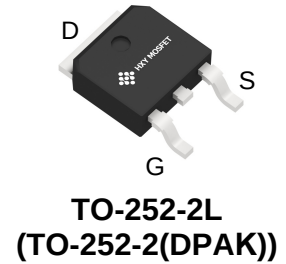




## Description

The IRFR1205TRPBF uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



## General Features

$V_{DS} = 60V$   $I_D = 30A$

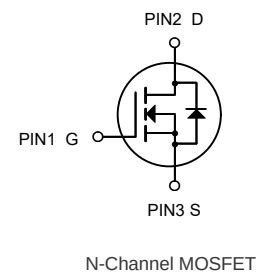
$R_{DS(ON)} < 26m\Omega$  @  $V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



## Ordering Information

| Product ID    | Pack                      | Brand      | Qty(PCS) |
|---------------|---------------------------|------------|----------|
| IRFR1205TRPBF | TO-252-2L(TO-252-2(DPAK)) | HXY MOSFET | 2500     |

## Absolute Maximum Ratings ( $T_C=25^{\circ}C$ unless otherwise noted)

| Symbol                 | Parameter                                             | Rating     | Units       |
|------------------------|-------------------------------------------------------|------------|-------------|
| $V_{DS}$               | Drain-Source Voltage                                  | 60         | V           |
| $V_{GS}$               | Gate-Source Voltage                                   | $\pm 20$   | V           |
| $I_D@T_C=25^{\circ}C$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 30         | A           |
| $I_D@T_C=100^{\circ}C$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 15         | A           |
| $I_D@T_A=25^{\circ}C$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 5.6        | A           |
| $I_D@T_A=70^{\circ}C$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 4.5        | A           |
| $I_{DM}$               | Pulsed Drain Current <sup>2</sup>                     | 46         | A           |
| EAS                    | Single Pulse Avalanche Energy <sup>3</sup>            | 25.5       | mJ          |
| $I_{AS}$               | Avalanche Current                                     | 22.6       | A           |
| $P_D@T_C=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>                  | 34.7       | W           |
| $P_D@T_A=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>                  | 2          | W           |
| $T_{STG}$              | Storage Temperature Range                             | -55 to 150 | $^{\circ}C$ |
| $T_J$                  | Operating Junction Temperature Range                  | -55 to 150 | $^{\circ}C$ |



|                  |                                                  |     |      |
|------------------|--------------------------------------------------|-----|------|
| R <sub>θJA</sub> | Thermal Resistance Junction-Ambient <sup>1</sup> | 62  | °C/W |
| R <sub>θJC</sub> | Thermal Resistance Junction-Case <sup>1</sup>    | 3.6 | °C/W |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions                                                                                    | Min. | Typ.  | Max. | Unit  |
|-------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------|------|-------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                                                   | 60   | ---   | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C , I <sub>D</sub> =1mA                                                       | ---  | 0.063 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V , I <sub>D</sub> =15A                                                    | ---  | 22    | 26   | mΩ    |
|                                     |                                                | V <sub>GS</sub> =4.5V , I <sub>D</sub> =10A                                                   | ---  | 30    | 38   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                      | 1.2  | ---   | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |                                                                                               | ---  | -5.24 | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C                             | ---  | ---   | 1    | uA    |
|                                     |                                                | V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =55°C                             | ---  | ---   | 5    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V                                                   | ---  | ---   | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V , I <sub>D</sub> =15A                                                     | ---  | 17    | ---  | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz                                            | ---  | 3.2   | ---  | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge (4.5V)                       | V <sub>DS</sub> =48V , V <sub>GS</sub> =4.5V , I <sub>D</sub> =12A                            | ---  | 12.6  | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |                                                                                               | ---  | 3.2   | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |                                                                                               | ---  | 6.3   | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =30V , V <sub>GS</sub> =10V ,<br>R <sub>G</sub> =3.3 ,<br>I <sub>D</sub> =10A | ---  | 8     | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |                                                                                               | ---  | 14.2  | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |                                                                                               | ---  | 24.4  | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |                                                                                               | ---  | 4.6   | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , f=1MHz                                           | ---  | 1378  | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |                                                                                               | ---  | 86    | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |                                                                                               | ---  | 64    | ---  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,5</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                            | ---  | ---   | 23   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,5</sup>           |                                                                                               | ---  | ---   | 46   | A     |
| V <sub>SD</sub>                     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C                               | ---  | ---   | 1.2  | V     |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is VDD=25V,VGS=10V,L=0.1mH,IAS=22.6A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.



