# iM5214



# P-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

- ☑ Advanced trench cell design
- ☑ Low Thermal Resistance

### 1.2 Applications

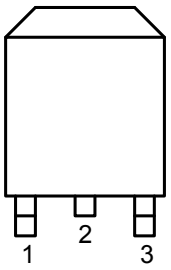
- ☑ Motor driver
- ☑ DC - DC Converter

### 1.3 Quick reference

- ☑ BV ≧ -60 V
- ☑ $P_{tot}$ ≦ 50 W
- ☑ $I_D$ ≦ - 38 A
- ☑ $R_{DS(ON)}$ ≦ 23 mΩ @ $V_{GS}$ = - 10 V
- ☑ $R_{DS(ON)}$ ≦ 33 mΩ @ $V_{GS}$ = - 4.5 V

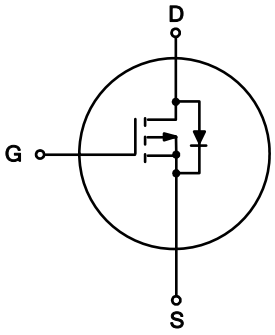
## 2. Pin Description

| Pin | Description |
|---|---|
| 1 | Gate(G) |
| 2 | Drain(D) |
| 3 | Source(S) |




Top View

TO-252





## 3. Limiting Values

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | $T_C$ = 25 ℃ | -60 | - | V |
| $V_{GS}$ | Gate-Source Voltage | $T_C$ = 25 ℃ | - | ± 20 | V |
| $I_D$* | Drain Current | $T_C$ = 25 ℃, $V_{GS}$ = - 10 V | - | -38 | A |
| | | $T_C$ = 100 ℃, $V_{GS}$ = - 10 V | - | -24 | A |
| $I_{DM}$*,**,*** | Pulsed Drain Current | $T_C$ = 25 ℃, $V_{GS}$ = 10 V | - | -120 | A |
| $P_{tot}$* | Total Power Dissipation | $T_C$ = 25 ℃ | - | 50 | W |
| $T_{stg}$ | Storage Temperature | | - 55 | 150 | ℃ |
| $T_J$ | Junction Temperature | | - | 150 | ℃ |
| $I_S$ | Diode Forward Current | $T_C$ = 25 ℃ | - | -38 | A |
| $E_{AS}$* | Single Pulsed Avalanche Energy | $V_{DD}$= - 50 V , L= 1.0 mH | - | 312 | mJ |
| $R_{\theta JC}$* | Thermal Resistance- Junction to Case | | - | 2.5 | ℃ / W |
| $R_{\theta JA}$* | Thermal Resistance- Junction to Ambient | | - | 62.5 | ℃ / W |

Notes :

* Surface Mounted on 1 $in^2$ pad area, t ≤ 10 sec

** Pulse width ≤ 10 μs, duty cycle ≤ 1 %

*** limited by bonding wire

## 4. Marking Information

| Product Name | Marking |
|---|---|
| iM5214 | iM5214<br>XXXXX X : Date Code |

## 5. Ordering Code

| | |
|---|---|
| iM5214 □ → Assembly Material | Assembly Material<br>G: Halogen and Lead Free Device |

Note: inergy defines " Green " as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)



