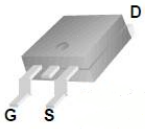
## Features

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

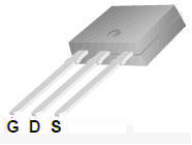
N-channel MOSFET

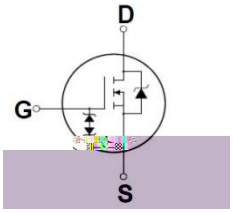
| $BV_{DSS}$ | $I_D$ | $R_{DS(on)}$ |
|---|---|---|
| 650V | 4.0A | < 2.4Ω |

D-PAK




I-PAK




| Device | Package | Marking | Remark |
|---|---|---|---|
| TMD4N65AZ / TMU4N65AZ | D-PAK/I-PAK | TMD4N65AZ / TMU4N65AZ | RoHS |
| TMD4N65AZG / TMU4N65AZG | D-PAK/I-PAK | TMD4N65AZG / TMU4N65AZG | Halogen Free |

## Absolute Maximum Ratings

| Parameter | | Symbol | TMD4N65AZ(G)/TMU4N65AZ(G) | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 650 | V |
| Gate-Source Voltage | | $V_{GS}$ | 30 | V |
| Continuous Drain Current | $T_C$ = 25 | $I_D$ | 4 | A |
| | $T_C$ = 100 | | 2.63 | A |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 16 | A |
| Single Pulse Avalanche Energy (Note 2) | | $E_{AS}$ | 206 | mJ |
| Repetitive Avalanche Current (Note 1) | | $I_{AR}$ | 4 | A |
| Repetitive Avalanche Energy (Note 1) | | $E_{AR}$ | 9.84 | mJ |
| Power Dissipation | $T_C$ = 25 | $P_D$ | 98.4 | W |
| | Derate above 25 | | 0.78 | 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 | TMD4N65AZ(G)/TMU4N65AZ(G) | Unit |
