PD - 94114

International
**IOR** Rectifier

**PROVISIONAL**
**SMPS MOSFET**

# IRFB42N20D
# IRFS42N20D
# IRFSL42N20D

HEXFET® Power MOSFET

## Applications

- High frequency DC-DC converters

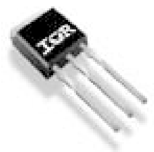
| $V_{DSS}$ | $R_{DS(on)}$ max | $I_D$ |
|---|---|---|
| **200V** | **0.055Ω** | **42.6A** |

## Benefits

- Low Gate-to-Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective $C_{OSS}$ to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current


TO-220AB
IRFB42N20D


$D^2$Pak
IRFS42N20D


TO-262
IRFSL42N20D

## Absolute Maximum Ratings

|  | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 42.6 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V | 30 |  |
| $I_{DM}$ | Pulsed Drain Current ① | 170 |  |
| $P_D$ @$T_A$ = 25°C | Power Dissipation ⑦ | 3.8 | W |
| $P_D$ @$T_C$ = 25°C | Power Dissipation | 300 |  |
|  | Linear Derating Factor | 2 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 30 | V |
| dv/dt | Peak Diode Recovery dv/dt ③ | TBD | V/ns |
| $T_J$ | Operating Junction and | -55 to + 175 | °C |
| $T_{STG}$ | Storage Temperature Range |  |  |
|  | Soldering Temperature, for 10 seconds | 260 (1.6mm from case ) |  |
|  | Mounting torqe, 6-32 or M3 screw⑥ | 10 lbf•in (1.1N•m) |  |

## Typical SMPS Topologies

- Telecom 48V input DC-DC Active Clamp Reset Forward Converter

Notes ① through ⑦ are on page 6

## Static @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 200 | ––– | ––– | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | ––– | TBD | ––– | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | ––– | ––– | 0.055 | Ω | $V_{GS}$ = 10V, $I_D$ = 25.5A ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 3.0 | ––– | 5.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| $I_{DSS}$ | Drain-to-Source Leakage Current | ––– | ––– | 25 | µA | $V_{DS}$ = 200V, $V_{GS}$ = 0V |
| | | ––– | ––– | 250 | | $V_{DS}$ = 160V, $V_{GS}$ = 0V, $T_J$ = 150°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | ––– | ––– | 100 | nA | $V_{GS}$ = 30V |
| | Gate-to-Source Reverse Leakage | ––– | ––– | -100 | | $V_{GS}$ = -30V |

## Dynamic @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $g_{fs}$ | Forward Transconductance | TBD | ––– | ––– | S | $V_{DS}$ = 25V, $I_D$ = 25.5A |
| $Q_g$ | Total Gate Charge | ––– | 103 | ––– | nC | $I_D$ = 25.5A |
| $Q_{gs}$ | Gate-to-Source Charge | ––– | 26 | ––– | | $V_{DS}$ = 160V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | ––– | 48 | ––– | | $V_{GS}$ = 10V ④ |
| $t_{d(on)}$ | Turn-On Delay Time | ––– | TBD | ––– | ns | $V_{DD}$ = 100V |
| $t_r$ | Rise Time | ––– | TBD | ––– | | $I_D$ = 25.5A |
| $t_{d(off)}$ | Turn-Off Delay Time | ––– | TBD | ––– | | $R_G$ = TBDΩ |
| $t_f$ | Fall Time | ––– | TBD | ––– | | $V_{GS}$ = 10V ④ |
| $C_{iss}$ | Input Capacitance | ––– | 3470 | ––– | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | ––– | 560 | ––– | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | ––– | 120 | ––– | | $f$ = 1.0MHz⑥ |
| $C_{oss}$ | Output Capacitance | ––– | TBD | ––– | | $V_{GS}$ = 0V, $V_{DS}$ = 1.0V, $f$ = 1.0MHz |
| $C_{oss}$ | Output Capacitance | ––– | TBD | ––– | | $V_{GS}$ = 0V, $V_{DS}$ = 160V, $f$ = 1.0MHz |
| $C_{oss}$ eff. | Effective Output Capacitance | ––– | TBD | ––– | | $V_{GS}$ = 0V, $V_{DS}$ = 0V to 160V ⑤ |