## Typical Characteristics

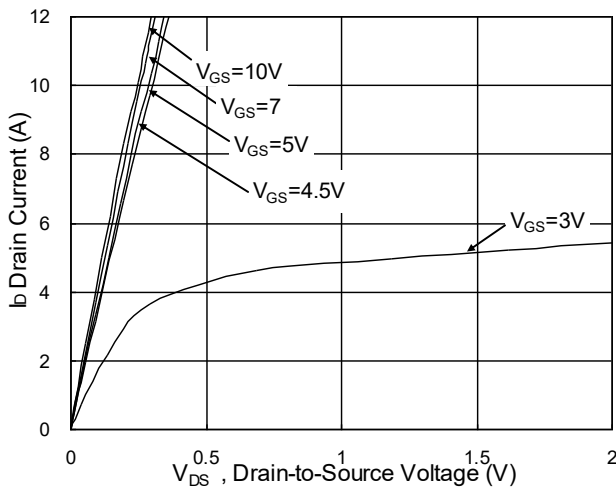


Fig.1 Typical Output Characteristics

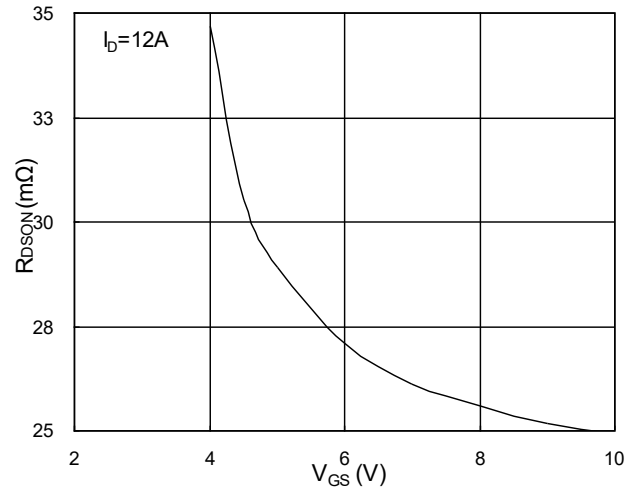


Fig.2 On-Resistance v.s Gate-Source

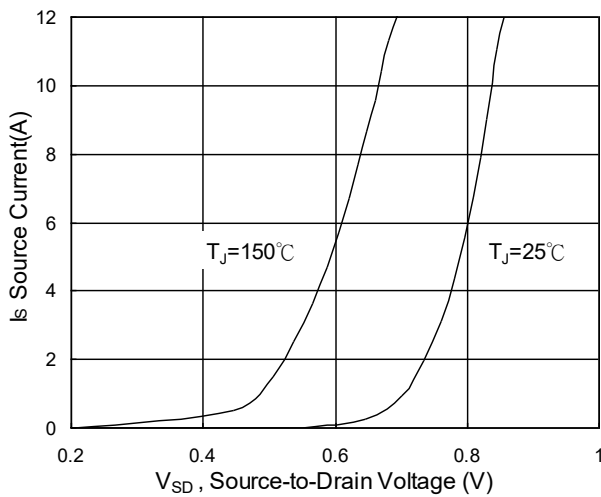


Fig.3 Forward Characteristics of Reverse

