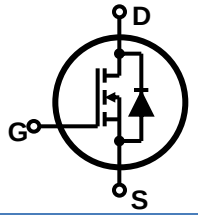
## Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- Halogen free package
- JEDEC Qualification




## Absolute Maximum Ratings

| Parameter | | Symbol | TMAN15N50 | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 500 | V |
| Gate-Source Voltage | | $V_{GS}$ | 30 | V |
| Continuous Drain Current | $T_C$ = 25 | $I_D$ | 14.2 | A |
| | $T_C$ = 100 | | 9 | A |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 56.8 | A |
| Single Pulse Avalanche Energy (Note 2) | | $E_{AS}$ | 638 | mJ |
| Repetitive Avalanche Current (Note 1) | | $I_{AR}$ | 14.2 | A |
| Repetitive Avalanche Energy (Note 1) | | $E_{AR}$ | 24.5 | mJ |
| Power Dissipation | $T_C$ = 25 | $P_D$ | 245 | W |
| | Derate above 25 | | 1.96 | W/ |
| Peak Diode Recovery dv/dt (Note 3) | | dv/dt | 4.5 | V/ns |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55~150 | |
| Maximum lead temperature for soldering purposes, | | $T_L$ | 300 | |

* Limited only by maximum junction temperature

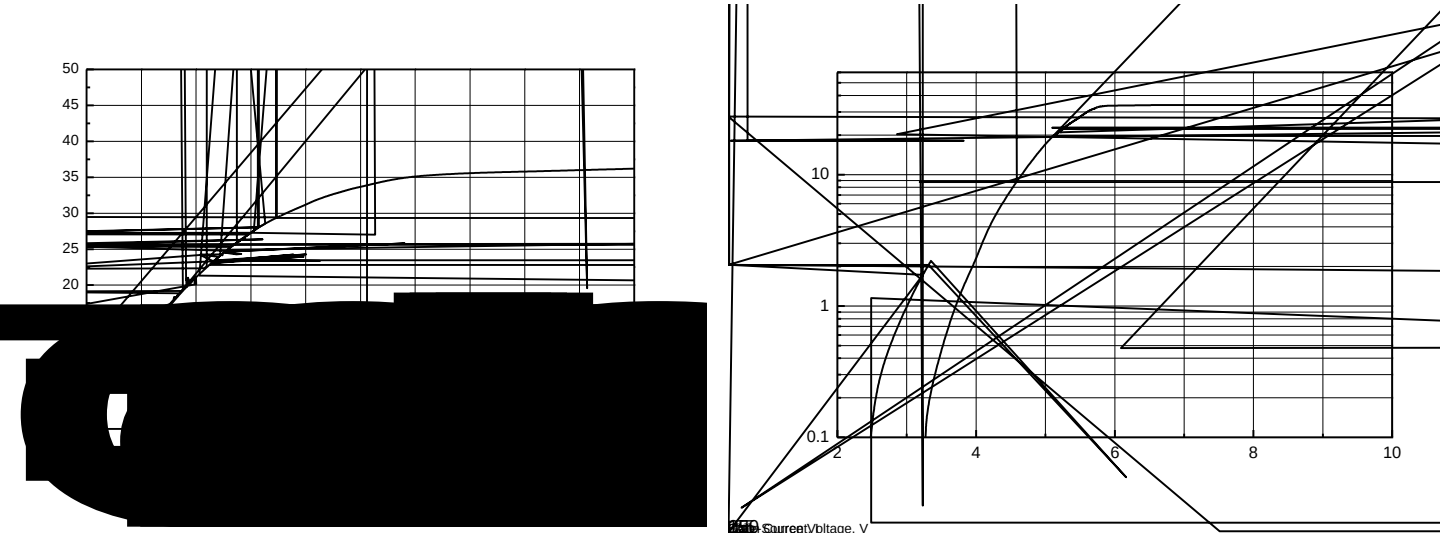
## Thermal Characteristics

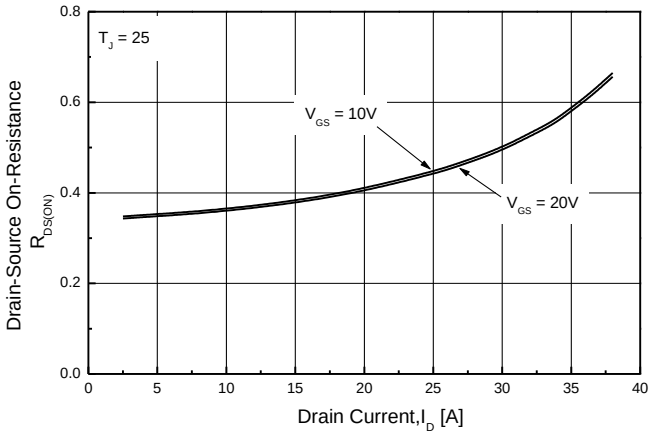
| Parameter | Symbol | TMA15N50 | Unit |
|---|---|---|---|
| Maximum Thermal resistance, Junction-to-Case | $R_{\theta JC}$ | 0.51 | /W |
| Maximum Thermal resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | /W |

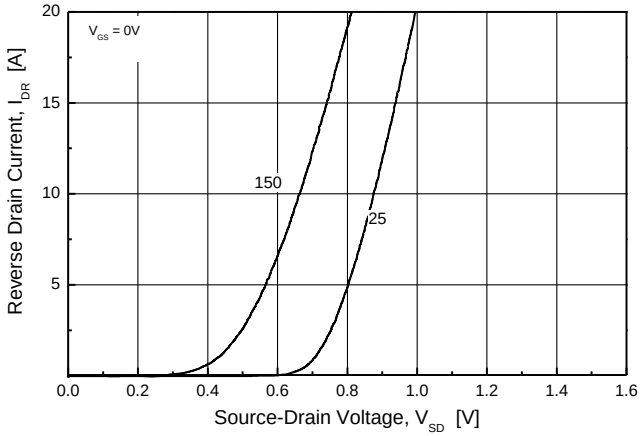
## Electrical Characteristics : $T_C$=25 , unless otherwise noted

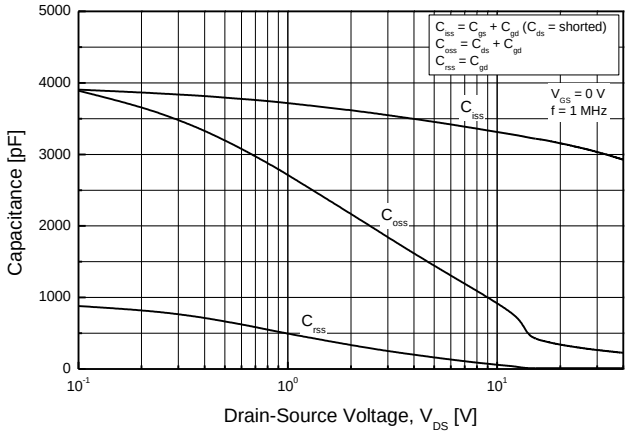
| Parameter | Symbol | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **OFF** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 500 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 500 V, $V_{GS}$ = 0 V | -- | -- | 1 | µA |
| | | $V_{DS}$ = 400 V, $T_C$ = 125°C | -- | -- | 10 | µA |