## 6. Electrical Characteristics ($T_C$ = 25 °C Unless Otherwise Noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_{DS}$ = -250 μA | -60 | - | - | V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_{DS}$ = -250 μA | -1 | - | -3 | V |
| $I_{DSS}$ | Drain Leakage Current | $V_{DS}$ = -48 V, $V_{GS}$ = 0 V | - | - | -1 | μA |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$ = ± 20 V, $V_{DS}$ = 0 V | - | - | ± 100 | nA |
| $R_{DS(ON)}$[a] | Channel On-State Resistance | $V_{GS}$ = -10 V, $I_D$ = -20 A | - | 18 | 23 | mΩ |
| | | $V_{GS}$ = -4.5 V, $I_D$ = -15 A | - | 25 | 33 | |
| **Diode Characteristics** | | | | | | |
| $V_{SD}$[a] | Diode Forward Voltage | $I_{SD}$ = -20 A, $V_{GS}$ = 0 V | - | - | -1.3 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$ = -20 A, $dI_{SD}$ / dt = 100 A / μs | - | 24.5 | - | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 26.8 | - | nC |
| **Dynamic Characteristics**[b] | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0 V, $V_{DS}$ = -30 V Frequency = 1 MHz | - | 4548 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 177 | - | |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 119 | - | |
| $t_d$(on) | Turn-on Delay Time | $V_{DS}$ = - 30 V, $V_{GEN}$ = - 10 V, $R_G$ = 3.9 Ω, $R_L$ = 1.5 Ω, $I_{DS}$ = - 20 A | - | 67 | - | nS |
| $t_r$ | Turn-on Rise Time | | - | 100.5 | - | |
| $t_d$(off) | Turn-off Delay Time | | - | 460 | - | |
| $t_f$ | Turn-off Fall Time | | - | 200.4 | - | |
| **Gate Charge Characteristics**[b] | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = - 10 V, $V_{DS}$ = - 30 V, $I_{DS}$ = - 20 A | - | 72.3 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 19.6 | - | |
| $Q_{gd}$ | Gate-Drain Charge | | - | 9.9 | - | |

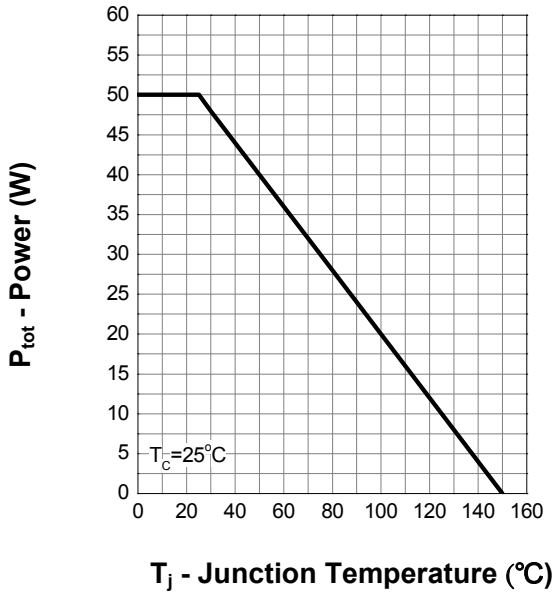
Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

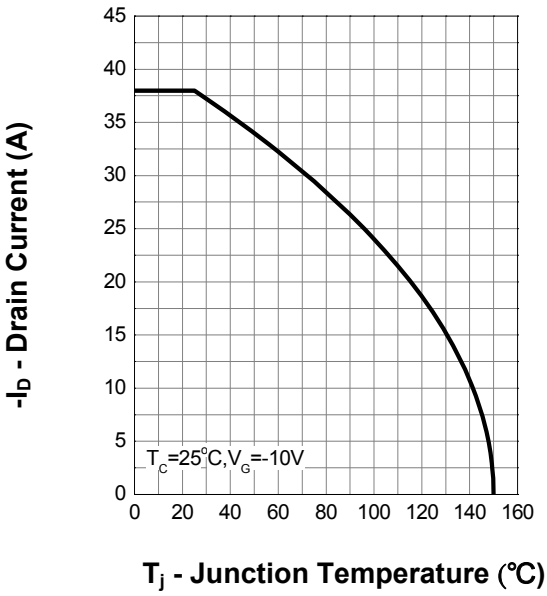
b : Guaranteed by design, not subject to production testing