|---|---|---|---|
| Maximum Thermal resistance, Junction-to-Case | $R_{\theta JC}$ | 1.27 | /W |
| Maximum Thermal resistance, Junction-to-Ambient | $R_{\theta JA}$ | 110 | /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 | 650 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 650 V, $V_{GS}$ = 0 V | -- | -- | 1 | µA |
| | | $V_{DS}$ = 520 V, $T_C$ = 125°C | -- | -- | 10 | µA |
| Forward Gate-Source Leakage Current | $I_{GSSF}$ | $V_{GS}$ = 30 V, $V_{DS}$ = 0 V | -- | -- | 100 | µA |
| Reverse Gate-Source Leakage Current | $I_{GSSR}$ | $V_{GS}$ = -30 V, $V_{DS}$ = 0 V | | | | |
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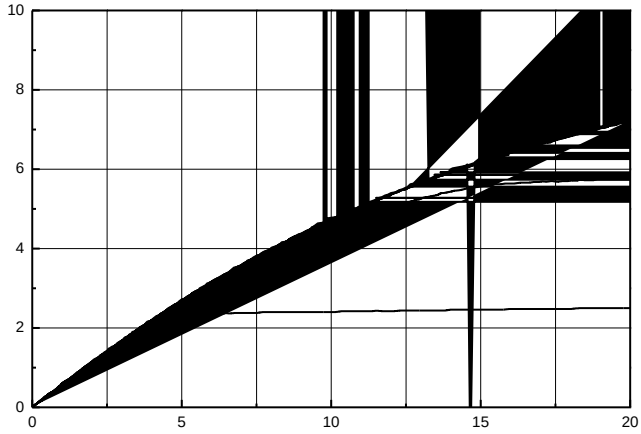
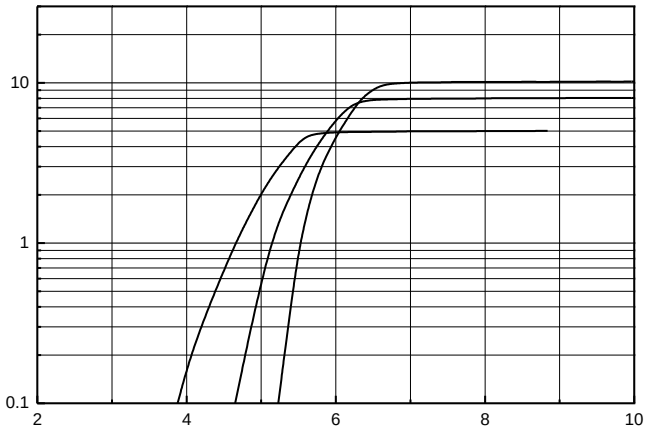
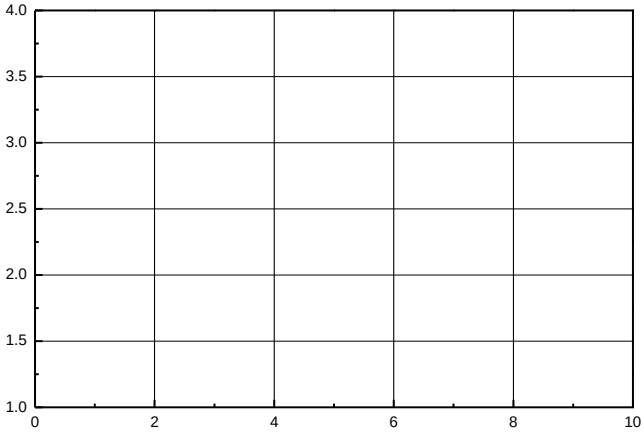
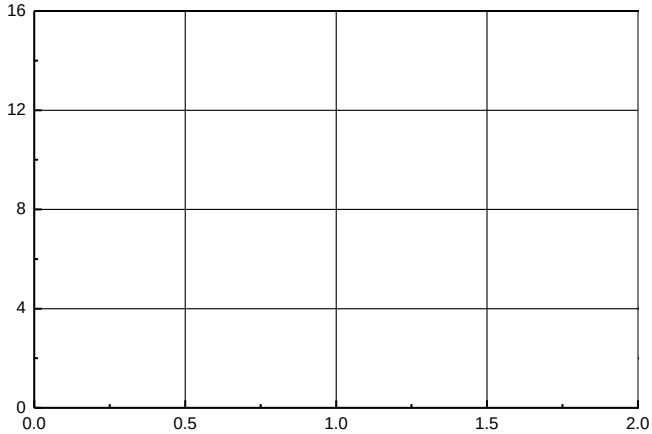
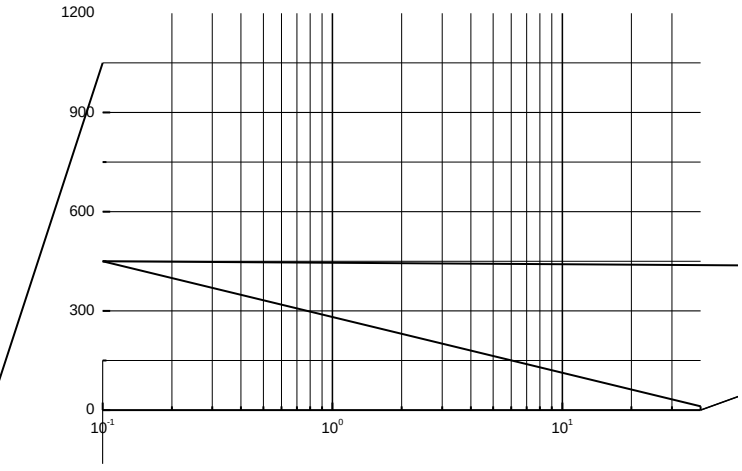
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=23.8mH, $I_{AS}$ = 4.0A, $V_{DD}$ = 50V, $R_G$ = 25 , Starting $T_J$= 25
3 $I_{SD}$ 4.0A, di/dt µs , $V_{DD}$ $_{DS}$, Starting $T_J$= 25
µ
5. Essentially Independent of Operating Temperature Typical Characteristics

