

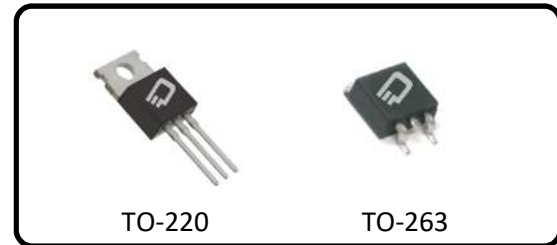
650V, 280mΩ, 11.6A N-Channel Enhancement Mode Super Junction Power MOSFET

Ordering Information

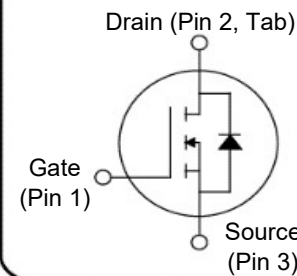
Part Number	Package Option
D3S280N65B-U	TO-220
D3S280N65E-U	TO-263

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 Parameters

Parameter	Value	Unit
$V_{DSS} @ T_{jmax}$	710	V
$R_{DS(on)} max$	< 280	mΩ
$Q_g typ$	22	nC
$I_{Dmax} @ 25 °C$	19.0	A

Applications

- POWER FACTOR CORRECTION
- SERVER POWER SUPPLIES
- TELECOM POWER SUPPLIES
- INVERTER WELDERS
- 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			7.3	A	$T_c = 100^\circ\text{C}$
				11.6	A	$T_c = 25^\circ\text{C}$
Pulsed drain current	$I_{D, \text{pulse}}$			46	A	$T_c = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}			260	mJ	$I_D = 5.1\text{A}$; $V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $L=10\text{mH}$, $R_G=25\text{ Ohms}$
Avalanche energy, repetitive	E_{AR}			0.39	mJ	$I_D = 2.0$; $V_{DD} = 50\text{V}$
Avalanche current, single pulse	I_{AS}			1.8	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}			91	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}			11.6	A	$T_c = 25^\circ\text{C}$
Diode pulse current	$I_{S, \text{pulse}}$			46	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			300	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	1.48	5.9	1.48	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	$V_{DS} = V_{GS}$, $I_D = 72\mu\text{A}$
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	$R_{DS(on)}$		0.26	0.28	Ω	$V_{GS} = 10\text{V}$, $I_D = 5.8\text{A}$, $T_j = 25^\circ\text{C}$
			0.63		Ω	$V_{GS} = 10\text{V}$, $I_D = 5.8\text{A}$, $T_j = 150^\circ\text{C}$
Gate resistance	R_G		1		Ω	

Table 5 Dynamic Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Input capacitance	C_{iss}		940		pF	$V_{DS} = 100\text{V}$, $f = 1\text{MHz}$, $V_{GS} = 0\text{V}$
Output capacitance	C_{oss}		39.7		pF	
Reverse transfer capacitance	C_{rss}		7.6		pF	
Turn-on delay time	$t_{d(on)}$		5		ns	$V_{DD} = 400\text{V}$, $I_D = 4.5\text{A}$, $R_G = 3.4\Omega$, $V_{GS} = 13\text{V}$
Rise time	t_r		5		ns	
Turn-off delay time	$t_{d(off)}$		48		ns	
Fall time	t_f		27		ns	

Table 6 Gate Charge Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Gate to source charge	Q_{gs}		4.4		nC	$V_{DD} = 480\text{V}$, $I_D = 5.8\text{A}$, $V_{GS} = 0$ to 10V
Gate to drain charge	Q_{gd}		8.4		nC	
Gate charge total	Q_g		22.2		nC	
Gate plateau voltage	$V_{plateau}$		5		V	