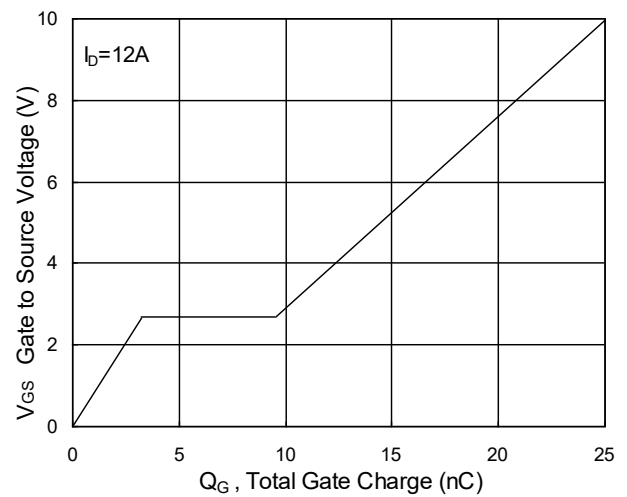


Fig.4 Gate-Charge Characteristics

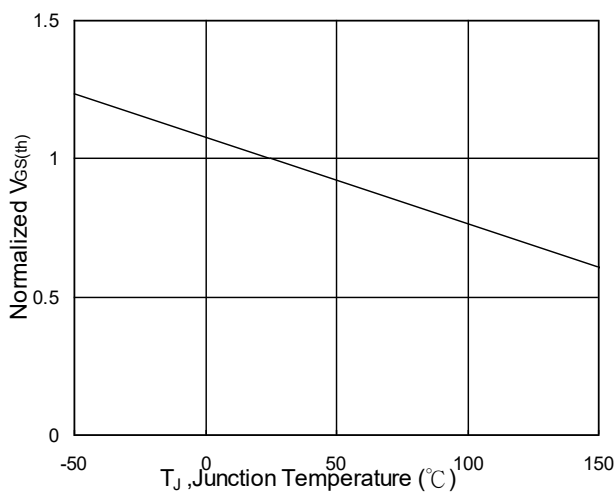


Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$

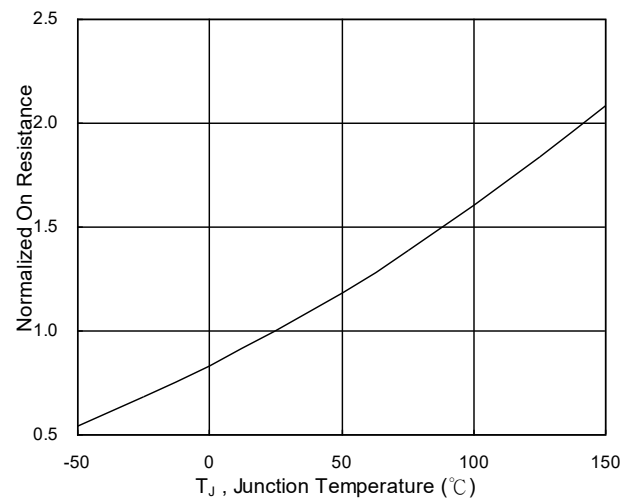


Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$

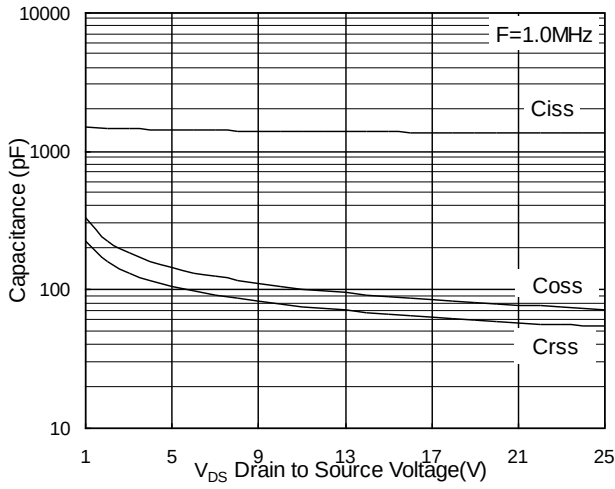