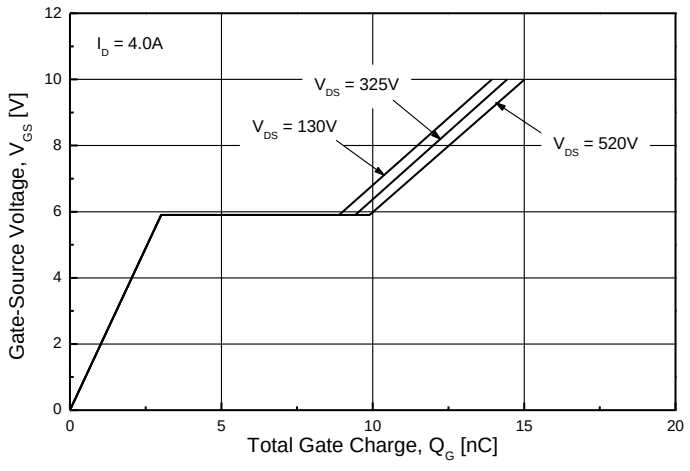

10
8
6
4
2
0
0
5
10
15
20

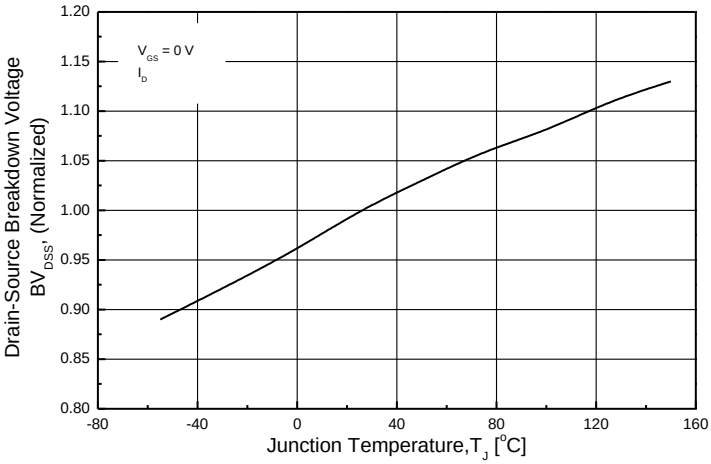

10
1
0.1
2
4
6
8
10

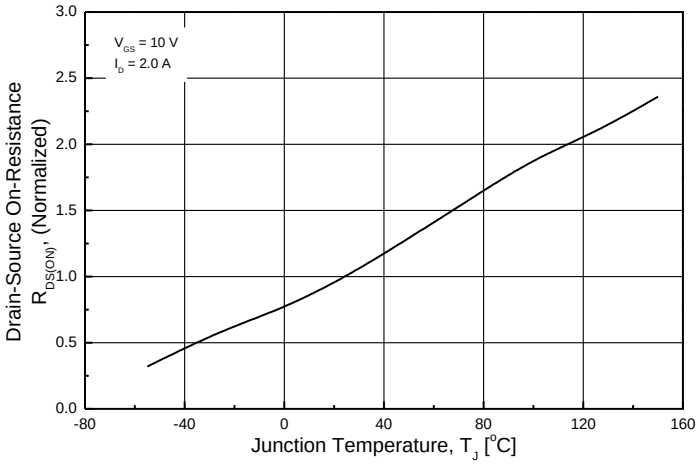

4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
2
4
6
8
10

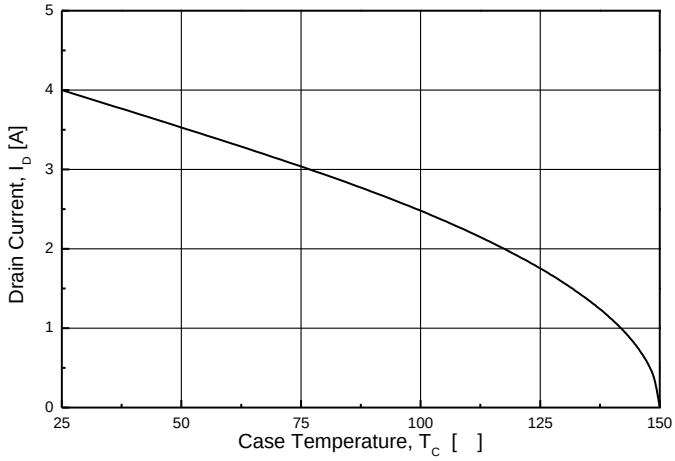

16
12
8
4
0
0.0
0.5
1.0
1.5
2.0

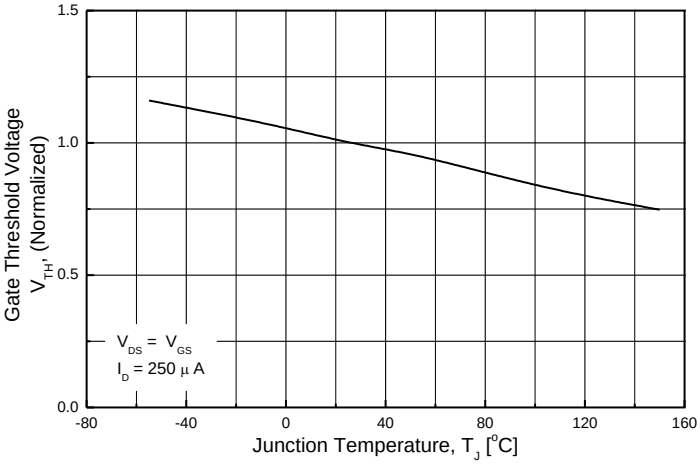

1200
900
600
300
0
$10^{-1}$
$10^{0}$
$10^{1}$

