

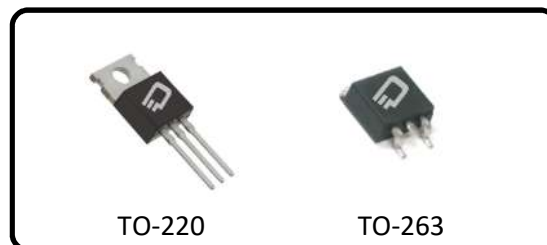
650V, 380mΩ, 8.5A N-Channel Enhancement Mode Super Junction Power MOSFET

Ordering Information

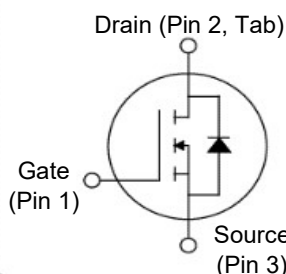
Part Number	Package Option
D3S380N65B-U	TO-220
D3S380N65E-U	TO-263

Description

+FET[™] is an advanced Super Junction Power MOSFET offering excellent efficiency through low R_{DS-ON} and low gate charge. +FET[™] is a rugged device with precision charge balance implementation designed for demanding uses such as enterprise power computing power supplies, motor control, lighting and other challenging power conversion applications.



Device Schematic



Features

- LOW $R_{DS(ON)}$
- FAST SWITCHING
- HIGH E_{AS}
- REL TEST SPEC: JESD-22
- HTRB >3000 HRS

Benefits

- LOW CONDUCTION LOSSES
- HIGH EFFICIENCY
- EXCELLENT AVALANCHE PERFORMANCE

Table 1 Key Maximum Parameters

Parameter	Value	Unit
$V_{DSS} @ T_{jmax}$	710	V
$R_{DS(on)} max$	< 380	mΩ
$Q_g typ$	16	nC
$I_{Dmax} @ 25\text{ }^{\circ}\text{C}$	13.9	A

Applications

- POWER FACTOR CORRECTION
- SERVER POWER SUPPLIES
- TELECOM POWER SUPPLIES
- INVERTERS
- MOTOR CONTROL

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1. Maximum Ratings

Table 2 Maximum Ratings

@ T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Continuous drain current	I _D			5.4	A	T _C = 100°C
				8.5	A	T _C = 25°C
Pulsed drain current	I _{D, pulse}			34	A	T _C = 25°C
Avalanche energy, single pulse	E _{AS}			304	mJ	I _D = 3.5A; V _{DD} = 50V, V _{GS} = 10V, L=50mH, RG=25 Ohms
Avalanche energy, repetitive	E _{AR}			0.456	mJ	I _D = 1.5; V _{DD} = 50V
Avalanche current, single pulse	I _{AS}			1.34	A	
MOSFET dv/dt ruggedness	dv/dt			50	V/ns	V _{DS} = 0...480V
Gate source voltage (static)	V _{GS}	-30		30	V	Static
Gate source voltage (dynamic)	V _{GS}	-30		30	V	AC (F>1Hz)
Power dissipation	P _{tot}			62	W	TO-220, TO-263, T _C = 25°C
Storage temperature	T _{stg}	-55		150	°C	
Operating junction temperature	T _j	-55		150	°C	
Mounting torque				60	N-cm	M3 and M3.5 screws
Continuous diode forward current	I _{SD}			8.5	A	T _C = 25°C
Diode pulse current	I _{S, pulse}			34	A	T _C = 25°C
Reverse diode dv/dt	dv/dt			15	V/ns	V _{DS} =0...480V, I _{SD} <=I _S , T _j = 25°C
Maximum diode commutation speed	di/dt			500	A/μs	V _{DS} =0...480V, I _{SD} <=I _S , T _j = 25°C