| Forward Gate-Source Leakage Current | $I_{GSSF}$ | $V_{GS}$ = 30 V, $V_{DS}$ = 0 V | -- | -- | 100 | nA |
| Reverse Gate-Source Leakage Current | $I_{GSSR}$ | $V_{GS}$ = -30 V, $V_{DS}$ = 0 V | -- | -- | -100 | nA |
| **ON** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2 | -- | 4 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 7.1 A | -- | 0.35 | 0.44 | Ω |
| Forward Transconductance (Note 4) | $g_{FS}$ | $V_{DS}$ = 30 V, $I_D$ = 7.1 A | -- | 10 | -- | S |
| **DYNAMIC** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1.0 MHz | -- | 2263 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 211 | -- | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 6.4 | -- | pF |
| **SWITCHING** | | | | | | |
| Turn-On Delay Time (Note 4,5) | $t_{d(on)}$ | $V_{DD}$ = 250 V, $I_D$ = 14.2 A, $R_G$ = 25 | -- | 65 | -- | ns |
| Turn-On Rise Time (Note 4,5) | $t_r$ | | -- | 55 | -- | ns |
| Turn-Off Delay Time (Note 4,5) | $t_{d(off)}$ | | -- | 144 | -- | ns |
| Turn-Off Fall Time (Note 4,5) | $t_f$ | | -- | 58 | -- | ns |
| Total Gate Charge (Note 4,5) | $Q_g$ | $V_{DS}$ = 400V, $I_D$ = 14.2 A, $V_{GS}$ = 10 V | -- | 39 | -- | nC |
| Gate-Source Charge (Note 4,5) | $Q_{gs}$ | | -- | 11 | -- | nC |
| Gate-Drain Charge (Note 4,5) | $Q_{gd}$ | | -- | 8.6 | -- | nC |
| **SOURCE DRAIN DIODE** | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$ | --- | -- | -- | 12 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | $I_{SM}$ | --- | -- | -- | 48 | A |
| Drain-Source Diode Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 14.2 A | -- | -- | 1.5 | V |
| Reverse Recovery Time (Note 4) | $t_{rr}$ | $V_{GS}$ = 0 V, $I_S$ = 14.2 A, $dI_F$ / dt = 100 A/µs | -- | 381 | -- | ns |
| Reverse Recovery Charge (Note 4) | $Q_{rr}$ | | -- | 4.4 | -- | µC |

