New Products Under Development

3rd Gen SiC MOSFET
Schematic Cross Section of SiC Trench MOSFET

Ordinary designed trench MOSFET

ROHM 3G SiC MOSFET

Conventional single-trench (Gate trench only)

Double-trench (Source trench and gate trench)

May lead to destruction of gate oxide at the bottom of the gate trench

Successfully reduced the electric field at the bottom of the gate trench
Condition: Same Vds supplied in both cases

Suppression of the electric field concentration at the bottom of the gate trench is achieved by the double trench structure of ROHM 3G SiC MOSFET.

<table>
<thead>
<tr>
<th>Eox: 35% lower</th>
<th>(MV/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>0.3</td>
<td>0.0</td>
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</tbody>
</table>

Suppression of the electric field concentration at the bottom of the gate trench is achieved by the double trench structure of ROHM 3G SiC MOSFET.
On-state Characteristics of 3G SiC Trench MOSFET

Id-Vds characteristics

- Low $\text{Ron}$ at recommended $\text{Vgs}$ of 18V
- A positive temperature-coefficient of on-resistance over $\text{Vgs}$ of 10.5V, thus lower risk of thermal runaway
Comparison of Temperature Dependency of Ron

- Compared to 2G planar MOSFET, Ron reduced by half throughout the entire temperature range.

**Ron-Temperature characteristics**

- Chip size: 13.6mm²
- Vgs = 18V
- Ron at Id = 15A
- 50% Reduction
- 1.9 times
- 75mΩ
- 40mΩ
Ciss vs Ron

The combination of Lower Ron & Ciss reduced both conduction and switching losses.

Reduction from 2G DMOS
Ciss: by 35%
Ron: by 50%
with the same chip size

Ciss: by 70% at the same Ron

The combination of Lower Ron & Ciss reduced both conduction and switching losses.
35% Lower Qg compared to ROHM 2G SiC DMOS
Switching Loss Reduction

Total switching loss reduced by 30% compared to ROHM 2G SiC MOSFET

Vdd=800V
Vgs=18V/-5V
L=500uH
Rg=0 Ω
Ta=25°C

Rated Vds of 1200V
Same chip size
Reverse Recovery Characteristics of Body-diode

Measurement condition:
- \( E = 300V \)
- \( R_g = 100\Omega \)
- \( I_d = 36A \)

Reverse recovery current of body-diode is extremely smaller than Si-MOSFETs.
## Lineup of 3G SiC MOSFET

<table>
<thead>
<tr>
<th>P/N</th>
<th>Package</th>
<th>$BV_{DSS}$</th>
<th>Vgs</th>
<th>$R_{DSon}$</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT30XXKL</td>
<td>TO247, Bare die</td>
<td>1200V</td>
<td>22V / -10V</td>
<td>22mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO247, Bare die</td>
<td>1200V</td>
<td>22V / -10V</td>
<td>30mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO247, Bare die</td>
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<td>22V / -10V</td>
<td>40mΩ</td>
<td>Under development</td>
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<td>SCT30XXAL</td>
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<td>22V / -10V</td>
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<td>22V / -10V</td>
<td>22mΩ</td>
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<tr>
<td></td>
<td>TO247, Bare die</td>
<td>650V</td>
<td>22V / -10V</td>
<td>30mΩ</td>
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</tr>
</tbody>
</table>

### Bare die

![Bare die Image](image1)

### Package

![Package Image](image2)