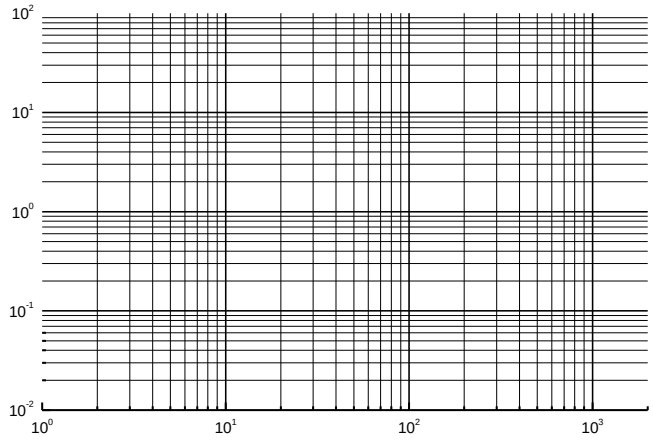

$I_D$ = 4.0A
$V_{DS}$ = 325V
$V_{DS}$ = 130V
$V_{DS}$ = 520V
Gate-Source Voltage, $V_{GS}$ [V]
Total Gate Charge, $Q_G$ [nC]
12
10
8
6
4
2
0
0
5
10
15
20

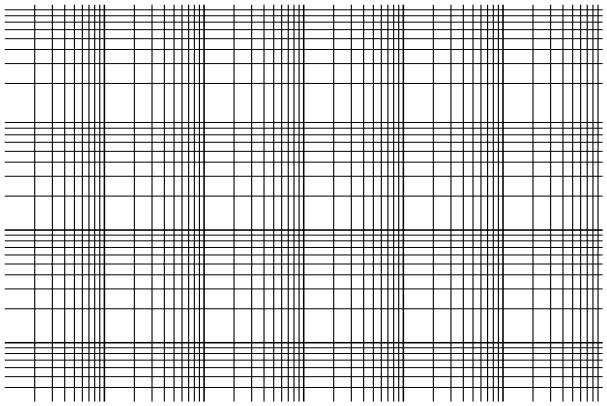

Drain-Source Breakdown Voltage
$BV_{DSS}$, (Normalized)
$V_{GS}$ = 0 V
$I_D$
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
-80
-40
0
40
80
120
160
Junction Temperature,$T_J$ [°C]


