

SuperQ™ 200V N-Channel Power MOSFET

FEATURES

- Industry leading $R_{DS(on)}$ in QDPAK package
- High short-circuit withstand capability (SCWC)
- 100% UIS tested in production
- Low switching losses, Q_{sw} and E_{oss}
- Easier parallelling with $\pm 0.5V$ gate threshold

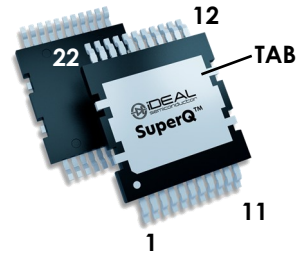
APPLICATIONS

- Motor control
- Boost converters and SMPS control FETs
- Secondary side synchronous rectifier

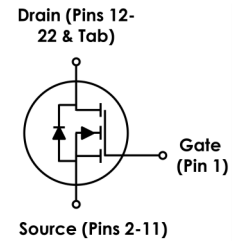
DESCRIPTION

Engineered for high-efficiency SMPS and motor drives, this 200V SuperQ MOSFET delivers ultra-low conduction and switching losses in a robust QDPAK package. Featuring best-in-class $R_{DS(on)}$ and Q_{sw} , it minimizes heat dissipation at both full and partial loads.

PRODUCT SUMMARY



QDPAK



Parameter	Value	Unit
$T_A = 25^\circ C$		
V_{DS}	200	V
$R_{DS(on),max}$	2.3	m Ω
I_D	369	A
Q_G	285	nC
Q_{sw}	20	nC
E_{oss}	10	μJ



ORDERING INFORMATION

Part Number	Package	Marking	Packaging
iS20M2R3S1QD	QDPAK	iS20M2R3S1	750pc Reel

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER ($T_A = 25^\circ C$ unless otherwise specified)	VALUE	UNIT
V_{GS}	Gate-to-source voltage	± 20	V
I_D	Continuous drain current (silicon limited), $T_C = 25^\circ C$	369	A
	Continuous drain current (silicon limited), $T_C = 100^\circ C$	261	
I_{DM}	Pulsed drain current	1,168	A
P_D	Power dissipation, $T_C = 25^\circ C$	750	W
T_J, T_{stg}	Operating junction, storage temperature	-55 to 175	$^\circ C$
E_{AS}	Avalanche energy, single pulse $I_D = 28.8A, R_{GS} = 25\Omega$	4,147	mJ

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER ($T_A = 25^\circ C$ unless otherwise specified)	VALUE			UNIT
		MIN	TYP	MAX	
$R_{\theta JC}$	Junction-to-case thermal resistance - QDPAK	-	-	0.2	$^\circ C/W$
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	-	-	60	$^\circ C/W$

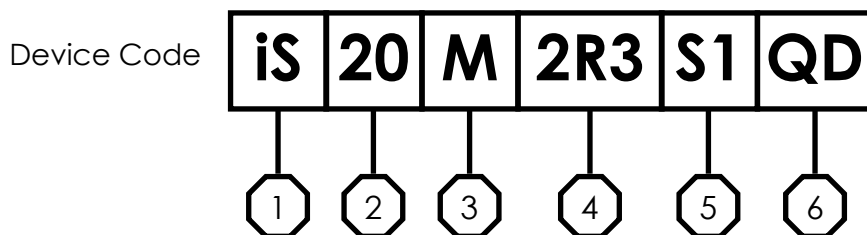
(1) 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.







ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise specified)						
SYMBOL	PARAMETER	TEST CONDITIONS	VALUE			UNIT
			MIN	TYP	MAX	
STATIC CHARACTERISTICS						
BV_{DSS}	Drain-to-source voltage	$V_{GS} = 0V, I_D = 1mA$	200	-	-	V
I_{DSS}	Drain-to-source leakage current	$V_{GS} = 0V, V_{DS} = 160V, T_J = 25^\circ\text{C}$	-	0.1	1	μA
		$V_{GS} = 0V, V_{DS} = 160V, T_J = 125^\circ\text{C}^{(2)}$	-	-	100	
I_{GSS}	Gate-to-source leakage current	$V_{DS} = 0V, V_{GS} = 20V$	-	1	100	nA
$V_{GS(th)}$	Gate-to-source threshold voltage	$V_{DS} = V_{GS}, I_D = 735\mu\text{A}$	3.1	3.5	4.1	V
$R_{DS(on)}$	Drain-to-source on-resistance	$V_{GS} = 10V, I_D = 49A$	-	2.1	2.3	m Ω
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance ⁽²⁾	$V_{GS} = 0V, V_{DS} = 100V, f = 100\text{kHz}$	-	18,719	24,335	pF
C_{rss}	Reverse transfer capacitance ⁽²⁾		-	115	149	
C_{oss}	Output capacitance ⁽²⁾		-	712	926	
$C_{o(er)}$	Effective output capacitance	$V_{DS} = 0 \text{ to } 100V, V_{GS} = 0V$	-	2,063	-	
R_G	Series gate resistance	$f = 1\text{MHz}$	-	1	2	Ω
$t_{d(on)}$	Turn-on delay time	$V_{DS} = 100V, V_{GS} = 10V, I_{DS} = 49A,$ $R_{G,EXT} = 0 \Omega$	-	TBD	-	ns
t_r	Rise time		-	TBD	-	
$t_{d(off)}$	Turn-off delay time		-	TBD	-	
t_f	Fall time		-	TBD	-	
GATE CHARGE CHARACTERISTICS						
Q_g	Gate charge total ⁽²⁾	$V_{DS} = 100V, I_D = 49A,$ $V_{GS} = 0 \text{ to } 10V$	-	285	374	nC
Q_{sw}	Switching charge ⁽³⁾		-	20	-	
Q_{gd}	Gate to drain charge ⁽²⁾⁽³⁾		-	9.8	13	
$Q_{g(th)}$	Gate charge at threshold		-	62	-	
Q_{gs2}	Gate to source charge ⁽³⁾		-	9.8	-	
$V_{plateau}$	Gate plateau voltage		-	5.5	-	V
Q_{oss}	Output charge ⁽²⁾	$V_{DS} = 0 \text{ to } 100V, V_{GS} = 0V$	-	875	1,138	nC
E_{oss}	Capacitive stored energy		-	10	-	μJ
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	$I_{SD} = 49A, V_{GS} = 0V$	-	0.9	1.2	V
Q_{rr}	Reverse recovery charge	$V_{DS} = 100V, I_F = 49A,$	-	1.2	-	μC
t_{rr}	Reverse recovery time	$di/dt = 100A/\mu\text{s}$	-	200	-	ns

(2) Defined by design. Not subject to production test.

(3) Q_{sw} should be used for switching loss calculations. See Figure 16 for gate charge definitions. For more information see Q_{sw} application note on www.idealsemi.com

DEVICE DECODER RING



-  1 — iDEAL Semiconductor product
-  2 — Voltage rating divided by 10 (200V)
-  3 — M = N-Channel MOSFET, Standard Threshold
-  4 — Maximum drain-to-source resistance
-  5 — SuperQ™ Generation
-  6 — QD = QDPAK

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