SCT2750NY
N-channel SiC power MOSFET

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain - Source voltage</td>
<td>$V_{DSS}$</td>
<td>1700</td>
<td>V</td>
</tr>
<tr>
<td>Continuous drain current</td>
<td>$I_D$</td>
<td>5.9</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed drain current</td>
<td>$I_{D,pulse}$</td>
<td>14</td>
<td>A</td>
</tr>
<tr>
<td>Gate - Source voltage (DC)</td>
<td>$V_{GSS}$</td>
<td>–6 to 22</td>
<td>V</td>
</tr>
<tr>
<td>Gate - Source surge voltage</td>
<td>$V_{GSS,surge}$</td>
<td>–10 to 26</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_D$</td>
<td>57</td>
<td>W</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_J$</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>Range of storage temperature</td>
<td>$T_{stg}$</td>
<td>–55 to +175</td>
<td>°C</td>
</tr>
</tbody>
</table>

Features
1) Low on-resistance
2) Fast switching speed
3) Long creepage distance with no center lead
4) Simple to drive
5) Pb-free lead plating ; RoHS compliant

Application
- Auxiliary power supplies
- Switch mode power supplies

Outline
TO-268-2L

Inner circuit
1) Gate
2) Drain
3) Source

*1 Body Diode

Packaging specifications
<table>
<thead>
<tr>
<th>Type</th>
<th>Packing</th>
<th>Embossed tape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reel size (mm)</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>Tape width (mm)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Basic ordering unit (pcs)</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Taping code</td>
<td>TB</td>
<td></td>
</tr>
<tr>
<td>Marking</td>
<td>SCT2750NY</td>
<td></td>
</tr>
</tbody>
</table>

Absolute maximum ratings ($T_a = 25°C$)

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### Thermal resistance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal resistance, junction - case</td>
<td>$R_{thJC}$</td>
<td>-</td>
<td>2.04</td>
</tr>
</tbody>
</table>

### Electrical characteristics ($T_a = 25^\circ C$)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain - Source breakdown voltage</td>
<td>$V_{BRDSS}$</td>
<td>$V_{GS} = 0V, I_D = 1mA$</td>
<td>1700</td>
<td>-</td>
</tr>
<tr>
<td>Zero gate voltage drain current</td>
<td>$I_{DSS}$</td>
<td>$V_{DS} = 1700V, V_{GS} = 0V$</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j = 25^\circ C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j = 150^\circ C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate - Source leakage current</td>
<td>$I_{GSS+}$</td>
<td>$V_{GS} = +22V, V_{DS} = 0V$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gate - Source leakage current</td>
<td>$I_{GSS-}$</td>
<td>$V_{GS} = -6V, V_{DS} = 0V$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gate threshold voltage</td>
<td>$V_{GS \ \text{th}}$</td>
<td>$V_{DS} = V_{GS}, I_D = 0.63mA$</td>
<td>1.6</td>
<td>2.8</td>
</tr>
</tbody>
</table>

*1 Limited only by maximum temperature allowed.
*2 PW ≤ 10µs, Duty cycle ≤ 1%
*3 Example of acceptable Vgs waveform

*4 Pulsed
### Electrical characteristics (Ta = 25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static drain - source on - state resistance</td>
<td>$R_{DS(on)}$</td>
<td>$V_{GS} = 18V, I_D = 1.7A$</td>
<td>- 750 975</td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_J = 25°C$</td>
<td>- 1088</td>
<td></td>
</tr>
<tr>
<td>Gate input resistance</td>
<td>$R_G$</td>
<td>$f = 1MHz, open drain$</td>
<td>- 49</td>
<td>Ω</td>
</tr>
<tr>
<td>Transconductance</td>
<td>$g_{fs}$</td>
<td>$V_{DS} = 10V, I_D = 1.7A$</td>
<td>- 0.6</td>
<td>S</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{iss}$</td>
<td>$V_{GS} = 0V$</td>
<td>- 275</td>
<td>pF</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oss}$</td>
<td>$V_{DS} = 800V$</td>
<td>- 19</td>
<td></td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{rss}$</td>
<td>$f = 1MHz$</td>
<td>- 7</td>
<td></td>
</tr>
<tr>
<td>Effective output capacitance, energy related</td>
<td>$C_{o(er)}$</td>
<td>$V_{GS} = 0V$</td>
<td>- 21</td>
<td>pF</td>
</tr>
<tr>
<td>Turn - on delay time</td>
<td>$t_{d(on)}$</td>
<td>$V_{DD} = 500V, I_D = 1.7A$</td>
<td>- 19</td>
<td>ns</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td>$V_{GS} = 18V/0V$</td>
<td>- 24</td>
<td></td>
</tr>
<tr>
<td>Turn - off delay time</td>
<td>$t_{d(off)}$</td>
<td>$RL = 294Ω$</td>
<td>- 41</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td>$R_G = 0Ω$</td>
<td>- 63</td>
<td></td>
</tr>
<tr>
<td>Turn - on switching loss</td>
<td>$E_{on}$</td>
<td>$V_{DD} = 800V, I_D=1.7A$</td>
<td>- 76</td>
<td>μJ</td>
</tr>
<tr>
<td>Turn - off switching loss</td>
<td>$E_{off}$</td>
<td>$E_{on}$ includes diode reverse recovery</td>
<td>- 33</td>
<td></td>
</tr>
</tbody>
</table>