Drain-Source On-Resistance
$R_{DS(ON)}$, (Normalized)
$V_{GS}$ = 10 V
$I_D$ = 2.0 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]

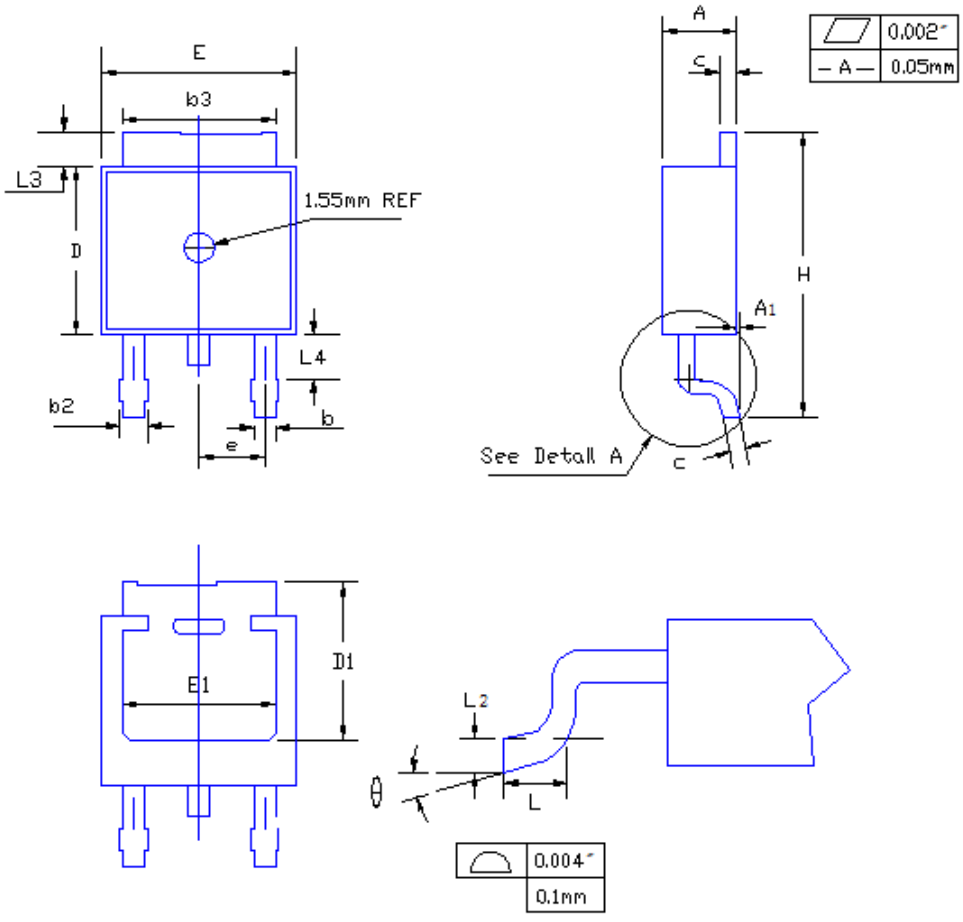

Drain Current, $I_D$ [A]
5
4
3
2
1
0
25
50
75
100
125
150
Case Temperature, $T_C$ [ ]


Gate Threshold Voltage
$V_{TH}$, (Normalized)
$V_{DS}$ = $V_{GS}$
$I_D$ = 250 μA
1.5
1.0
0.5
0.0
-80
-40
0
40
80
120
160
Junction Temperature, $T_J$ [°C]