2. Thermal Characteristics

Table 3 Thermal Characteristics

Symbol	Parameter	Values				Unit
		TO-220	TO-220FP	TO-263	TO-247	
R_{th-jc}	Thermal resistance, junction-case	2.0	8.2	2.0	TBD	°C/W
R_{th-jA}	Thermal resistance, junction-ambient	65	65	65	TBD	°C/W
T_s	Soldering temperature, wave soldering only allowed at leads	260	260	260	TBD	°C

3. Electrical Characteristics

@ $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 4 Static Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Drain-source breakdown voltage	$V_{(BR)DSS}$	650			V	$I_D = 1\text{mA}$, $V_{GS} = 0\text{V}$
Gate threshold voltage	$V_{GS(TH)}$	2.3	3	3.7	V	$V_{DS} = V_{GS}$, $I_D = 47\mu\text{A}$
Zero gate voltage drain current	I_{DSS}			1	μA	$V_{DS} = 650\text{V}$, $T_C = 25^\circ\text{C}$, $V_{GS} = 0\text{V}$
				50		$V_{DS} = 650\text{V}$, $T_C = 125^\circ\text{C}$, $V_{GS} = 0\text{V}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS} = \pm 30\text{V}$, $V_{DS} = 0\text{V}$
Drain-source on-state resistance	$R_{DS(on)}$		0.35	0.38	Ω	$V_{GS} = 10\text{V}$, $I_D = 4.3\text{A}$, $T_j = 25^\circ\text{C}$
			0.86		Ω	$V_{GS} = 10\text{V}$, $I_D = 4.3\text{A}$, $T_j = 150^\circ\text{C}$
Gate resistance***	R_G		1		Ω	

Table 5 Dynamic Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Input capacitance	C_{iss}		777		pF	$V_{DS} = 100\text{V}$, $f = 1\text{MHz}$, $V_{GS} = 0\text{V}$
Output capacitance	C_{oss}		26.2		pF	
Reverse transfer capacitance	C_{rss}		7.4		pF	
Turn-on delay time	$t_{d(on)}$		10.5		ns	$V_{DD} = 400\text{V}$, $I_D = 4.3\text{A}$, $R_G = 1\Omega$, $V_{GS} = 10\text{V}$
Rise time	t_r		20		ns	
Turn-off delay time	$t_{d(off)}$		35		ns	
Fall time	t_f		21		ns	

Table 6 Gate Charge Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Gate to source charge	Q_{gs}		3.1		nC	$V_{DD} = 480\text{V}$, $I_D = 4.3\text{A}$, $V_{GS} = 0\text{ to }10\text{V}$
Gate to drain charge	Q_{gd}		5.8		nC	
Gate charge total	Q_g		15.4		nC	
Gate plateau voltage	$V_{plateau}$		5		V	

