SuperQ™ 200-V N-Channel Power MOSFET

FEATURES

- Wide SOA and current capability
- Robustness under fault conditions
- Optimized linear mode operation
- Efficiency under normal operation (low $R_{DS(on)}$, Q_{SW}, E_{OSS})

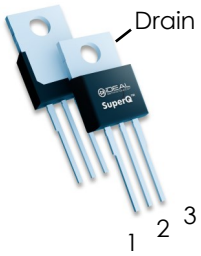
APPLICATIONS

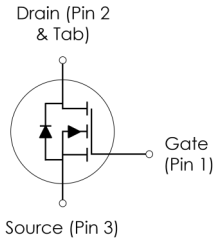
- Motor control
- Boost converters and SMPS control FETs
- Secondary side synchronous rectifier

DESCRIPTION

Engineered for high-efficiency motor drives, this 200V SuperQ MOSFET delivers ultra-low conduction and switching losses in a robust TO-220 package. Featuring best-in-class $R_{DS(on)}$ and Q_{SW}, it minimizes heat dissipation at both full and partial loads.

PRODUCT SUMMARY





TO-220

Parameter T_A = 25°C	Value	Unit
V_{DS}	200	V
$R_{DS(on),max}$	6.3	mΩ
I_D	141	A
Q_G	116	nC
Q_{SW}	12.4	nC
E_{OSS}	4.2	µJ

Pb

HAL

RoHS

ORDERING INFORMATION			
Part Number	**Package**	**Marking**	**Packaging**
iS20M6R3S1P	TO-220	iS20M6R3S1P	50pc Tube

ABSOLUTE MAXIMUM RATINGS			
SYMBOL	**PARAMETER** (T_A = 25°C unless otherwise specified)	**VALUE**	**UNIT**
V_{GS}	Gate-to-source voltage	± 20	V
I_D	Continuous drain current (silicon limited), T_C = 25°C	141	A
	Continuous drain current (silicon limited), T_C = 100°C	100	
I_{DM}	Pulsed drain current	561	A
P_D	Power dissipation, T_C = 25°C	300	W
T_J, T_{stg}	Operating junction, storage temperature	-55 to 175	°C
E_{AS}	Avalanche energy, single pulse I_D = 84A, R_{GS} = 25Ω	350	mJ

THERMAL CHARACTERISTICS					
SYMBOL	**PARAMETER** (T_A = 25°C unless otherwise specified)	**VALUE**			**UNIT**
		MIN	**TYP**	**MAX**	
$R_{\theta JC}$	Junction-to-case thermal resistance - TO-220	-	-	0.5	°C/W
$R_{\theta JA}$	Junction-to-ambient thermal resistance (1)	-	-	50	°C/W

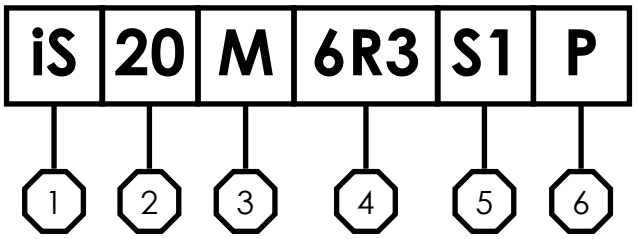
(1) 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

