

# P1402CDG-VB Datasheet

# N-Channel 30-V (D-S) MOSFET

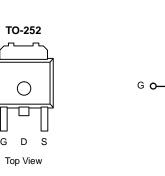
I	FE/	AT	U	RE

- Trench Power MOSFET
- 100 % Rg and UIS Tested ٠
- Compliant to RoHS Directive 2011/65/EU

#### APPLICATIONS

- OR-ing
- Server
- DC/DC

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ)			
30	0.007 at V <sub>GS</sub> = 10 V	70	25 nC			
	0.009 at V <sub>GS</sub> = 4.5 V	60	20110			



# N-Channel MOSFET

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#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted) Symbol Parameter Limit Unit V<sub>DS</sub> Drain-Source Voltage 30 V V<sub>GS</sub> Gate-Source Voltage ± 20 T<sub>C</sub> = 25 °C 70 T<sub>C</sub> = 70 °C 50 Continuous Drain Current (T<sub>J</sub> = 175 °C) $I_D$ T<sub>A</sub> = 25 °C 21.8<sup>b, c</sup> А T<sub>A</sub> = 70 °C 18<sup>b, c</sup> Pulsed Drain Current I<sub>DM</sub> 200 Avalanche Current Pulse $I_{AS}$ 39 L = 0.1 mHSingle Pulse Avalanche Energy E<sub>AS</sub> 94.8 mJ T<sub>C</sub> = 25 °C 50<sup>a, e</sup> Continuous Source-Drain Diode Current $I_S$ А T<sub>A</sub> = 25 °C 3.13<sup>b, c</sup> T<sub>C</sub> = 25 °C 100<sup>a</sup> T<sub>C</sub> = 70 °C 75 Maximum Power Dissipation $P_D$ W $T_A = 25 \degree C$ 3.25<sup>b, c</sup> $T_A = 70 \degree C$ 2.33<sup>b, c</sup> Operating Junction and Storage Temperature Range T<sub>J</sub>, T<sub>stg</sub> - 55 to 175 °C

THERMAL RESISTANCE RATINGS						
Parameter		Symbol	Тур.	Max.	Unit	
Maximum Junction-to-Ambient <sup>b, d</sup>	$t \le 10 \text{ sec}$	R <sub>thJA</sub>	32	40	°C/W	
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.5	0.6	0/10	

Notes:

a. Based on T<sub>C</sub> = 25 °C. b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 sec.
d. Maximum under steady state conditions is 90 °C/W.
e. Calculated based on maximum junction temperature. Package limitation current is 90 A.



Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit
Static	-					
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 V, I_{D} = 250 \mu A$	, I <sub>D</sub> = 250 μA 30			V
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	L _ 250 uA		35		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I <sub>D</sub> = 250 μA		- 7.5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \ \mu A$	1.5		2.0	V
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V},  V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zana Cata Maltana Duain Cumant	1	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	
Zero Gate Voltage Drain Current	IDSS	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$			10	μA
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	90			Α
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 21.8 A		0.007		Ω
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 18A		0.009		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 21.8 A		160		S
Dynamic <sup>b</sup>					•	
Input Capacitance	C <sub>iss</sub>			2201		pF
Output Capacitance	C <sub>oss</sub>	$V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz		525		
Reverse Transfer Capacitance	C <sub>rss</sub>			370		
Total Gate Charge	Qg	$V_{DS}$ = 15 V, $V_{GS}$ = 10 V, $I_{D}$ = 21.8 A		35	45	nC
				25	35	
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_{D}$ = 21.8 A		15		
Gate-Drain Charge	Q <sub>gd</sub>			20		
Gate Resistance	Rg	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	t <sub>d(on)</sub>			18	27	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.625 $\Omega$		11	17	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong$ 24 A, $V_{GEN}$ = 10 V, $R_g$ = 1 $\Omega$		70	105	
Fall Time	t <sub>f</sub>			10	15	-
Turn-On Delay Time	t <sub>d(on)</sub>			55	83	ns
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.67 $\Omega$		180	270	-
Turn-Off Delay Time	t <sub>d(off)</sub>	$\text{I}_\text{D}\cong\text{22.5}$ A, $\text{V}_\text{GEN}$ = 4.5 V, $\text{R}_\text{g}$ = 1 $\Omega$		55	83	
Fall Time	t <sub>f</sub>			12	18	
Drain-Source Body Diode Characteristic	s			•	•	
Continuous Source-Drain Diode Current	۱ <sub>S</sub>	T <sub>C</sub> = 25 °C			120	A
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				120	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>			52	78	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = 20 A, di/dt = 100 A/μs, Τ <sub>.I</sub> = 25 °C		70.2	105	nC
Reverse Recovery Fall Time	t <sub>a</sub>	$r_F = 20 \text{ A}, \text{ aval} = 100 \text{ Avps}, 1 \text{ J} = 25 \text{ C}$		27		20
Reverse Recovery Rise Time	t <sub>b</sub>			25		ns

Notes:

a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2$  %.

b. Guaranteed by design, not subject to production testing.

