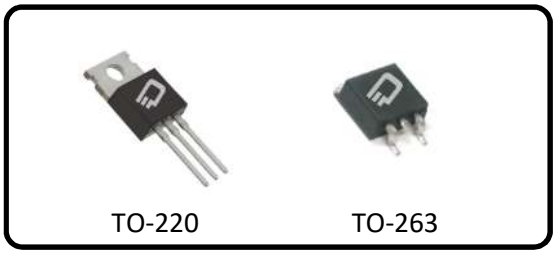
D3 SEMICONDUCTOR®
DEFINING PRECISION POWER

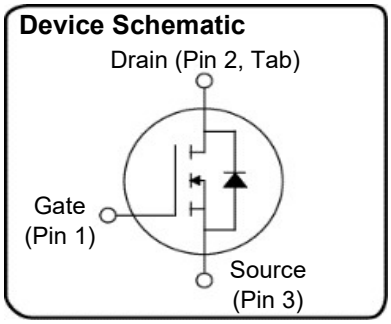
+FET™
D3S380N65x

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 Rds-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
RDS(on) max	< 380	mΩ
Qg typ	16	nC
I_{Dmax} @ 25 ºC	13.9	A

Applications

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

Contents

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 = 100ºC
				8.5	A	T_c = 25ºC
Pulsed drain current	$I_{D, pulse}$			34	A	T_c = 25ºC
Avalanche energy, single pulse	E_{AS}			304	mJ	I_D = 3.5A; V_{DD} = 50V, VGS = 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 = 25ºC
Storage temperature	T_{stg}	-55		150	ºC	
Operating junction temperature	T_j	-55		150	ºC	
Mounting torque				60	N-cm	M3 and M3.5 screws
Continuous diode forward current	I_{SD}			8.5	A	Tc = 25ºC
Diode pulse current	$I_{S, pulse}$			34	A	Tc = 25ºC
Reverse diode dv/dt	dv/dt			15	V/ns	V_{DS}=0…480V, I_{SD}<=I_S, T_j = 25ºC
Maximum diode commutation speed	di_f/dt			500	A/µs	V_{DS}=0…480V, I_{SD}<=I_S, T_j = 25ºC

2. Thermal Characteristics

Table 3 Thermal Characteristics

Symbol	Parameter	Values				Unit
		TO-220	TO-220FP	TO-263	TO-247	
$R_{th\text{-}jC}$	Thermal resistance, junction-case	2.0	8.2	2.0	TBD	ºC/W
$R_{th\text{-}jA}$	Thermal resistance, junction-ambient	65	65	65	TBD	ºC/W
T_S	Soldering temperature, wave soldering only allowed at leads	260	260	260	TBD	ºC

3. Electrical Characteristics

@ T_j = 25ºC, 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 = 25ºC, V_{GS} = 0V
				50		V_{DS} = 650V, T_C = 125ºC, 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 = 25ºC
			0.86		Ω	V_{GS} = 10V, I_D = 4.3 A, T_J = 150ºC
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	