ELECTRICAL CHARACTERISTICS (T_A = 25°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°C	-	0.1	1	µA
		V_{GS} = 0V, V_{DS} = 160V, T_J = 125°C (2)	-	-	100	
I_{GSS}	Gate-to-source leakage current	V_{DS} = 0V, V_{GS} = 20V	-	30	100	nA
$V_{GS(th)}$	Gate-to-source threshold voltage	V_{DS} = V_{GS}, I_D = 300µA	2.8	3.5	4.2	V
$R_{DS(on)}$	Drain-to-source on-resistance	V_{GS} = 10V, I_D = 30A	-	5.5	6.3	mΩ
g_{fs}	Transconductance	V_{DS} = 10V, I_D = 30A	68	136	-	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance (2)	V_{GS} = 0V, V_{DS} = 100V, f = 100kHz	-	7,607	10,042	pF
C_{rss}	Reverse transfer capacitance (2)		-	47	61	
C_{oss}	Output capacitance (2)		-	289	376	
$C_{o(er)}$	Effective output capacitance	V_{DS} = 0 to 100V, V_{GS} = 0V	-	838	-	
R_G	Series gate resistance	f = 1MHz	-	1.2	1.8	Ω
$t_{d(on)}$	Turn-on delay time	V_{DS} = 100V, V_{GS} = 10V, I_{DS} = 30A, $R_{G,EXT}$ = 0 Ω	-	TBD	-	ns
t_r	Rise time		-	TBD	-	
$t_{d(off)}$	Turn-off delay time		-	TBD	-	
t_f	Fall time		-	TBD	-	
GATE CHARGE CHARACTERISTICS						
Q_{gs}	Gate to source charge	V_{DS} = 100V, I_D = 30A, V_{GS} = 0 to 10V	-	60	-	nC
Q_g	Gate charge total (2)		-	116	152	
Q_{sw}	Switching charge (3)		-	12.4	-	
Q_{gd}	Gate to drain charge (2)		-	22	32	
$Q_{g(th)}$	Gate charge at threshold		-	27	-	
$V_{plateau}$	Gate plateau voltage		-	5.5	-	V
Q_{oss}	Output charge (2)	V_{DS} = 0 to 100V, V_{GS} = 0V	-	356	458	nC
E_{oss}	Capacitive stored energy		-	4.2	-	µJ
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = 30A, V_{GS} = 0V	-	1.1	1.3	V
Q_{rr}	Reverse recovery charge	V_{DS} = 100V, I_F = 30A, di/dt = 100A/µs	-	1.1	-	µC
t_{rr}	Reverse recovery time		-	244	-	ns

(2) Defined by design. Not subject to production test.
(3) Q_{SW} should be used for switching loss calculations. See Q_{SW} application note on www.idealsemi.com

DEVICE DECODER RING

Device Code



1 – iDEAL Semiconductor product

2 – Voltage rating divided by 10 (200V)

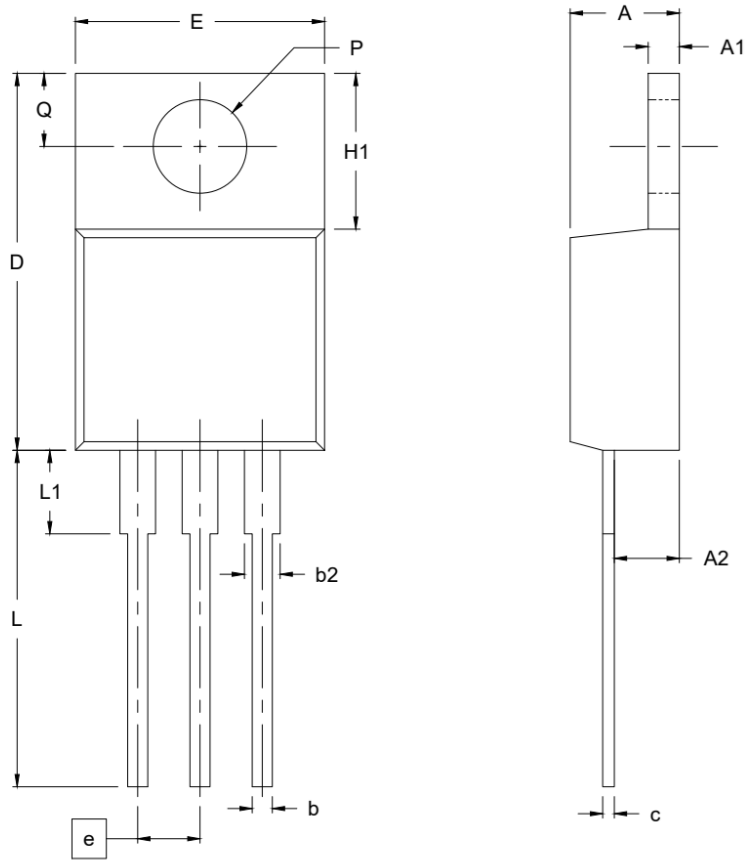
3 – M = N-Channel MOSFET, Standard Threshold

4 – Maximum drain-to-source resistance

5 – SuperQ™ Generation

6 – P = TO-220

TO-220 Package Drawing



SYMBOL	MIN	MAX
A	4.19	4.82
A1	1.14	1.40
A2	2.38	2.92
b	0.63	1.01
b2	1.13	1.78
c	0.31	0.64
D	14.22	16.51
E	9.66	10.66
e	2.54 BSC	
H1	5.85	6.85
L	12.70	14.73
L1	2.39	4.42
P	3.54	4.08
Q	2.54	3.42

Notes:
1. All linear dimensions in millimeters
2. Dimensions D and E do not include mold flash or protrusions

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