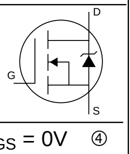
## Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $E_{AS}$ | Single Pulse Avalanche Energy② | ––– | TBD | mJ |
| $I_{AR}$ | Avalanche Current① | ––– | 25.5 | A |
| $E_{AR}$ | Repetitive Avalanche Energy① | ––– | 30 | mJ |

## Thermal Resistance

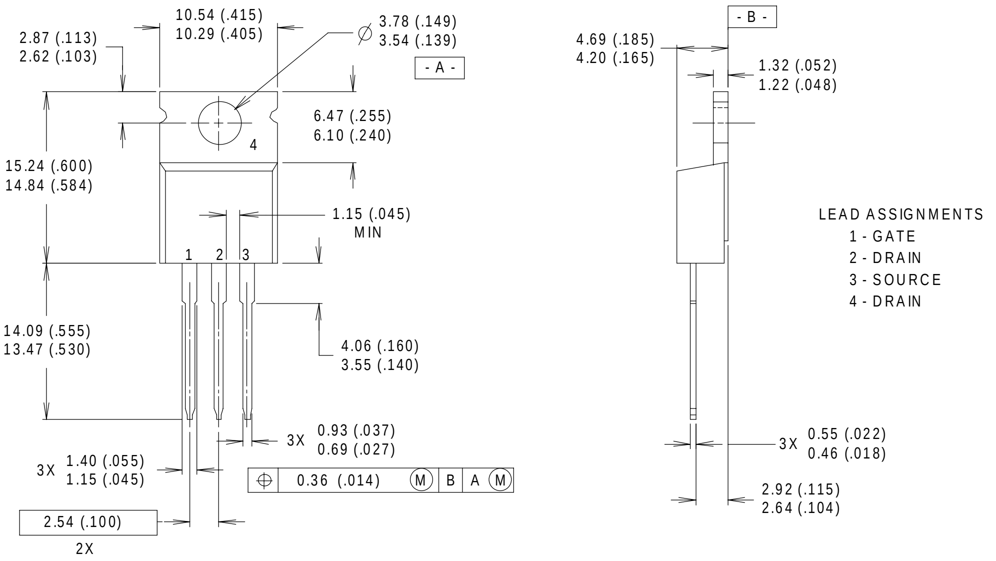
| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case | ––– | 0.5 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface ⑥ | 0.50 | ––– | |
| $R_{\theta JA}$ | Junction-to-Ambient⑥ | ––– | 62 | |
| $R_{\theta JA}$ | Junction-to-Ambient⑦ | ––– | 40 | |

## Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current<br>(Body Diode) | ––– | ––– | 42.6 | A | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ① | ––– | ––– | 170 | | |
| $V_{SD}$ | Diode Forward Voltage | ––– | ––– | 1.3 | V | $T_J$ = 25°C, $I_S$ = 25.5A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | ––– | TBD | TBD | ns | $T_J$ = 25°C, $I_F$ = 25.5A |
| $Q_{rr}$ | Reverse RecoveryCharge | ––– | 2.4 | 3.6 | µC | di/dt = 100A/µs ④ |
| $t_{on}$ | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |

## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

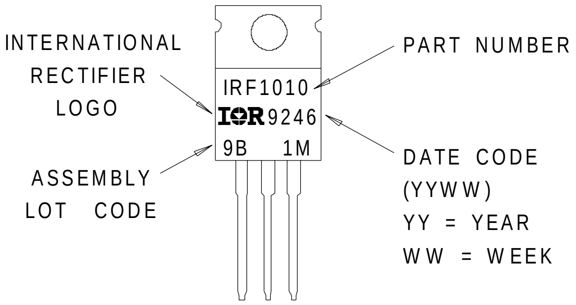


NOTES:

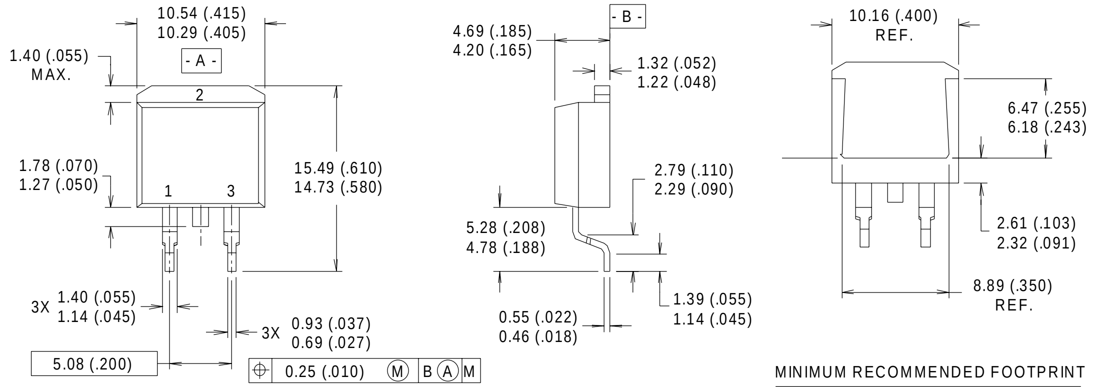
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION : INCH
3. OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4. HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

## TO-220AB Part Marking Information

EXAMPLE : THIS IS AN IRF1010
WITH ASSEMBLY
LOT CODE 9B1M



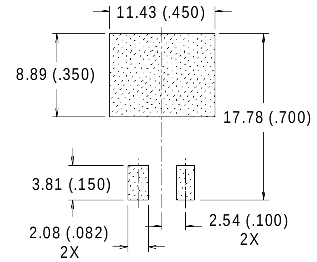
## D$^2$Pak Package Outline



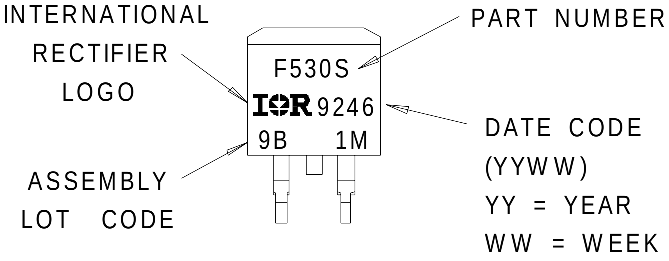
NOTES:
1 DIMENSIONS AFTER SOLDER DIP.
2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3 CONTROLLING DIMENSION : INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

