

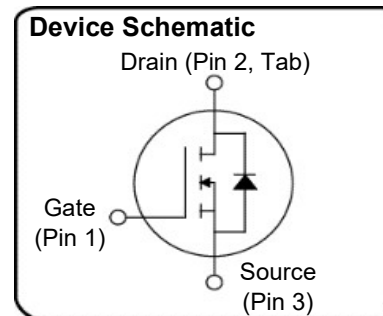
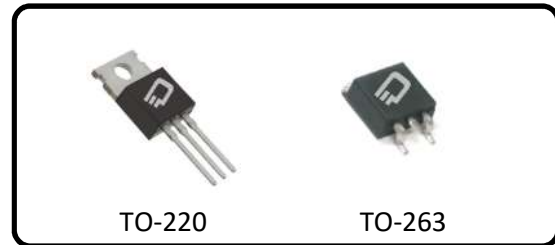
650V, 380mΩ, 8.5A N-Channel Enhancement Mode Super Junction Power MOSFET

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.



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 °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

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

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Continuous drain current	I_D			5.4	A	$T_c = 100^\circ\text{C}$
				8.5	A	$T_c = 25^\circ\text{C}$
Pulsed drain current	$I_{D, \text{pulse}}$			34	A	$T_c = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}			304	mJ	$I_D = 3.5\text{A}; V_{DD} = 50\text{V}, V_{GS} = 10\text{V}, L=50\text{mH}, R_G=25\text{ Ohms}$
Avalanche energy, repetitive	E_{AR}			0.456	mJ	$I_D = 1.5; V_{DD} = 50\text{V}$
Avalanche current, single pulse	I_{AS}			1.34	A	
MOSFET dv/dt ruggedness	dv/dt			50	V/ns	$V_{DS} = 0 \dots 480\text{V}$
Gate source voltage (static)	V_{GS}	-30		30	V	Static
Gate source voltage (dynamic)	V_{GS}	-30		30	V	AC ($F > 1\text{Hz}$)
Power dissipation	P_{tot}			62	W	TO-220, TO-263, $T_c = 25^\circ\text{C}$
Storage temperature	T_{stg}	-55		150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55		150	$^\circ\text{C}$	
Mounting torque				60	N-cm	M3 and M3.5 screws
Continuous diode forward current	I_{SD}			8.5	A	$T_c = 25^\circ\text{C}$
Diode pulse current	$I_{S, \text{pulse}}$			34	A	$T_c = 25^\circ\text{C}$
Reverse diode dv/dt	dv/dt			15	V/ns	$V_{DS}=0 \dots 480\text{V}, I_{SD} \leq I_S, T_j = 25^\circ\text{C}$
Maximum diode commutation speed	di/dt			500	A/ μs	$V_{DS}=0 \dots 480\text{V}, I_{SD} \leq I_S, T_j = 25^\circ\text{C}$

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°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 = 1mA, V _{GS} = 0V
Gate threshold voltage	V _{GS(TH)}	2.3	3	3.7	V	V _{DS} = V _{GS} , I _D = 47uA
Zero gate voltage drain current	I _{DSS}			1	μA	V _{DS} = 650V, T _C = 25°C, V _{GS} = 0V
				50		V _{DS} = 650V, T _C = 125°C, V _{GS} = 0V
Gate-source leakage current	I _{GSS}			100	nA	V _{GS} = ±30V, V _{DS} = 0V
Drain-source on-state resistance	R _{DS(on)}		0.35	0.38	Ω	V _{GS} = 10V, I _D = 4.3 A, T _J = 25°C
			0.86		Ω	V _{GS} = 10V, I _D = 4.3 A, T _J = 150°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} = 100V, f = 1MHz, V _{GS} = 0V
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} = 400V, I _D = 4.3A R _G = 1Ω, V _{GS} = 10V
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} = 480V, I _D = 4.3A, V _{GS} = 0 to 10V
Gate to drain charge	Q _{gd}		5.8		nC	
Gate charge total	Q _g		15.4		nC	
Gate plateau voltage	V _{plateau}		5		V	