Fig.7 Capacitance

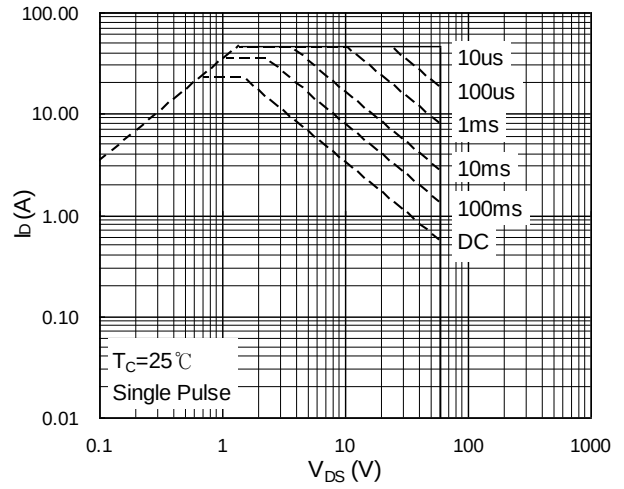


Fig.8 Safe Operating Area

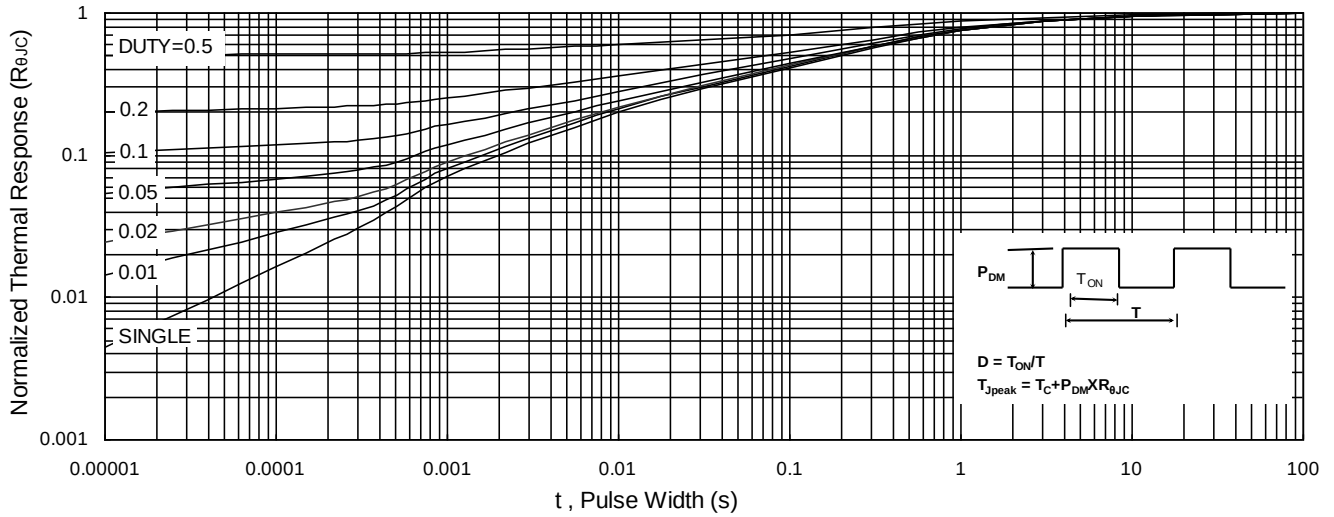


Fig.9 Normalized Maximum Transient Thermal Impedance

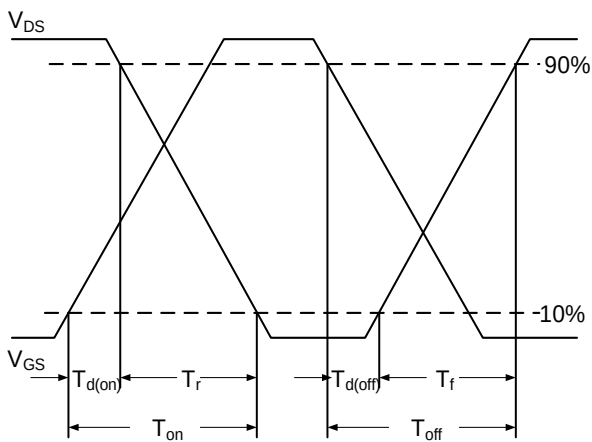


Fig.10 Switching Time Waveform

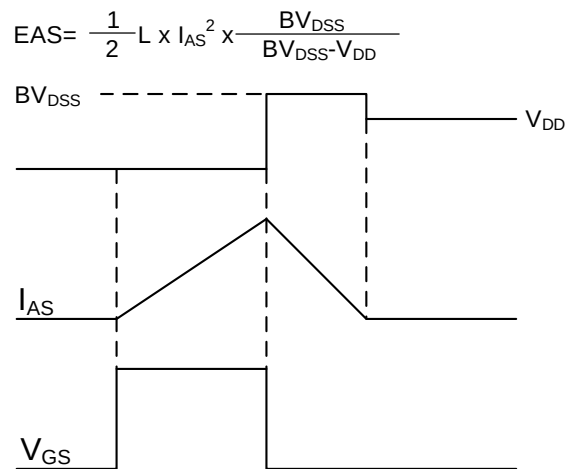