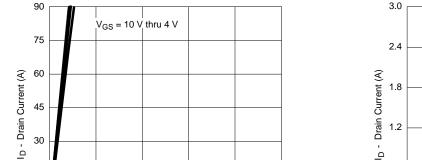
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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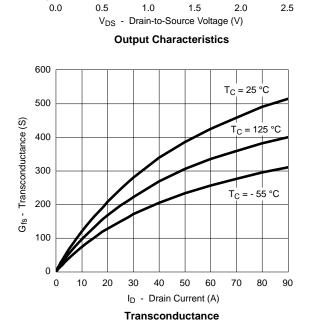
 $V_{IGS} = 2 V$ 

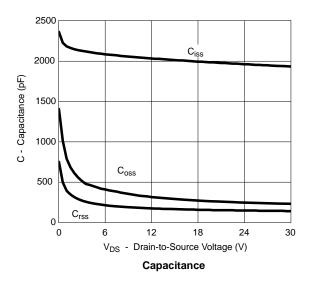


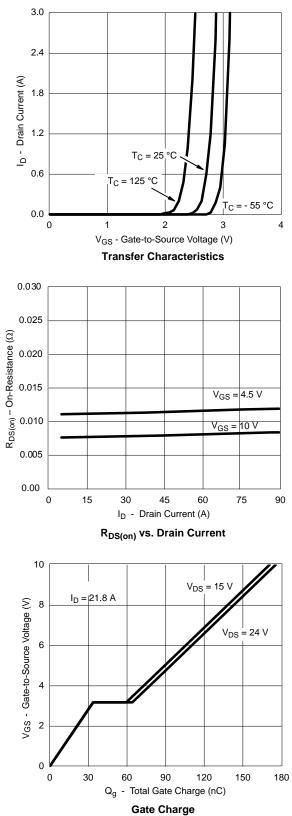


 $V_{GS} = 3 V$ 

#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

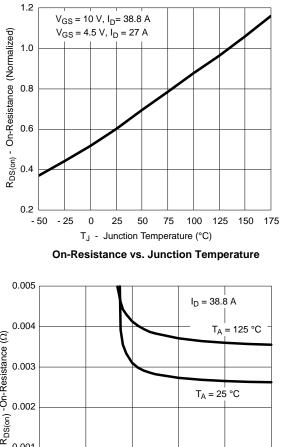


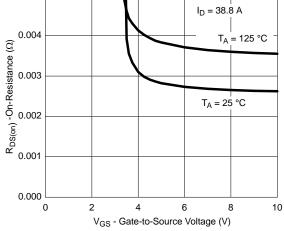


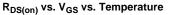


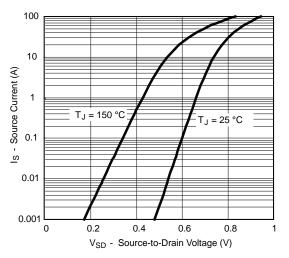


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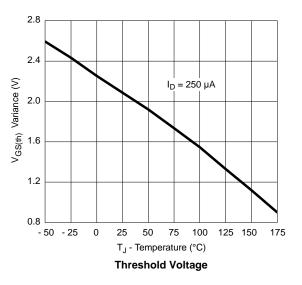


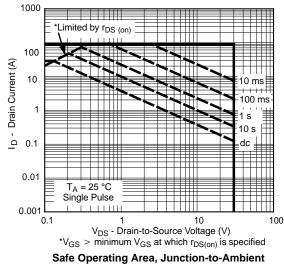




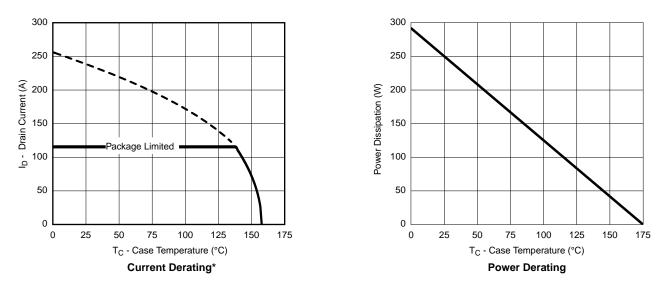


Forward Diode Voltage vs. Temperature



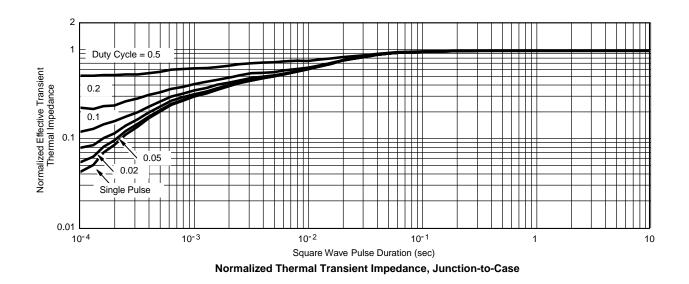






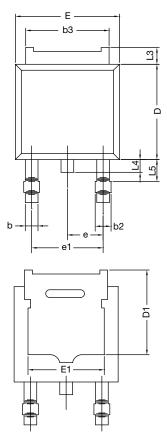
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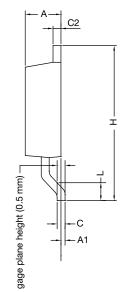
\*The power dissipation  $P_D$  is based on  $T_{J(max)} = 175$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.





# **TO-252AA CASE OUTLINE**





	MILLIMETERS		INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
А	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
С	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
Н	9.40	10.41	0.370	0.410
е	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.14	1.52	0.045	0.060
ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347				

Note

• Dimension L3 is for reference only.



### **RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)**



Recommended Minimum Pads Dimensions in Inches/(mm)



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