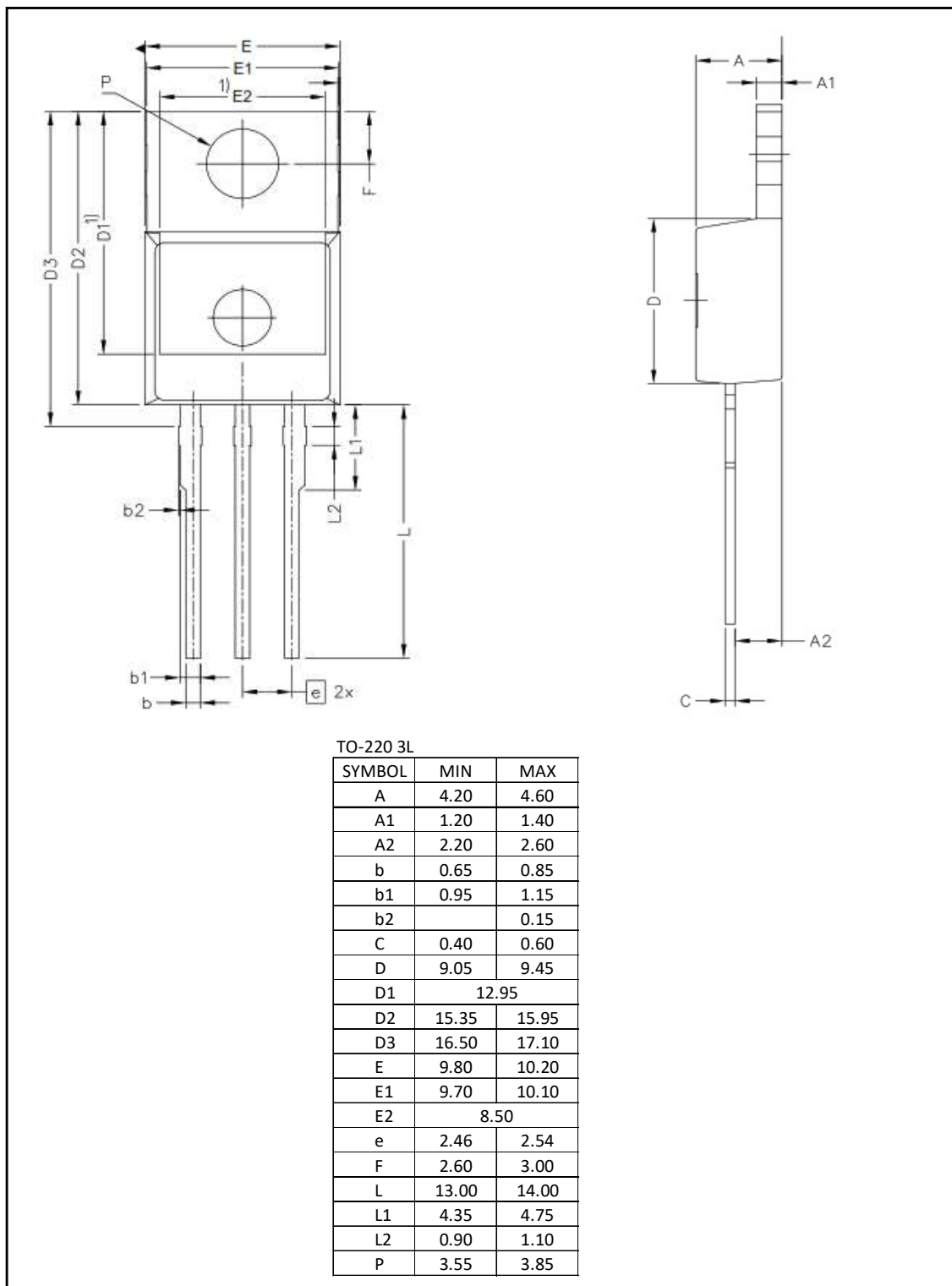
Table 7 Reverse Diode Characteristics

Parameter	Symbol	Values			Unit	Condition
		Min	Typ	Max		
Diode source-drain current	I_{SD}			11.6	A	
Diode forward voltage	V_{fd}		0.95	1.5	V	$I_{SD} = 11.6A$, $V_{GS} = 0V$, $T_J = 25^{\circ}C$
Reverse recovery time	t_{rr}		219		ns	$I_F = 11.6A$, $L = 5mH$ $di/dt = 100A/\mu S$ $V_{DD} = 60V$, $T_J = 25^{\circ}C$
Reverse recovery charge	Q_{rr}		2.0		μC	
Peak reverse recovery current	I_{rrm}		16.9		A	