### Gate Charge characteristics (Ta = 25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total gate charge</td>
<td>$Q_g$</td>
<td>$V_{DD} = 500V$</td>
<td>- 17</td>
<td>nC</td>
</tr>
<tr>
<td>Gate - Source charge</td>
<td>$Q_{gs}$</td>
<td>$I_D = 1.5A$</td>
<td>- 5</td>
<td></td>
</tr>
<tr>
<td>Gate - Drain charge</td>
<td>$Q_{gd}$</td>
<td>$V_{GS} = 18V$</td>
<td>- 6.5</td>
<td></td>
</tr>
<tr>
<td>Gate plateau voltage</td>
<td>$V_{(plateau)}$</td>
<td>$V_{DD} = 500V, I_D = 1.5A$</td>
<td>- 11.0</td>
<td>V</td>
</tr>
</tbody>
</table>
### Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ$C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverse diode continuous, forward current</td>
<td>$I_S$</td>
<td>$T_c = 25^\circ$C</td>
<td>-</td>
<td>5.9</td>
</tr>
<tr>
<td>Inverse diode direct current, pulsed</td>
<td>$I_{SM}$</td>
<td>-</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Forward voltage</td>
<td>$V_{SD}$</td>
<td>$V_{GS} = 0V, I_S = 1.7A$</td>
<td>-</td>
<td>4.3</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>$t_r$</td>
<td>$I_F = 1.7A, V_R = 800V, di/dt = 290A/\mu s$</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>Reverse recovery charge</td>
<td>$Q_r$</td>
<td>-</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Peak reverse recovery current</td>
<td>$I_{rm}$</td>
<td>-</td>
<td>-</td>
<td>1.3</td>
</tr>
</tbody>
</table>

### Typical Transient Thermal Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th1}$</td>
<td>243m</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th2}$</td>
<td>1529m</td>
<td></td>
</tr>
<tr>
<td>$R_{th3}$</td>
<td>268m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{th1}$</td>
<td>352µ</td>
<td>Ws/K</td>
</tr>
<tr>
<td>$C_{th2}$</td>
<td>1.57m</td>
<td></td>
</tr>
<tr>
<td>$C_{th3}$</td>
<td>68.7m</td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of thermal characteristics](image)
Electrical characteristic curves

**Fig. 1 Power Dissipation Derating Curve**

- Power Dissipation: \( P_D \) [W]
- Drain Current: \( I_D \) [A]
- Junction Temperature: \( T_j \) [°C]
- Drain - Source Voltage: \( V_{DS} \) [V]

**Fig. 2 Maximum Safe Operating Area**

- Operation in this area is limited by \( R_{DS(on)} \)
- **Fig. 3 Typical Transient Thermal Resistance vs. Pulse Width**

- Transient Thermal Resistance: \( R_{th} \) [K/W]
- Pulse Width: \( P_W \) [s]
Electrical characteristic curves

**Fig. 4 Typical Output Characteristics(I)**

- Drain Current: $I_D$ [A]
- Drain - Source Voltage: $V_{DS}$ [V]

**Fig. 5 Typical Output Characteristics(II)**

- Drain Current: $I_D$ [A]
- Drain - Source Voltage: $V_{DS}$ [V]

**Fig. 6 $T_J = 150°C$ Typical Output Characteristics(I)**

- Drain Current: $I_D$ [A]
- Drain - Source Voltage: $V_{DS}$ [V]

**Fig. 7 $T_J = 150°C$ Typical Output Characteristics(II)**

- Drain Current: $I_D$ [A]
- Drain - Source Voltage: $V_{DS}$ [V]
Electrical characteristic curves

**Fig. 8 Typical Transfer Characteristics (I)**

Gate - Source Voltage : $V_{GS}$ [V]

Drain Current : $I_D$ [A]

- $V_{DS} = 10V$
- Pulsed

- $T_a = 175^\circ C$
- $T_a = 125^\circ C$
- $T_a = 75^\circ C$
- $T_a = 25^\circ C$
- $T_a = -25^\circ C$

**Fig. 9 Typical Transfer Characteristics (II)**

Gate - Source Voltage : $V_{GS}$ [V]

Drain Current : $I_D$ [A]

- $V_{DS} = 10V$
- Pulsed

- $T_a = 175^\circ C$
- $T_a = 125^\circ C$
- $T_a = 75^\circ C$
- $T_a = 25^\circ C$
- $T_a = -25^\circ C$

**Fig. 10 Gate Threshold Voltage vs. Junction Temperature**

Gate Threshold Voltage : $V_{GS(th)}$ [V]

Junction Temperature : $T_j$ [^\circ C]

$V_{GS} = V_{DS}$

$I_D = 0.63mA$

**Fig. 11 Transconductance vs. Drain Current**

Transconductance : $g_{fs}$ [S]