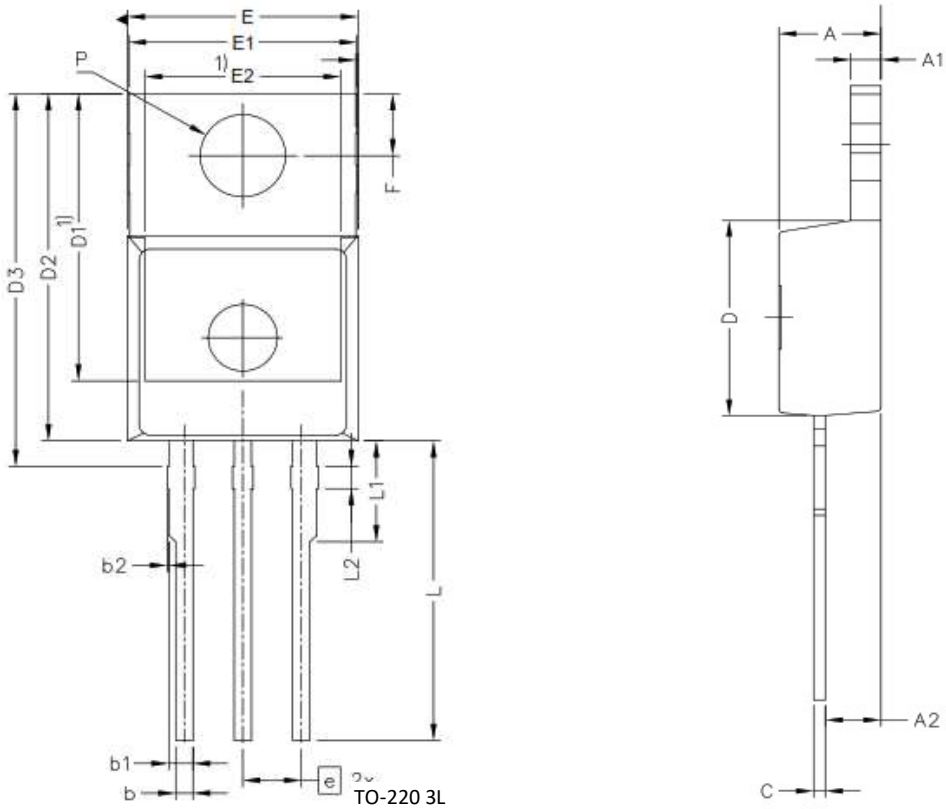
Table 7 Reverse Diode Characteristics

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 = 25ºC
Reverse recovery time	t_{rr}		244		ns	I_F = 8.5A, L = 5mH di/dt = 100A/µS V_{DD} = 60V, T_J = 25ºC
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

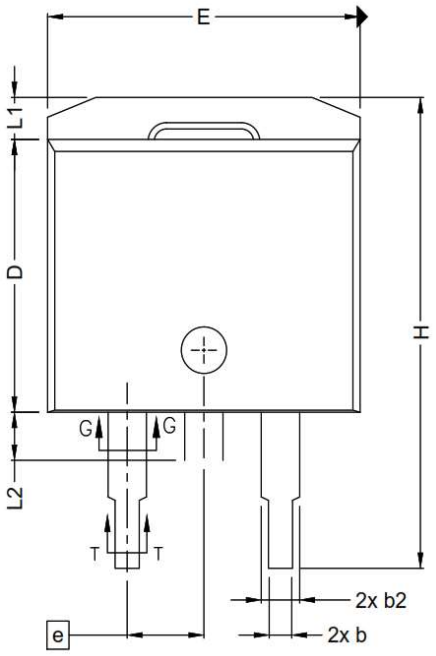


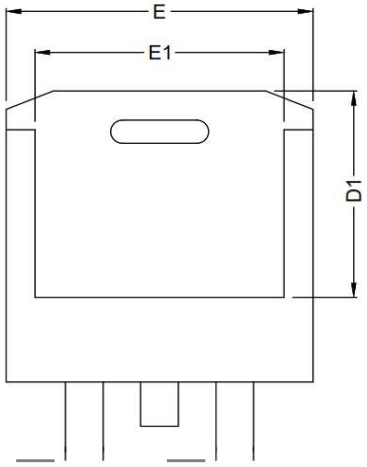
TO-220 3L

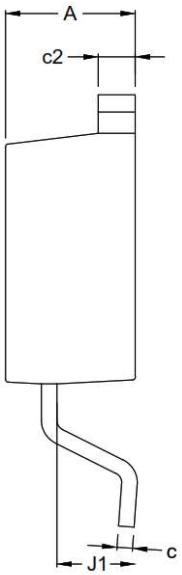
SYMBOL	MIN	MAX
A	4.20	4.60
A1	1.20	1.40
A2	2.20	2.60
b	0.65	0.85
b1	0.95	1.15
b2		0.15
C	0.40	0.60
D	9.05	9.45
D1	12.95	
D2	15.35	15.95
D3	16.50	17.10
E	9.80	10.20
E1	9.70	10.10
E2	8.50	
e	2.46	2.54
F	2.60	3.00
L	13.00	14.00
L1	4.35	4.75
L2	0.90	1.10
P	3.55	3.85

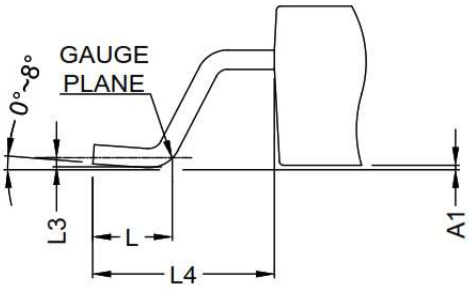
4b) TO-263

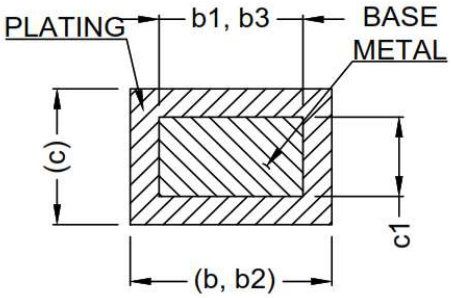
D3 Semiconductor TO-263 (D2PAK)











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

www.d3semi.com

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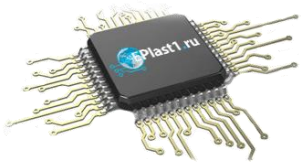

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