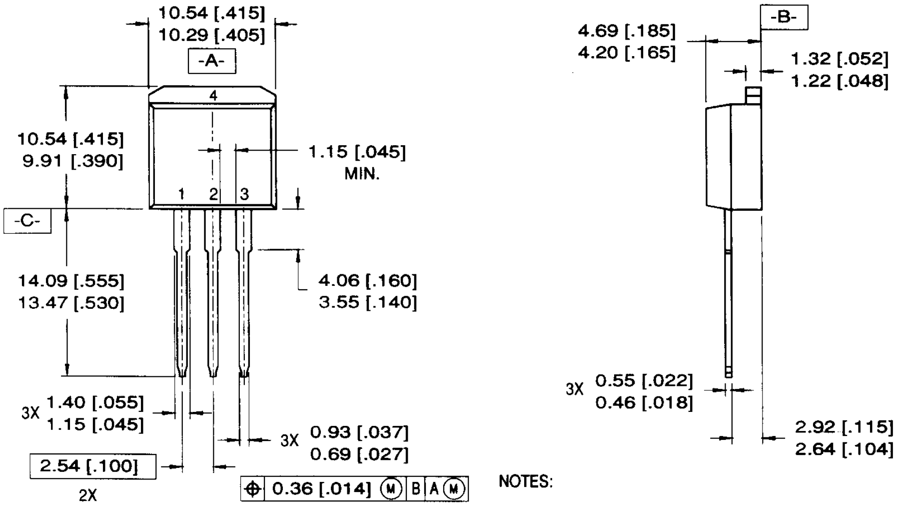
MINIMUM RECOMMENDED FOOTPRINT



## D$^2$Pak Part Marking Information



## TO-262 Package Outline



LEAD ASSIGNMENTS

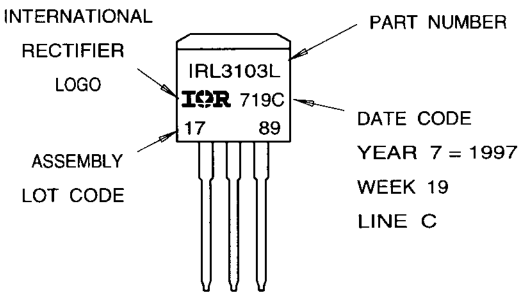
1 = GATE
2 = DRAIN
3 = SOURCE
4 = DRAIN

NOTES:

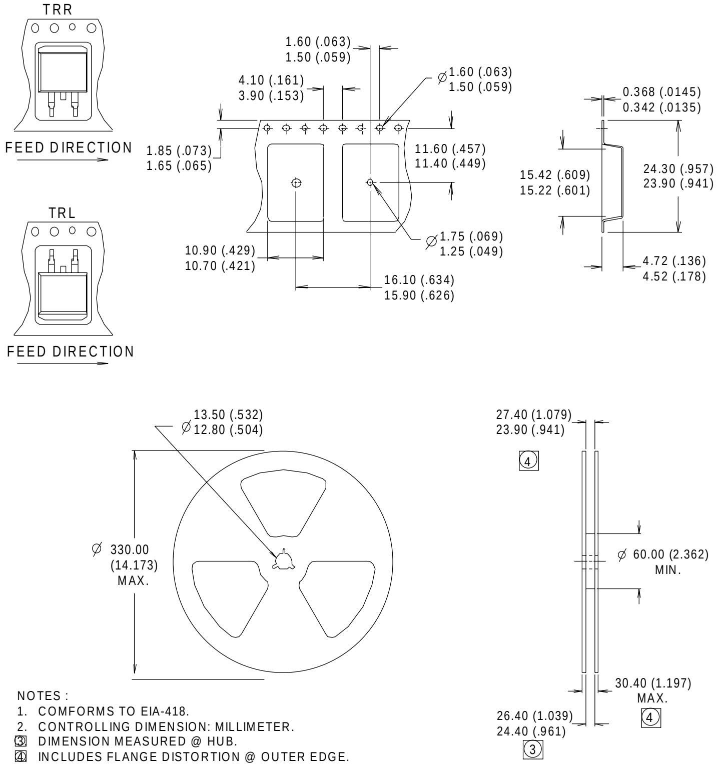
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

## TO-262 Part Marking Information

EXAMPLE: THIS IS AN IRL3103L
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



## D²Pak Tape & Reel Information



NOTES :
1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
3 DIMENSION MEASURED @ HUB.
4 INCLUDES FLANGE DISTORTION @ OUTER EDGE.

**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting $T_J = 25°C$, L = TBDmH $R_G = TBD\Omega$, $I_{AS} = 25.5A$.

③ $I_{SD} \le 25.5A$, di/dt ≤ TBDA/µs, $V_{DD} \le V_{(BR)DSS}$, $T_J \le 175°C$

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

⑤ $C_{oss}$ eff. is a fixed capacitance that gives the same charging time as $C_{oss}$ while $V_{DS}$ is rising from 0 to 80% $V_{DSS}$

⑥ This is only applied to TO-220AB package

⑦ This is applied to D²Pak, when mounted on 1" square PCB ( FR-4 or G-10 Material ). For recommended footprint and soldering techniques refer to application note #AN-994.

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