## 7. Typical Characteristics

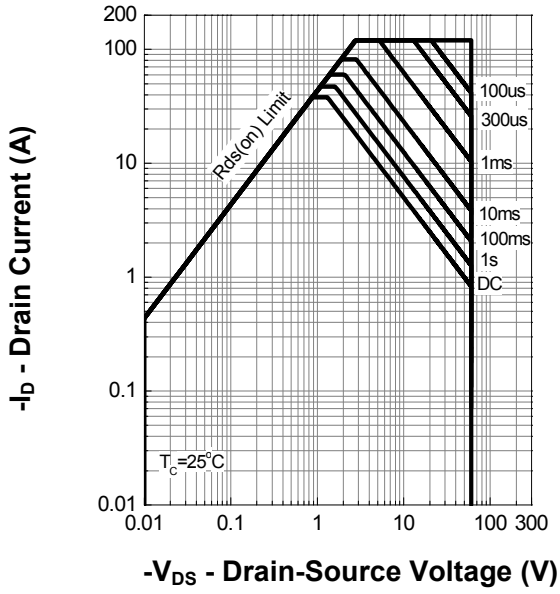
**Power Dissipation**



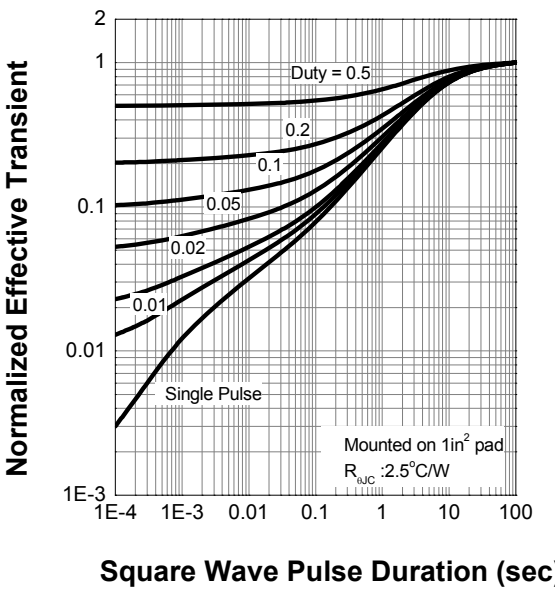

**Drain Current**




**Safe Operation Area**

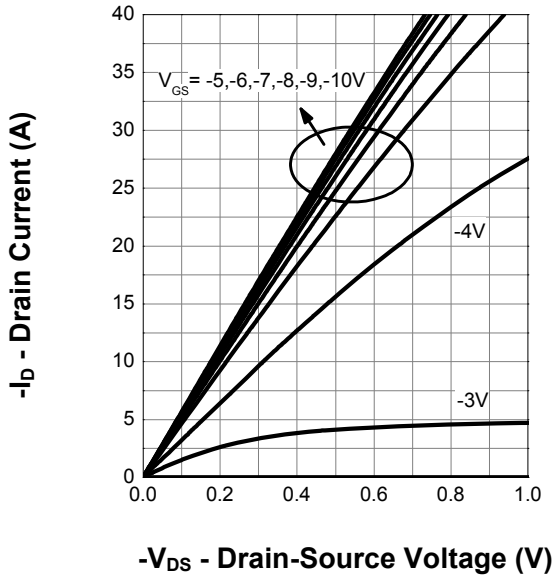



**Thermal Transient Impedance**

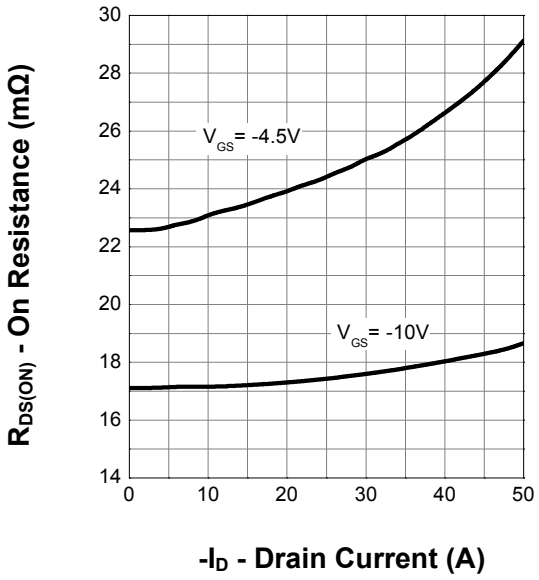


## 7. Typical Characteristics (cont.)

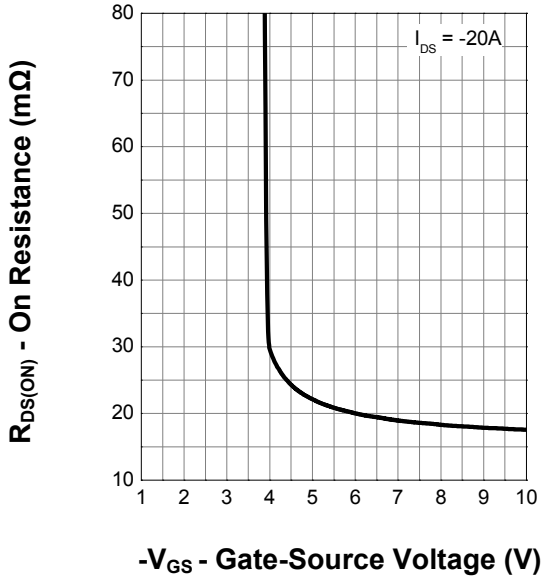
**Output Characteristics**



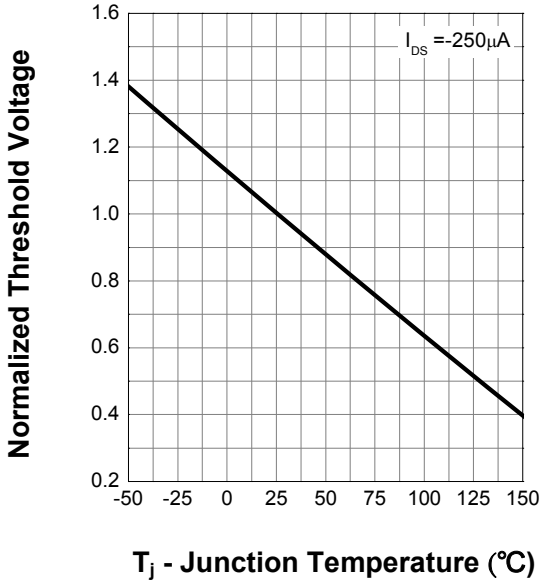

