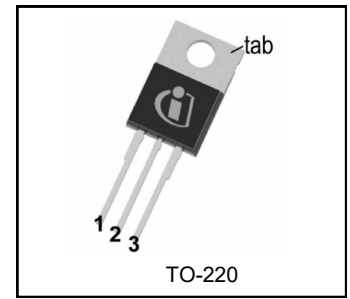
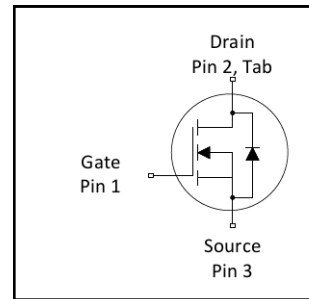


|                   |                |
|-------------------|----------------|
| $V_{(BR)DSS}$     | 100V           |
| $R_{DS(on)}$ max. | 0.044 $\Omega$ |
| $I_D$             | 36A            |

## Features

- Logic-Level Gate Drive
- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



| G    | D     | S      |
|------|-------|--------|
| Gate | Drain | Source |

## Description

Fifth Generation HEXFET Power MOSFETs utilizes the advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels at approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.

| Base part number | Package Type | Standard Pack |          | Orderable Part Number |
|------------------|--------------|---------------|----------|-----------------------|
|                  |              | Form          | Quantity |                       |
| IRL540NPbF       | TO-220       | Tube          | 50       | IRL540NPbF            |

## Absolute Maximum Rating

| Symbol                            | Parameter                                               | Max.               | Units |
|-----------------------------------|---------------------------------------------------------|--------------------|-------|
| $I_D$ @ $T_C = 25^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V                | 36                 | A     |
| $I_D$ @ $T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V                | 26                 |       |
| $I_{DM}$                          | Pulsed Drain Current ①                                  | 120                |       |
| $P_D$ @ $T_C = 25^\circ\text{C}$  | Maximum Power Dissipation                               | 140                | W     |
|                                   | Linear Derating Factor                                  | 0.91               | W/°C  |
| $V_{GS}$                          | Gate-to-Source Voltage                                  | $\pm 16$           | V     |
| $E_{AS}$                          | Single Pulse Avalanche Energy ②                         | 310                | mJ    |
| $I_{AR}$                          | Avalanche Current ①                                     | 18                 | A     |
| $E_{AR}$                          | Repetitive Avalanche Energy ①                           | 14                 | mJ    |
| dv/dt                             | Peak Diode Recovery dv/dt ③                             | 5.0                | V/ns  |
| $T_J$                             | Operating Junction and                                  | -55 to + 175       | °C    |
| $T_{STG}$                         | Storage Temperature Range                               |                    |       |
|                                   | Soldering Temperature, for 10 seconds (1.6mm from case) | 300                |       |
|                                   | Mounting torque, 6-32 or M3 screw                       | 10 lbf•in (1.1N•m) |       |

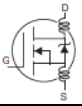
## Thermal Resistance

| Symbol          | Parameter                           | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case                    | —    | 1.1  | °C/W  |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.50 | —    |       |
| $R_{\theta JA}$ | Junction-to-Ambient                 | —    | 62   |       |

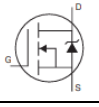
Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|                                 | Parameter                            | Min. | Typ. | Max.  | Units               | Conditions                                           |
|---------------------------------|--------------------------------------|------|------|-------|---------------------|------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 100  | —    | —     | V                   | $V_{GS} = 0V, I_D = 250\mu A$                        |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.11 | —     | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$    |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —    | 0.044 | $\Omega$            | $V_{GS} = 10V, I_D = 18A$ ④                          |
|                                 |                                      | —    | —    | 0.053 |                     | $V_{GS} = 5.0V, I_D = 18A$ ④                         |
|                                 |                                      | —    | —    | 0.063 |                     | $V_{GS} = 4.0V, I_D = 15A$ ④                         |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 1.0  | —    | 2.0   | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                    |
| $g_{fs}$                        | Forward Trans conductance            | 14   | —    | —     | S                   | $V_{DS} = 25V, I_D = 18A$ ④                          |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 25    | $\mu A$             | $V_{DS} = 100V, V_{GS} = 0V$                         |
|                                 |                                      | —    | —    | 250   |                     | $V_{DS} = 80V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100   | nA                  | $V_{GS} = 16V$                                       |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100  |                     | $V_{GS} = -16V$                                      |