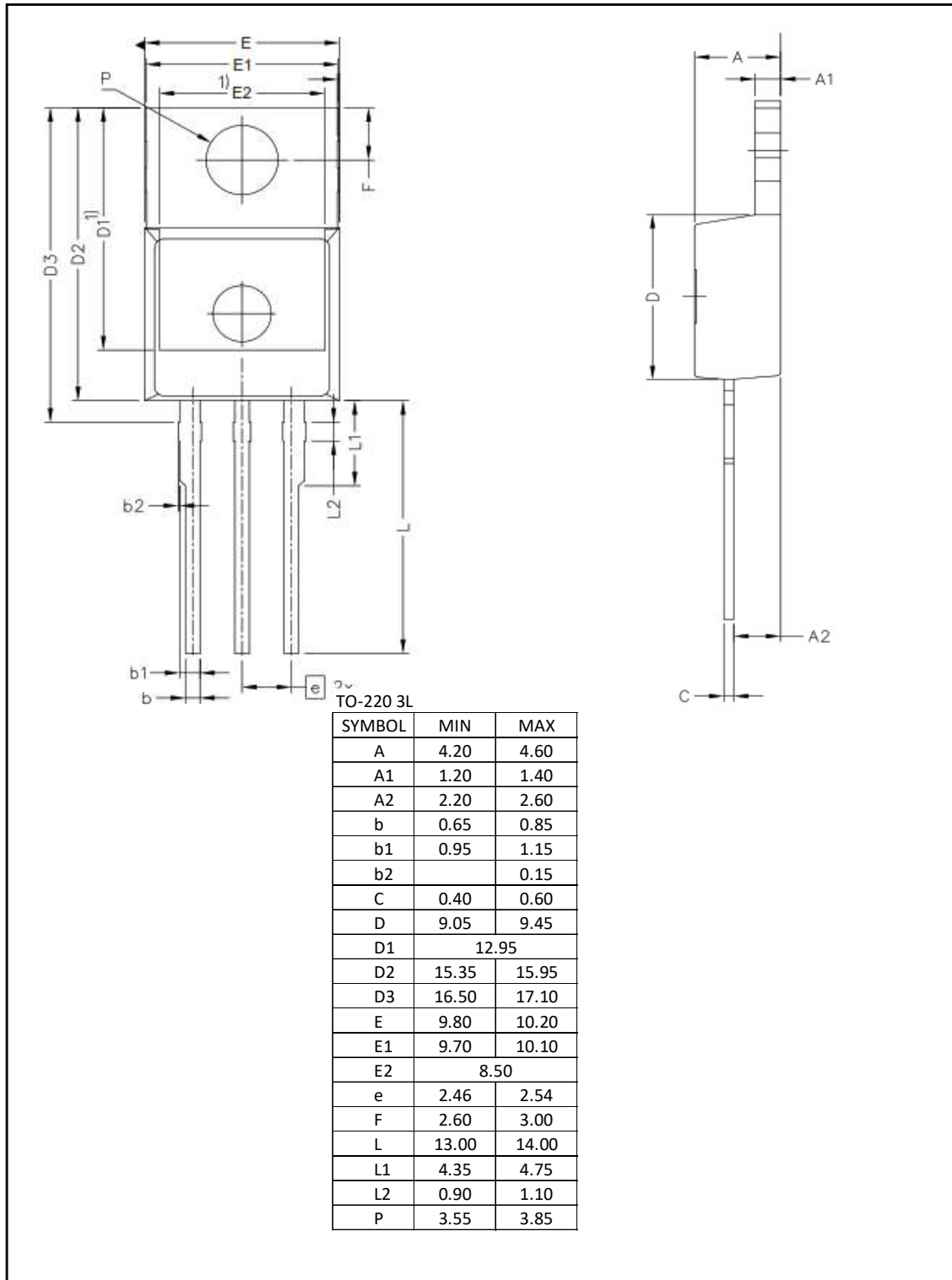
Table 7 Reverse Diode Characteristics

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

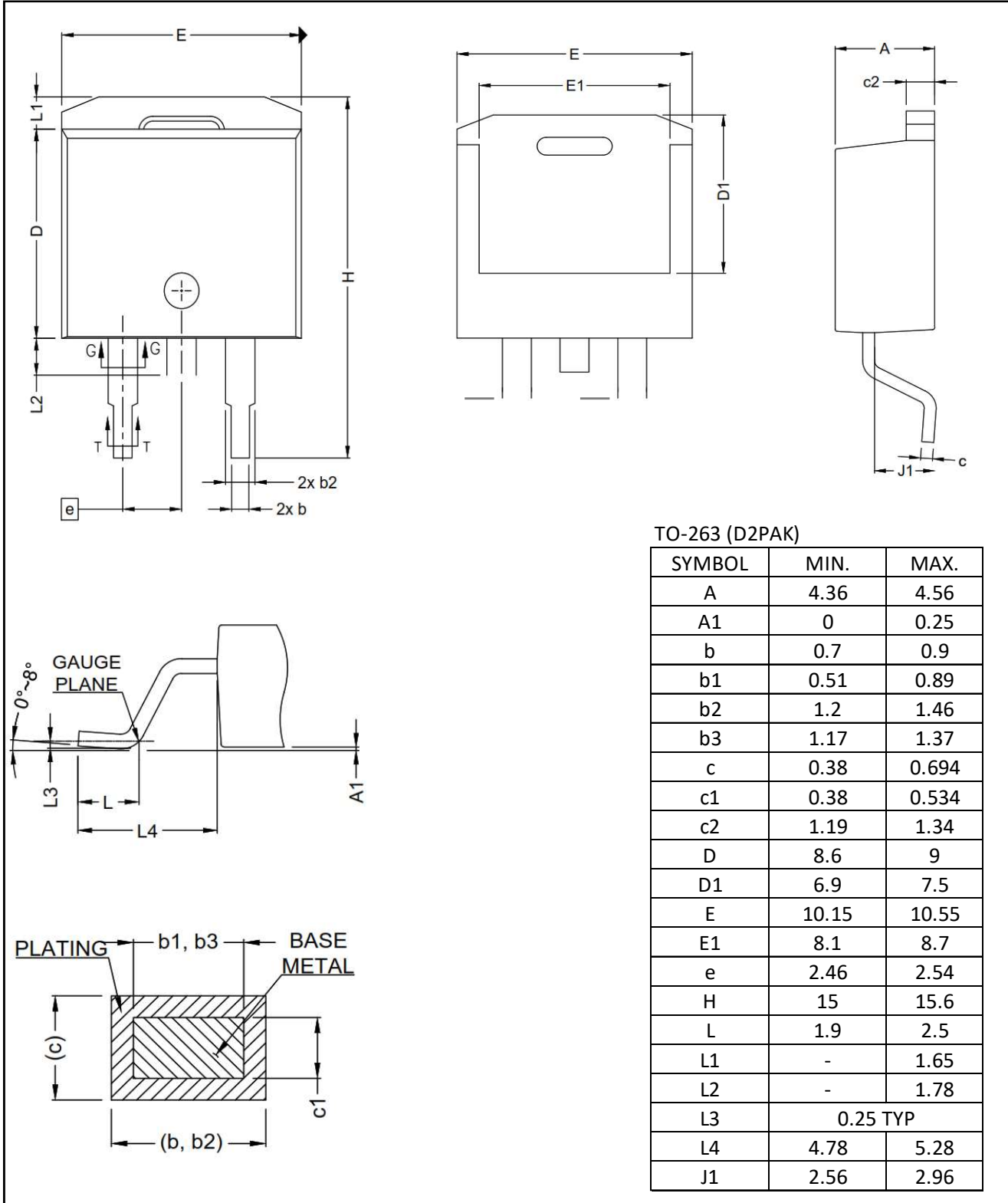
4a) TO-220

D3 Semiconductor TO-220-3L



4b) TO-263

D3 Semiconductor TO-263 (D2PAK)



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

www.d3semi.com

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