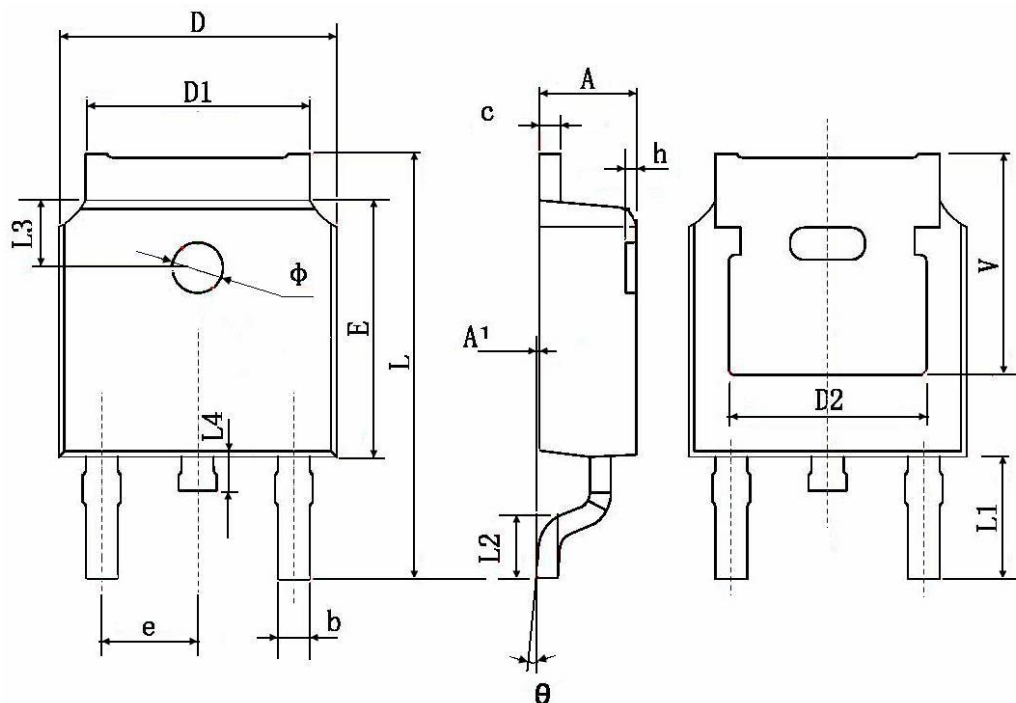


Fig.11 Unclamped Inductive Waveform



## TO-252-2L(TO-252-2(DPAK)) Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 0.483 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |



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