Dynamic Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|              |                              |   |      |     |    |                                                                                                                                                        |
|--------------|------------------------------|---|------|-----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| $Q_g$        | Total Gate Charge            | — | —    | 74  | nC | $I_D = 18A$                                                                                                                                            |
| $Q_{gs}$     | Gate-to-Source Charge        | — | —    | 9.4 |    | $V_{DS} = 50V$                                                                                                                                         |
| $Q_{gd}$     | Gate-to-Drain Charge         | — | —    | 38  |    | $V_{GS} = 5.0V$ , See Fig. 6 and 13                                                                                                                    |
| $t_{d(on)}$  | Turn-On Delay Time           | — | 11   | —   | ns | $V_{DD} = 50V$                                                                                                                                         |
| $t_r$        | Rise Time                    | — | 81   | —   |    | $I_D = 18A$                                                                                                                                            |
| $t_{d(off)}$ | Turn-Off Delay Time          | — | 39   | —   |    | $R_G = 5.0\Omega$                                                                                                                                      |
| $t_f$        | Fall Time                    | — | 62   | —   |    | $R_D = 2.7\Omega, V_{GS} = 5.0V$ , See Fig. 10 ④                                                                                                       |
| $L_D$        | Internal Drain Inductance    | — | 4.5  | —   | nH | Between lead, 6mm (0.25in.) from package and center of die contact  |
| $L_S$        | Internal Source Inductance   | — | 7.5  | —   |    |                                                                                                                                                        |
| $C_{iss}$    | Input Capacitance            | — | 1800 | —   | pF | $V_{GS} = 0V$                                                                                                                                          |
| $C_{oss}$    | Output Capacitance           | — | 350  | —   |    | $V_{DS} = 25V$                                                                                                                                         |
| $C_{rss}$    | Reverse Transfer Capacitance | — | 170  | —   |    | $f = 1.0\text{MHz}$ , See Fig.5                                                                                                                        |

## Diode Characteristics

|          | Parameter                              | Min. | Typ. | Max. | Units   | Conditions                                                                                                                                           |
|----------|----------------------------------------|------|------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —    | —    | 36   | A       | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —    | —    | 120  |         |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —    | —    | 1.3  | V       | $T_J = 25^\circ\text{C}, I_S = 18A, V_{GS} = 0V$ ④                                                                                                   |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 190  | 290  | ns      | $T_J = 25^\circ\text{C}, I_F = 18A$                                                                                                                  |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 1.1  | 1.7  | $\mu C$ | $di/dt = 100A/\mu s$ ④                                                                                                                               |

## Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1.9\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 18A$ . (See fig. 12)
- ③  $I_{SD} \leq 18A$ ,  $di/dt \leq 180A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

