \text{ V} \)
## ELECTRICAL CHARACTERISTICS (TA = 25°C)

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
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<th>UNIT</th>
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<td>VDS = 100 V, VGS = 0 V</td>
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<td></td>
<td>µA</td>
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<td>Gate Leakage Current</td>
<td>IGSS</td>
<td>VGS = ±20 V, VDS = 0 V</td>
<td>±10</td>
<td></td>
<td></td>
<td>µA</td>
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<td>2.5</td>
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<td>5.0</td>
<td>10.3</td>
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<td>S</td>
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<td>Drain to Source On-state Resistance</td>
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<td></td>
<td>mΩ</td>
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<td>96</td>
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<td></td>
<td>mΩ</td>
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<td>Input Capacitance</td>
<td>Ciss</td>
<td>VDS = 10 V</td>
<td>900</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>Coss</td>
<td>VGS = 0 V</td>
<td>110</td>
<td></td>
<td></td>
<td>pF</td>
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<tr>
<td>Reverse Transfer Capacitance</td>
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<td>f = 1 MHz</td>
<td>50</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Turn-on Delay Time</td>
<td>t(O)</td>
<td>VDS = 50 V, Id = 6 A</td>
<td>9</td>
<td></td>
<td></td>
<td>ns</td>
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<tr>
<td>Rise Time</td>
<td>r</td>
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<td></td>
<td></td>
<td>ns</td>
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<td>Turn-off Delay Time</td>
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<td>VDD = 80 V</td>
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<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate to Source Charge</td>
<td>Qgs</td>
<td>VDD = 10 V</td>
<td>3.0</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate to Drain Charge</td>
<td>Qgd</td>
<td>Id = 12 A</td>
<td>6.2</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Body Diode Forward Voltage</td>
<td>VFS(S-D)</td>
<td>Ir = 12 A, VGS = 0 V</td>
<td>0.89</td>
<td>1.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Reverse Recovery Time</td>
<td>tr</td>
<td>Ir = 12 A, VGS = 0 V</td>
<td>52</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Reverse Recovery Charge</td>
<td>Qrr</td>
<td>di/dt = 100 A/µs</td>
<td>94</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
</tbody>
</table>

**Note:** Pulsed

### TEST CIRCUIT 1 AVALANCHE CAPABILITY

![TEST CIRCUIT 1](image)

### TEST CIRCUIT 2 SWITCHING TIME

![TEST CIRCUIT 2](image)

### TEST CIRCUIT 3 GATE CHARGE

![TEST CIRCUIT 3](image)
TYPICAL CHARACTERISTICS (TA = 25°C)

DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

FORWARD BIAS SAFE OPERATING AREA

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

Data Sheet  D16777EJ1V0DS  3
2SK3793

DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

Pulsed

VGS = 4.5 V
10 V

RDS(on) - Drain to Source On-state Resistance - Ω

-100 -50 0 50 100 150 200

Tch - Channel Temperature - °C

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

Ciss, Coss, Crss - Capacitance - pF

0.001 0.1 10 1000

VDS - Drain to Source Voltage - V

SWITCHING CHARACTERISTICS

VDD = 50 V
VGS = 10 V
RG = 0 Ω

Ibs = Drain Current - A

0.1 1 10 100

td(on), tr, td(off), tf - Switching Time - ns

0.1 1 10 100

ID - Drain Current - A

50 V
20 V

VGS = 0 V

QG - Gate Charge - nC

VGS - Gate to Source Voltage - V

SOURCE TO DRAIN DIODE FORWARD VOLTAGE

VF(S-D) - Source to Drain Voltage - V

0 0.5 1 1.5

trr - Reverse Recovery Time - ns

0.1 1 10 100

IF - Diode Forward Current - A

VGS = 0 V

REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

di/dt = 100 A/µs

Irr - Reverse Recovery Time - ns

Irr - Diode Forward Current - A

0.01 0.1 1 1.5

V(Y(S-D)) - Source to Drain Voltage - V
**SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD**

- $I_{AS} = 10$ A
- $E_{AS} = 10$ mJ
- $V_D = 50$ V
- $R_G = 25$ Ω
- $V_GS = 20 \rightarrow 0$ V
- Starting $T_{ch} = 25°C$

**SINGLE AVALANCHE ENERGY DERATING FACTOR**

- $V_D = 50$ V
- $R_G = 25$ Ω
- $V_GS = 20 \rightarrow 0$ V
- $I_{AS} \leq 10$ A

**Starting $T_{ch}$ - Starting Channel Temperature - °C**
PACKAGE DRAWING (Unit: mm)

Isolated TO-220 (MP-45F)

EQUIVALENT CIRCUIT

**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD.

When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.
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