



RSC25R33

Silicon Carbide MOSFET 25 mΩ, 3300V, Bare Die

Description

Silicon Carbide (SiC) MOSFET uses a completely new technology that provides superior switching performance and higher reliability compared to Silicon. In addition, the low ON resistance and compact chip size ensure low capacitance and gate charge. Consequently, system benefits include highest efficiency, faster operation frequency, increased power density, reduced EMI, and reduced system size.

Features

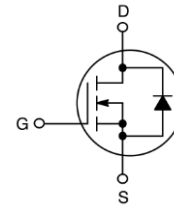
- Typ. $R_{DS(on)} = 25 \text{ m}\Omega @ V_{GS} = 18 \text{ V}$
- Low Switching Losses

Applications

- Traction Inverters
- Electric Vehicle Charging Stations
- Uninterruptible Power Supplies (UPS)
- Energy Storage Systems

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
3300 V	25 mΩ @ 18 V	100 A

N-CHANNEL MOSFET



Die Information

- **Wafer Diameter** 6inch
- **Die Size** 11068 x 8068 um
- **Metallization**
 - **Top:** AlCu 4μm
 - **Back:** TiNiAg 1um
- **Die Thickness:** 175 um
- **Gate Pad:** 607um x 613um
- **Source Pad:** 2 x (2095 x 8882) um

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THERMAL CHARACTERISTICS

Parameter	Symbol	Typ	Max	Unit
Junction-to-Case – Steady State (Note 4)	R_{SJC}	0.17	0.22	°C/W
Junction-to-Ambient – Steady State (Note 4)	R_{SJA}	–	40	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF-STATE CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0\text{ V}, I_{\text{D}} = 1\text{ mA}$	3300	–	–	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$	$I_{\text{D}} = 1\text{ mA}$, referenced to 25°C (Note 9)	–	0.3	–	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0\text{ V}, V_{\text{DS}} = 1700\text{ V}, T_J = 25^\circ\text{C}$	–	–	100	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{GS}} = +22/-10\text{ V}, V_{\text{DS}} = 0\text{ V}$	–	–	± 1	μA

ON-STATE CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_{\text{D}} = 37\text{ mA}$	2.6	2.8	3	V
Recommended Gate Voltage	V_{GOP}		–4	–	+18	V
Drain-to-Source On Resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}} = 18\text{ V}, I_{\text{D}} = 60\text{ A}, T_J = 25^\circ\text{C}$	–	25	35	m Ω
		$V_{\text{GS}} = 18\text{ V}, I_{\text{D}} = 60\text{ A}, T_J = 175^\circ\text{C}$ (Note 9)	–	38	–	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 10\text{ V}, I_{\text{D}} = 75\text{ A}$ (Note 9)	–	57	–	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0\text{ V}, f = 1\text{ MHz}, V_{\text{DS}} = 2640\text{ V}$ (Note 9)	–	8700	–	pF
Output Capacitance	C_{OSS}		–	194	–	
Reverse Transfer Capacitance	C_{RSS}		–	11	–	
Total Gate Charge	$Q_{\text{G(TOT)}}$	$V_{\text{GS}} = -4/18\text{ V}, V_{\text{DS}} = 2640\text{ V}, I_{\text{D}} = 75\text{ A}$ (Note 9)	–	410	–	nC
Threshold Gate Charge	$Q_{\text{G(TH)}}$		–	120	–	
Gate-to-Source Charge	Q_{GS}		–	138	–	
Gate-to-Drain Charge	Q_{GD}		–	131	–	
Gate-Resistance	R_{G}	$f = 1\text{ MHz}$	–	1	–	Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{\text{d(ON)}}$	$V_{\text{GS}} = -4/18\text{ V}, V_{\text{DS}} = 2640\text{ V}, I_{\text{D}} = 75\text{ A}, R_{\text{G}} = 4.7\text{ }\Omega$ Inductive load (Notes 8, 9)	–	TBD	–	ns
Rise Time	t_{r}		–	TBD	–	
Turn-Off Delay Time	$t_{\text{d(OFF)}}$		–	TBD	–	
Fall Time	t_{f}		–	TBD	–	
Turn-On Switching Loss	E_{ON}		–	TBD	–	μJ
Turn-Off Switching Loss	E_{OFF}		–	TBD	–	
Total Switching Loss	E_{tot}		–	TBD	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Continuous Source-Drain Diode Forward Current	I_{SD}	$V_{\text{GS}} = -5\text{ V}, T_C = 25^\circ\text{C}$ (Note 9)	–	TBD	–	A
Pulsed Source-Drain Diode Forward Current (Note 5)	I_{SDM}		–	TBD	–	
Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = -5\text{ V}, I_{\text{SD}} = 40\text{ A}, T_J = 25^\circ\text{C}$	–	3.5	–	V

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ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SOURCE-DRAIN DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	$V_{GS} = -4/+18\text{ V}$, $I_{SD} = 75\text{ A}$, $dI_S/dt = 15500\text{ A}/\mu\text{s}$, $V_{DS} = 2310\text{ V}$ (Note 9)	-	35	-	ns
Reverse Recovery Charge	Q_{RR}		-	4400	-	nC
Reverse Recovery Energy	E_{REC}		-		-	μJ
Peak Reverse Recovery Current	I_{RRM}		-	210	-	A
Charge Time	T_A		-		-	ns
Discharge Time	T_B		-		-	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- 1 Based on TO-247 package
- 2 Tested 100% on wafer
- 3 Sawn-on-film frame packing based on wafer tested
- 4 The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 5 Repetitive rating, limited by max junction temperature.
- 6 The maximum current rating is based on typical $R_{DS(on)}$ performance.
- 7 EAS of 800 mJ is based on starting $T_J = 25^\circ\text{C}$; $L = 1\text{ mH}$, $I_{AS} = 40\text{ VDD} = 100\text{ V}$, $V_{GS} = 18\text{ V}$.
- 8 E_{ON}/E_{OFF} result is with body diode.
- 9 Defined by design, not subject to production test.

Die Layout