Drain Current : $I_D$ [A]

- $V_{DS} = 10V$
- Pulsed

- $T_a = 175^\circ C$
- $T_a = 125^\circ C$
- $T_a = 75^\circ C$
- $T_a = 25^\circ C$
- $T_a = -25^\circ C$
Electrical characteristic curves

**Fig. 12 Static Drain - Source On-State Resistance vs. Gate Source Voltage**

- Static Drain - Source On-State Resistance: $R_{DS(on)}$ [Ω]
- Gate - Source Voltage: $V_{GS}$ [V]

- $I_D = 1.7A$
- $I_D = 3.4A$
- $T_A = 25ºC$
- $V_{GS} = 18V$
- Pulsed

**Fig. 13 Static Drain - Source On-State Resistance vs. Junction Temperature**

- Static Drain - Source On-State Resistance: $R_{DS(on)}$ [Ω]
- Junction Temperature: $T_J$ [ºC]

- $I_D = 1.7A$
- $I_D = 3.4A$
- $V_{GS} = 18V$
- Pulsed

**Fig. 14 Static Drain - Source On-State Resistance vs. Drain Current**

- Static Drain - Source On-State Resistance: $R_{DS(on)}$ [Ω]
- Drain Current: $I_D$ [A]

- $T_A = -25ºC$
- $T_A = 25ºC$
- $T_A = 75ºC$
- $T_A = 125ºC$
- $T_A = 175ºC$
- $V_{GS} = 18V$
- Pulsed
● Electrical characteristic curves

Fig. 15 Typical Capacitance vs. Drain - Source Voltage

Fig. 16 Coss Stored Energy

Fig. 17 Switching Characteristics

Fig. 18 Dynamic Input Characteristics

1. Capacitance: $C$ [pF]
2. Drain - Source Voltage: $V_{DS}$ [V]
3. Switching Time: $t$ [ns]
4. Drain Current: $I_D$ [A]
5. Total Gate Charge: $Q_g$ [nC]
6. Gate - Source Voltage: $V_{GS}$ [V]
7. Coss Stored Energy: $E_{OSS}$ [μJ]

- $T_a = 25^\circ C$
- $f = 1 MHz$
- $V_{DS} = 0 V$
- $V_{DD} = 500 V$
- $V_{GS} = 18 V$
- $R_G = 0 \Omega$
- Pulsed
● Electrical characteristic curves

**Fig. 19 Typical Switching Loss vs. Drain - Source Voltage**

Switching Energy: \( E \) [\( \mu \text{J} \)]

Drain - Source Voltage: \( V_{\text{DS}} \) [V]

- \( T_a = 25^\circ\text{C} \)
- \( I_D = 1.7\text{A} \)
- \( V_{\text{GS}} = 18\text{V}/0\text{V} \)
- \( R_G = 0\Omega \)
- \( L = 2\text{mH} \)

**Fig. 20 Typical Switching Loss vs. Drain Current**

Switching Energy: \( E \) [\( \mu \text{J} \)]

Drain Current: \( I_D \) [A]

- \( T_a = 25^\circ\text{C} \)
- \( V_{\text{DD}} = 800\text{V} \)
- \( V_{\text{GS}} = 18\text{V}/0\text{V} \)
- \( R_G = 0\Omega \)
- \( L = 2\text{mH} \)

**Fig. 21 Typical Switching Loss vs. External Gate Resistance**

Switching Energy: \( E \) [\( \mu \text{J} \)]

External Gate Resistance: \( R_G \) [\( \Omega \)]

- \( T_a = 25^\circ\text{C} \)
- \( V_{\text{DD}} = 800\text{V} \)
- \( I_D = 1.7\text{A} \)
- \( V_{\text{GS}} = 18\text{V}/0\text{V} \)
- \( L = 2\text{mH} \)
Electrical characteristic curves

Fig. 22 Inverse Diode Forward Current vs. Source - Drain Voltage

- Graph shows Inverse Diode Forward Current (I_S [A]) vs. Source - Drain Voltage (V_SD [V])
- Curves for different temperatures: Ta = 175°C, Ta = 125°C, Ta = 75°C, Ta = 25°C, Ta = -25°C
- Key parameters: VGS = 0V, Pulsed

Fig. 23 Reverse Recovery Time vs. Inverse Diode Forward Current

- Graph shows Reverse Recovery Time (t_r [ns]) vs. Inverse Diode Forward Current (I_S [A])
- Key parameters: Ta = 25°C, di/dt = 290A/µs, VR = 800V, VGS = 0V, Pulsed
● Measurement circuits

Fig.1-1  Switching Time Measurement Circuit

Fig.1-2  Switching Waveforms

Fig.2-1  Gate Charge Measurement Circuit

Fig.2-2  Gate Charge Waveform

Fig.3-1  Switching Energy Measurement Circuit

Fig.3-2  Switching Waveforms

Fig.4-1  Reverse Recovery Time Measurement Circuit

Fig.4-2  Reverse Recovery Waveform
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