**Drain-Source On Resistance**




**Transfer Characteristics**

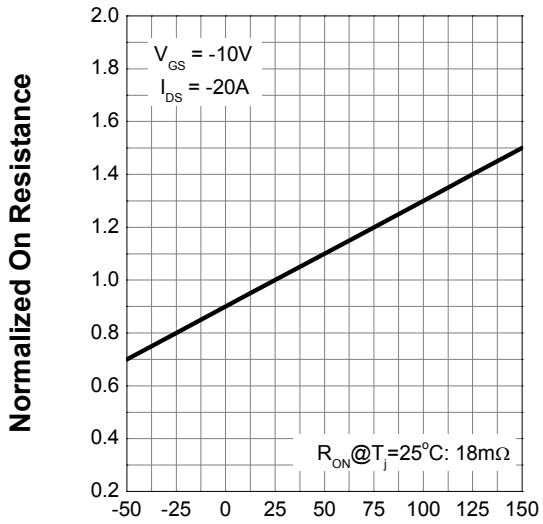



**Gate Threshold Voltage**

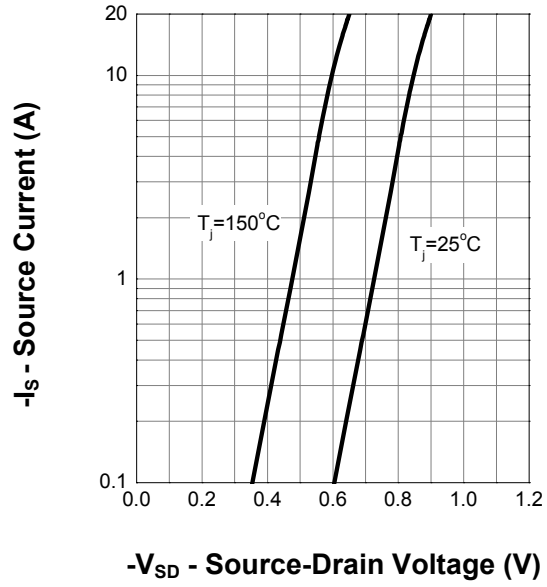


## 7. Typical Characteristics (cont.)

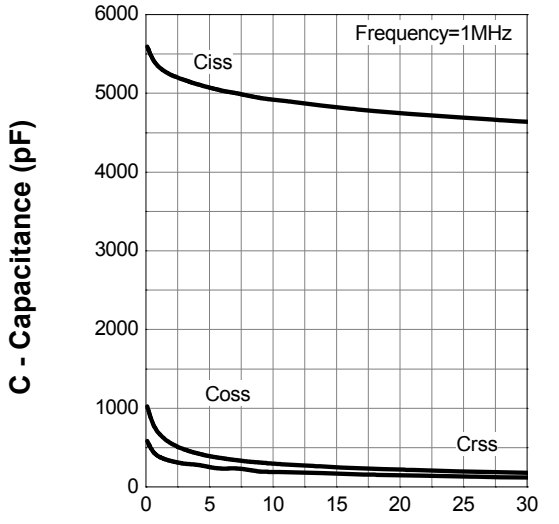
**Drain-Source On Resistance**



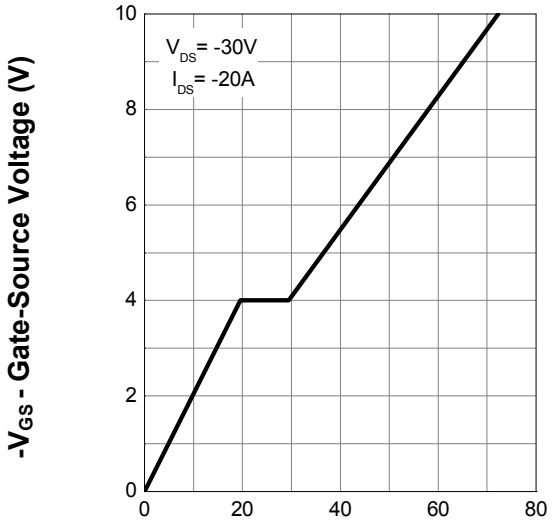

**Source-Drain Diode Forward**




**Capacitance**

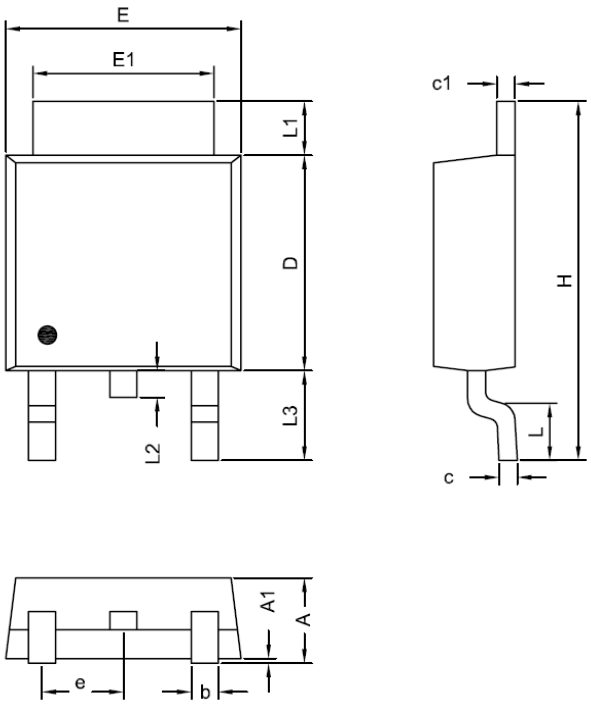



**Gate Charge**



## 8.Package Dimensions

### TO252-3L




| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | MIN. | MAX. |
| A | 2.19 | 2.38 |
| A1 | 0.02 | 0.13 |
| D | 5.30 | 6.40 |
| E | 6.35 | 6.80 |
| E1 | 5.20 | 5.50 |
| c | 0.40 | 0.60 |
| c1 | 0.40 | 0.60 |
| b | 0.55 | 0.85 |
| e | 2.30 BCS | |
| L | 1.00 | 1.80 |
| L1 | 0.70 | 1.80 |
| L2 | 0.70 BCS | |
| L3 | 2.40 | 2.80 |
| H | 9.20 | 10.40 |