4. Package Outlines

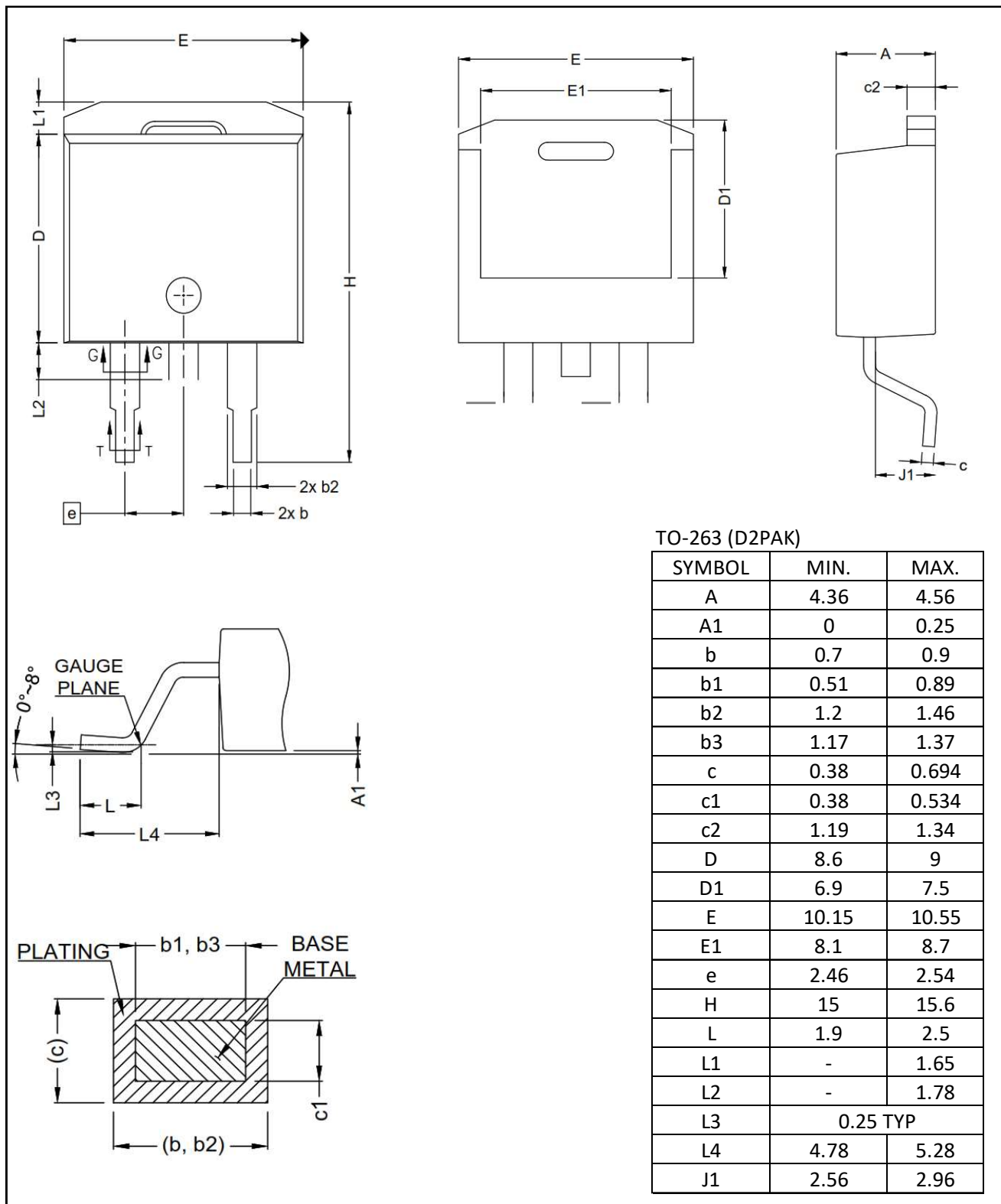
4a) TO-220

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 data tables and package information

6. Resources

www.d3semi.com

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