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

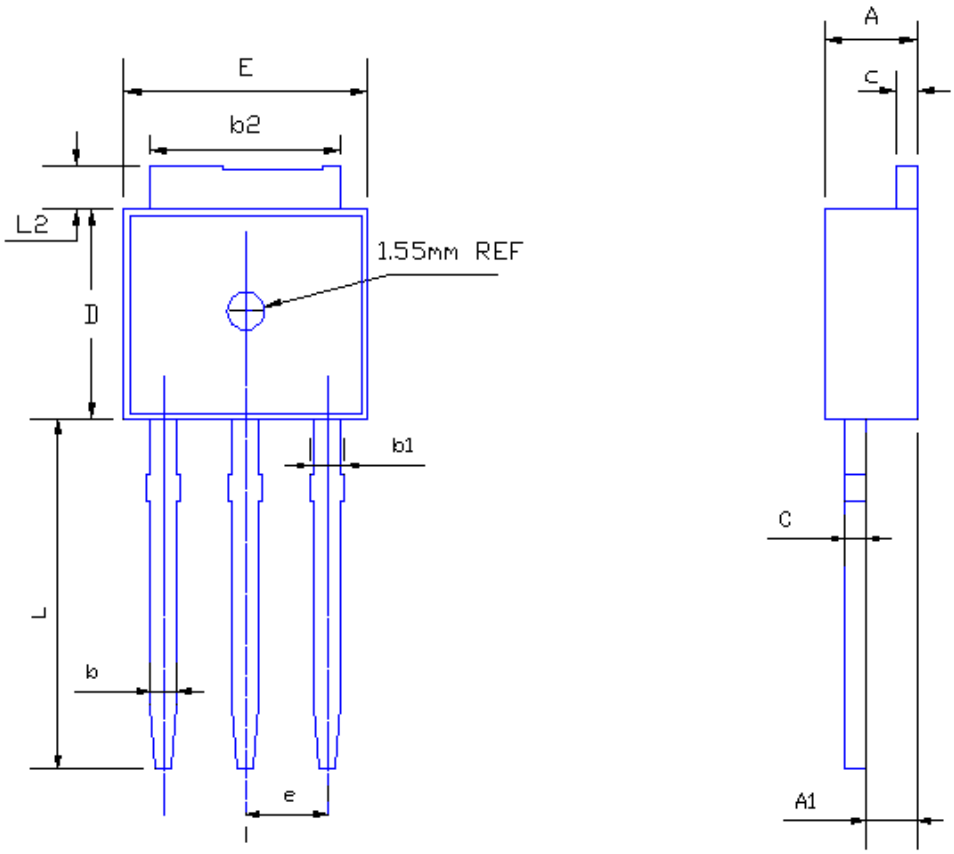


# TO-252 (D-PAK) MECHANICAL DATA




| SYMBOL | MILLIMETERS | |
|---|---|---|
| | MIN | MAX |
| A | 2.19 | 2.38 |
| A1 | – | 0.13 |
| b | 0.64 | 0.89 |
| b2 | 0.84 | 1.14 |
| b3 | 5.21 | 5.46 |
| c | 0.46 | 0.61 |
| D | 5.97 | 6.22 |
| D1 | 5.21 | — |
| E | 6.35 | 6.73 |
| E1 | 4.83 | — |
| e | 2.29BSC | |
| H | 9.65 | 10.41 |
| L | 1.40 | 1.78 |
| L2 | 0.51BSC | |
| L3 | 0.89 | 1.27 |
| L4 | 0.64 | 1.01 |
| θ | 0 | 8 |

# TO-251 (I-PAK) MECHANICAL DATA




| SYMBOL | MILLIMETERS | |
|---|---|---|
| | MIN | MAX |
| A | 2.19 | 2.38 |
| A1 | 1.04 | 1.23 |
| b | 0.64 | 0.89 |
| b1 | 0.84 | 1.14 |
| b2 | 5.23 | 5.48 |
| c | 0.46 | 0.61 |
| D | 5.91 | 6.28 |
| E | 6.21 | 6.59 |
| e | 2.28 TYP | |
| L | 8.89 | 9.65 |
| L2 | 0.89 | 1.27 |