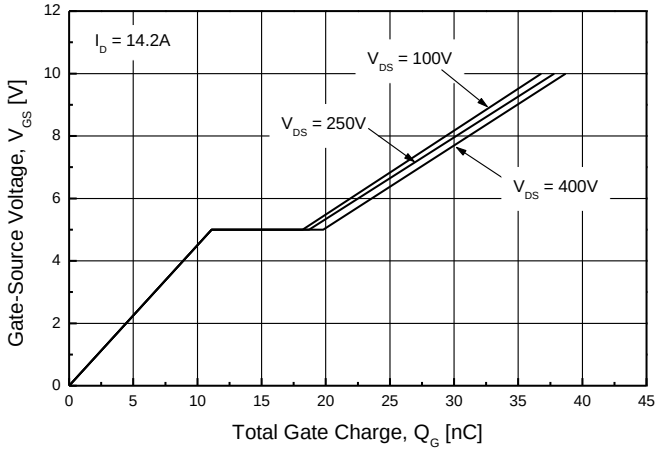
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=5.7mH, $I_{AS}$ = 14.2A, $V_{DD}$ = 50V, $R_G$ = 25 , Starting $T_J$= 25
3 $I_{SD}$ µs , $V_{DD}$ $_{DS}$, Starting $T_J$= 25
µ
5. Essentially Independent of Operating Temperature Typical Characteristics