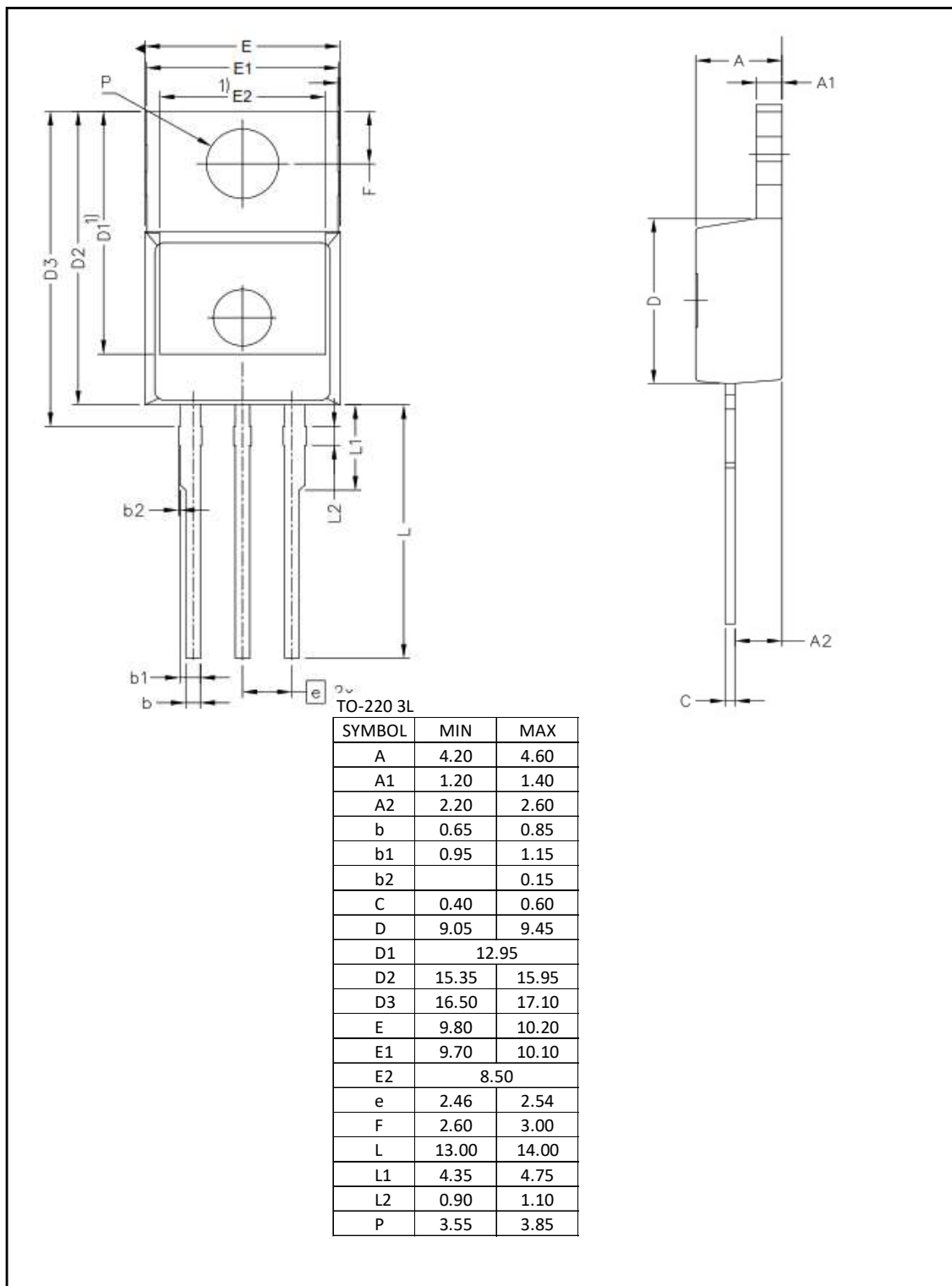
Table 7 Reverse Diode Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Diode source-drain current	I_{SD}			8.5	A	
Diode forward voltage	V_{fd}		0.95	1.5	V	$I_{SD} = 8.5A$, $V_{GS} = 0V$, $T_J = 25^{\circ}C$
Reverse recovery time	t_{rr}		244		ns	$I_F = 8.5A$, $L = 5mH$ $di/dt = 100A/\mu S$ $V_{DD} = 60V$, $T_J = 25^{\circ}C$
Reverse recovery charge	Q_{rr}		3.1		μC	
Peak reverse recovery current	I_{rrm}		14.6		A	

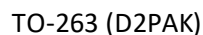
4. Package Outlines

4a) TO-220

D3 Semiconductor TO-220-3L



D3 Semiconductor TO-263 (D2PAK)



SYMBOL	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.7	0.9
b1	0.51	0.89
b2	1.2	1.46
b3	1.17	1.37
c	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.6	9
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
e	2.46	2.54
H	15	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25 TYP	
L4	4.78	5.28
J1	2.56	2.96

5. Revision History

Revision	Release Date	Comments
1.0	1-November-2016	Preliminary Datasheet Release
1.1	1-July-2017	Updated tables and package information

6. Resources

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