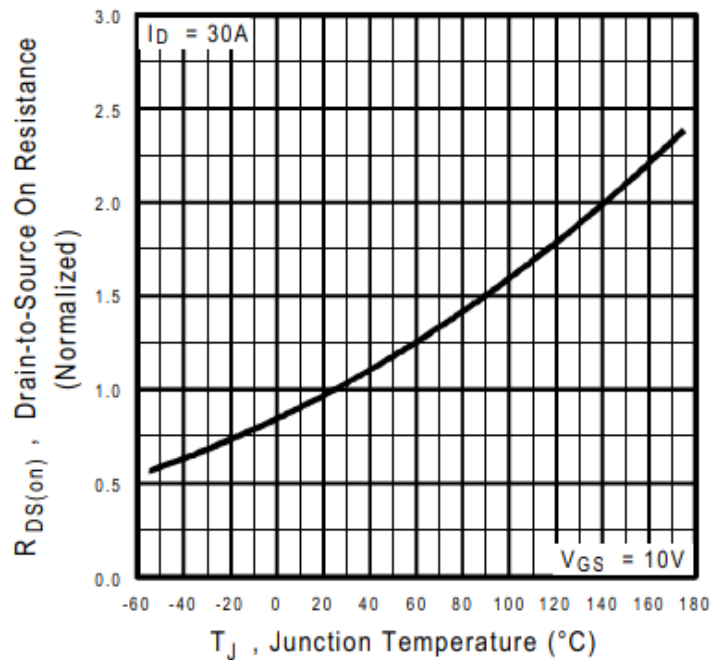
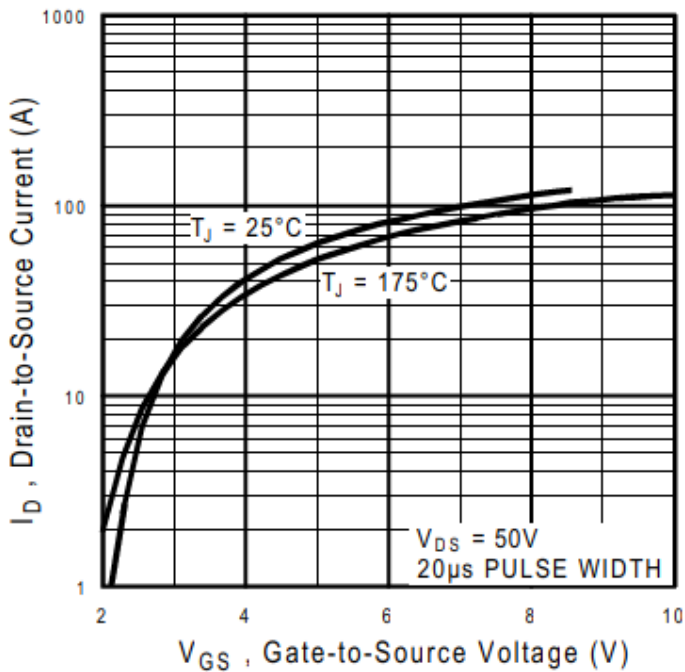
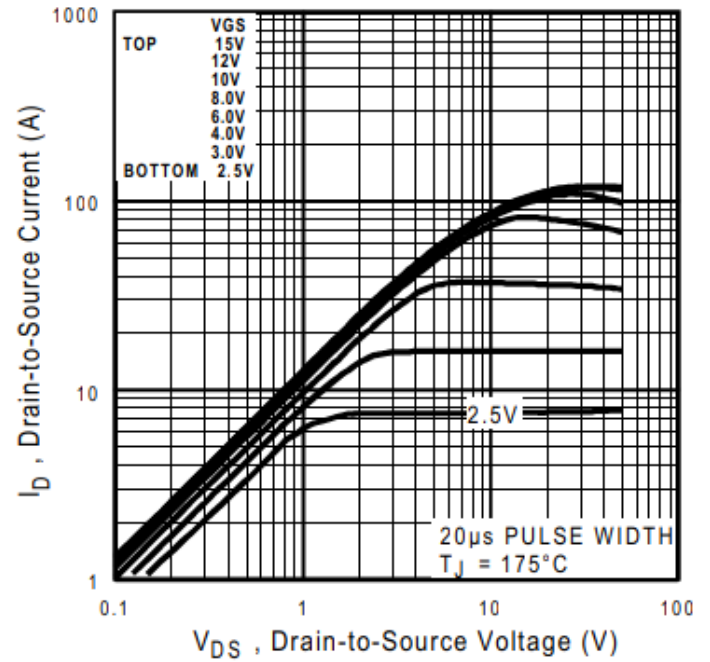