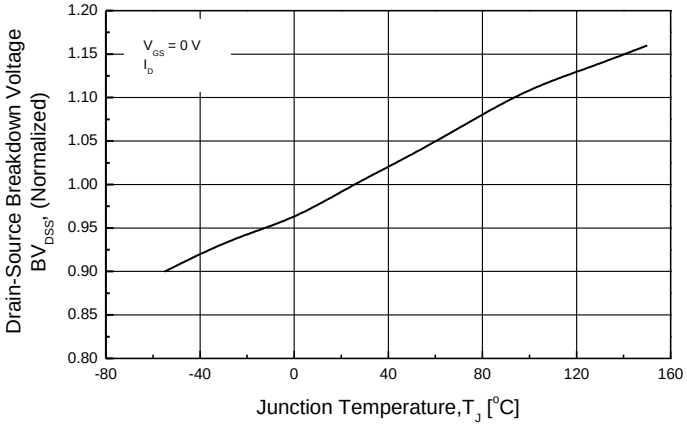

50
45
40
35
30
25
20
10
1
0.1
2
4
6
8
10

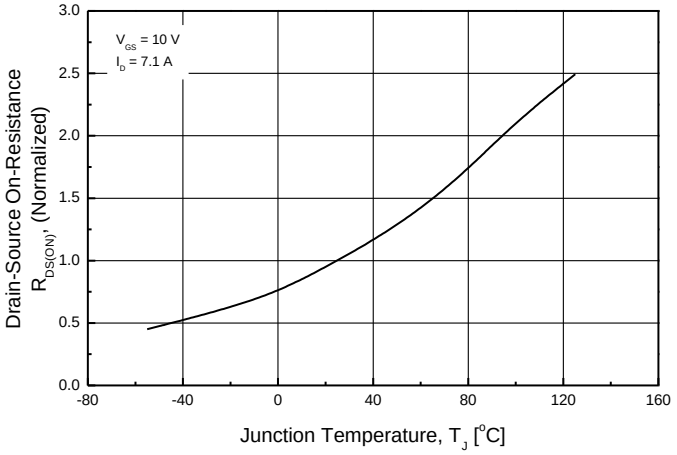

T_J = 25
V_GS = 10V
V_GS = 20V
Drain-Source On-Resistance
R_DS(ON)
Drain Current,I_D [A]
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
30
35
40

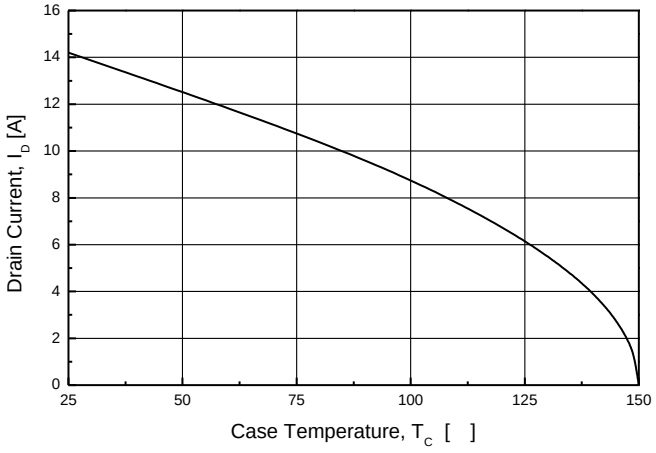

V_GS = 0V
150
25
Reverse Drain Current, I_DR [A]
Source-Drain Voltage, V_SD [V]
20
15
10
5
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

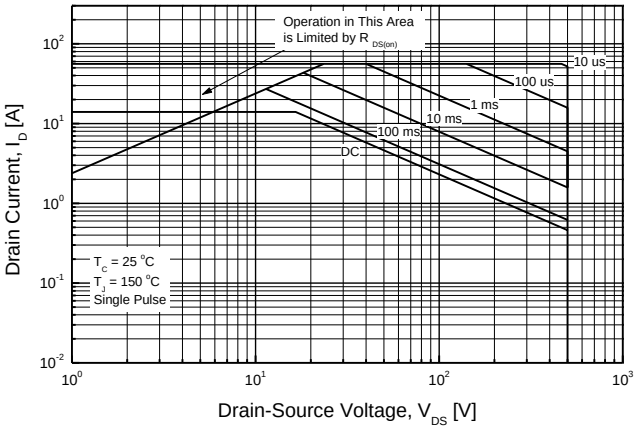

C_iss = C_gs + C_gd (C_ds = shorted)
C_oss = C_ds + C_gd
C_rss = C_gd
V_GS = 0 V
f = 1 MHz
C_iss
C_oss
C_rss
Capacitance [pF]
Drain-Source Voltage, V_DS [V]
5000
4000
3000
2000
1000
0
10^-1
10^0
10^1

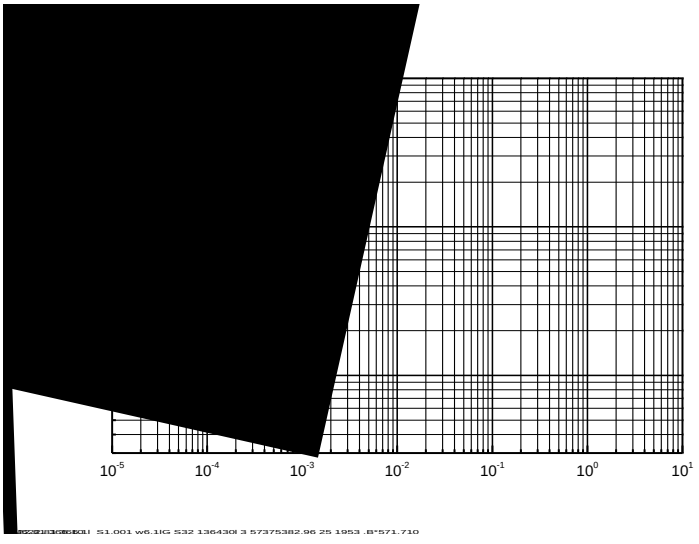

I_D = 14.2A
V_DS = 100V
V_DS = 250V
V_DS = 400V
Gate-Source Voltage, V_GS [V]
Total Gate Charge, Q_G [nC]
12
10
8
6
4
2
0
0
5
10
15
20
25
30
35
40
45


Drain-Source Breakdown Voltage
$BV_{DSS}$, (Normalized)
$V_{GS}$ = 0 V
$I_D$
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
-80
-40
0
40
80
120
160
Junction Temperature,$T_J$ [°C]

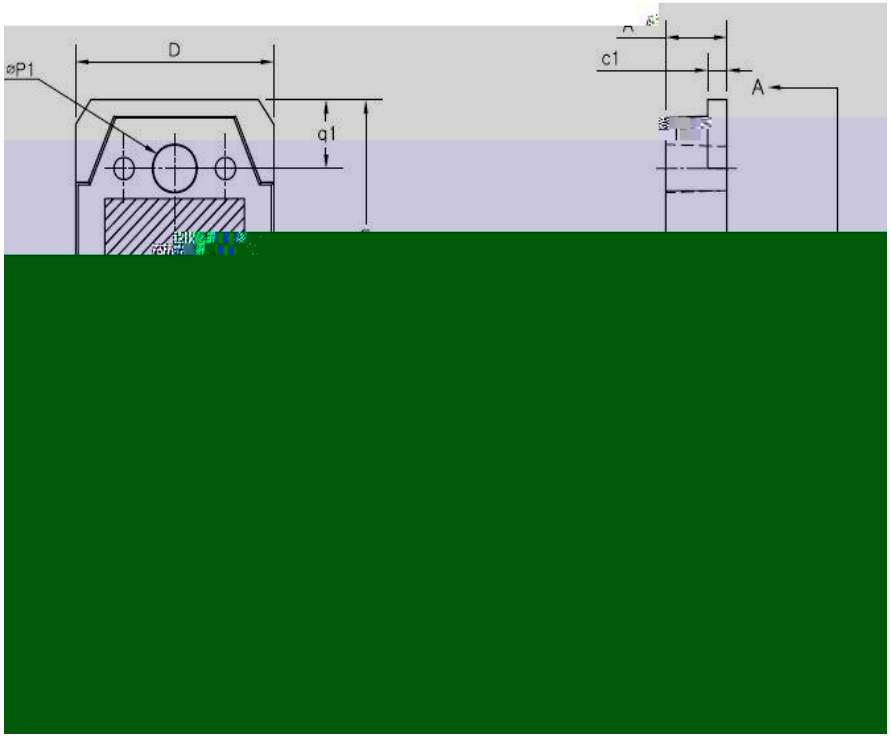

Drain-Source On-Resistance
$R_{DS(ON)}$, (Normalized)
$V_{GS}$ = 10 V
$I_D$ = 7.1 A
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-80
-40
0
40
80
120
160
Junction Temperature, $T_J$ [°C]

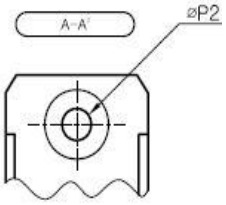

Drain Current, $I_D$ [A]
16
14
12
10
8
6
4
2
0
25
50
75
100
125
150
Case Temperature, $T_C$ [ ]


Drain Current, $I_D$ [A]
Operation in This Area
is Limited by $R_{DS(on)}$
10 us
100 us
1 ms
10 ms
100 ms
DC
$T_C$ = 25 °C
$T_J$ = 150 °C
Single Pulse
$10^2$
$10^1$
$10^0$
$10^{-1}$
$10^{-2}$
$10^0$
$10^1$
$10^2$
$10^3$
Drain-Source Voltage, $V_{DS}$ [V]


$10^{-5}$
$10^{-4}$
$10^{-3}$
$10^{-2}$
$10^{-1}$
$10^0$
$10^1$

# TO-3PN MECHANICAL DATA




| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 4.60 | 4.80 | 5.00 |
| øP1 | 3.30 | 3.40 | 3.50 |