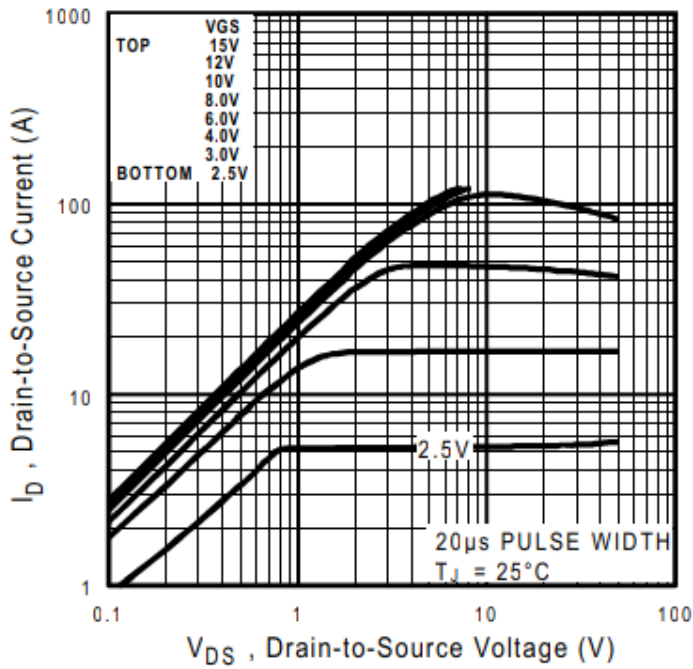
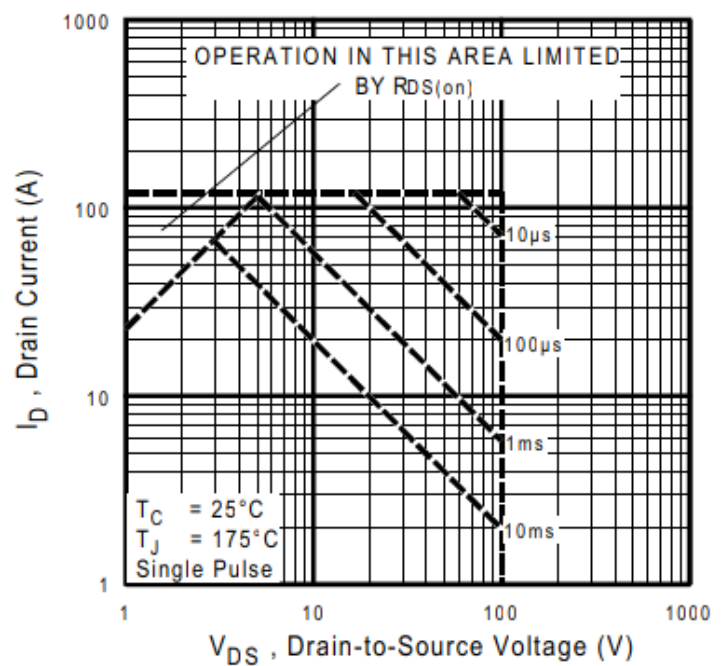
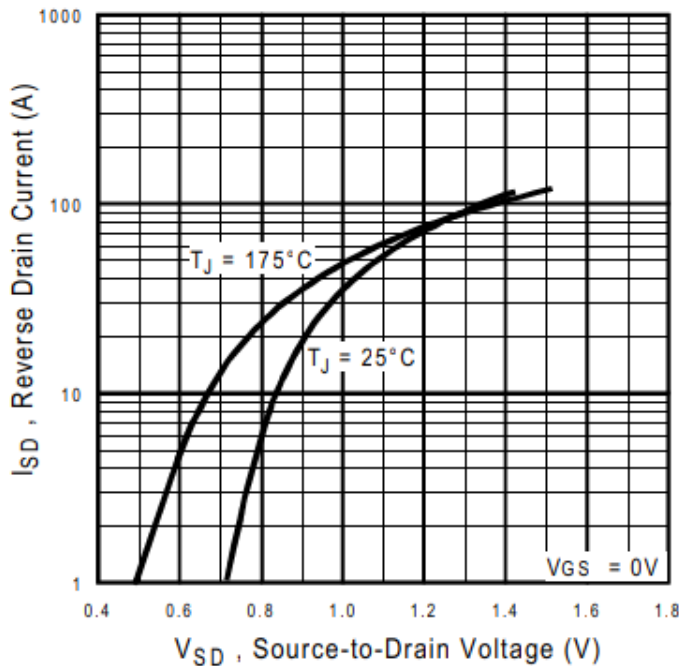
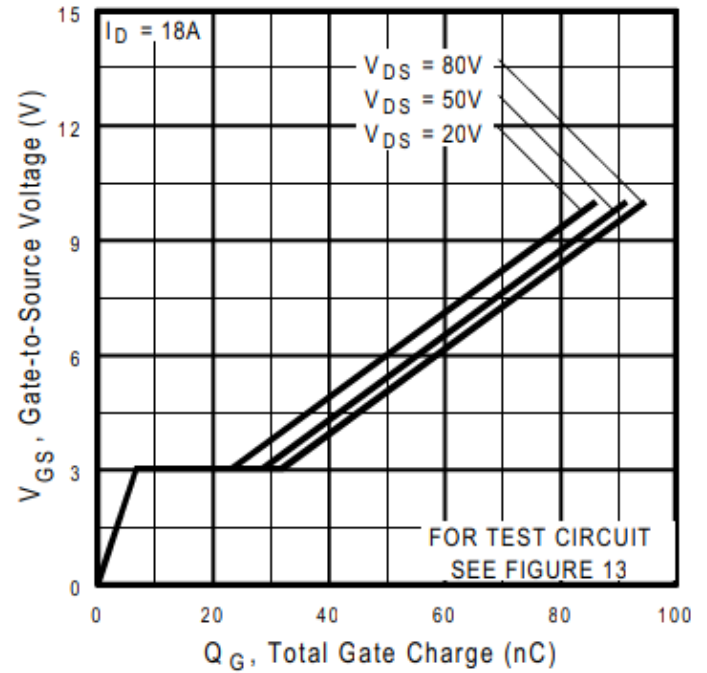
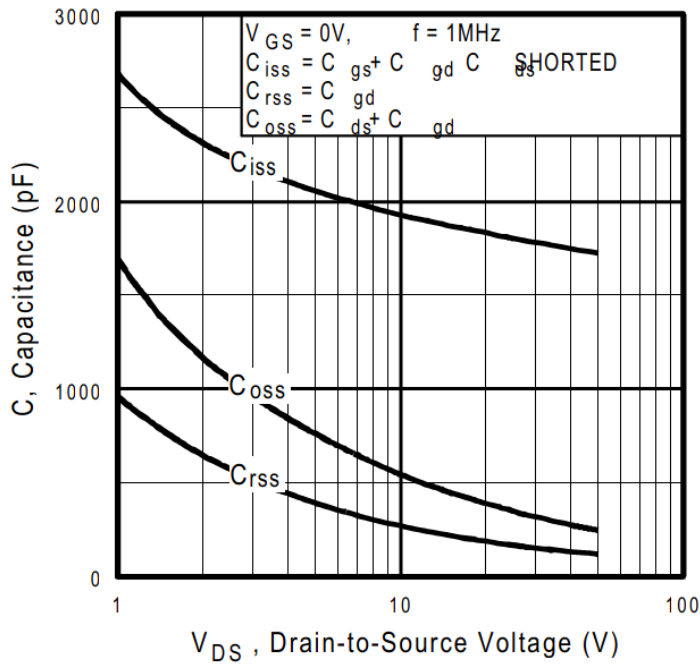
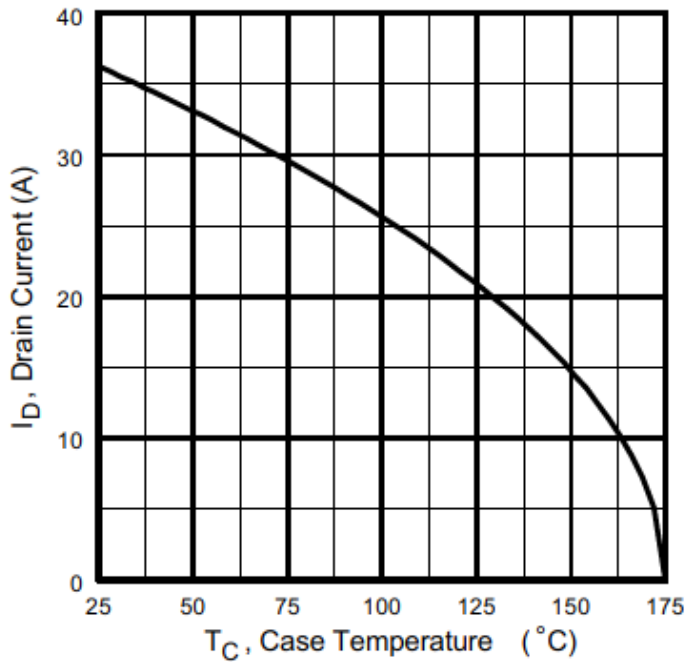


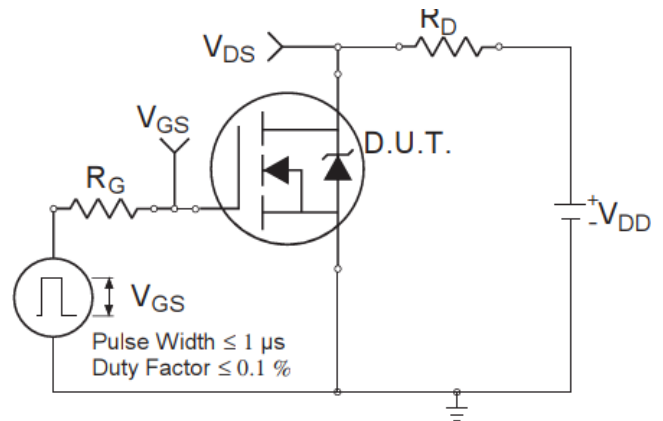
Fig. 3 Typical Transfer Characteristics

Fig. 4 Normalized On-Resistance vs. Temperature

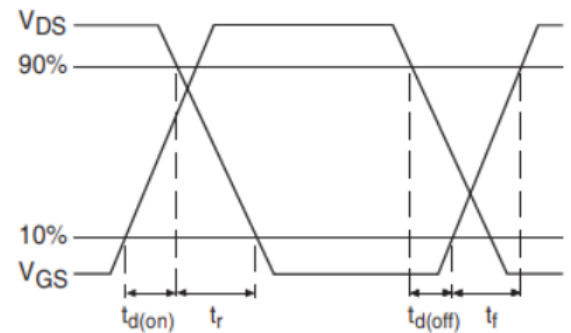




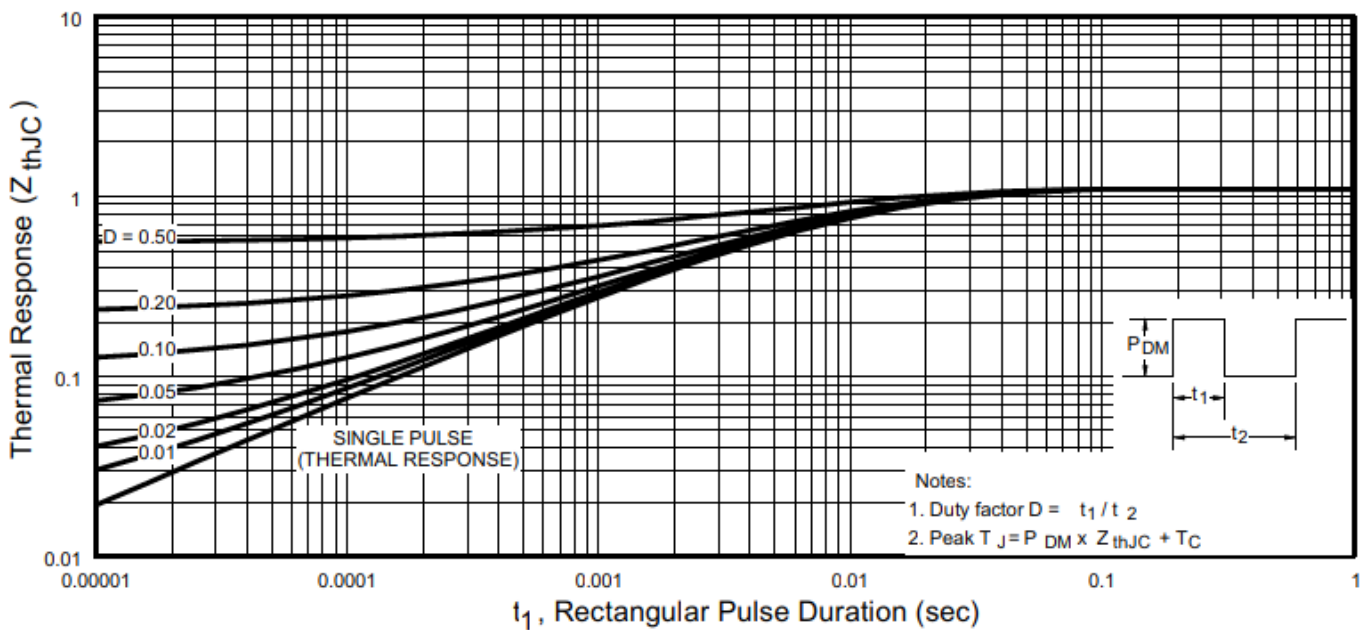
**Fig 9.** Maximum Drain Current vs. Case Temperature



**Fig 10b.** Switching Time Test Circuit



**Fig 10b.** Switching Time Waveforms



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

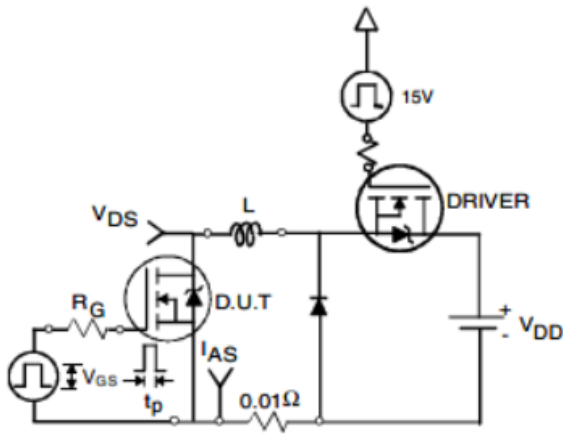


Fig. 12a. Unclamped Inductive Test Circuit

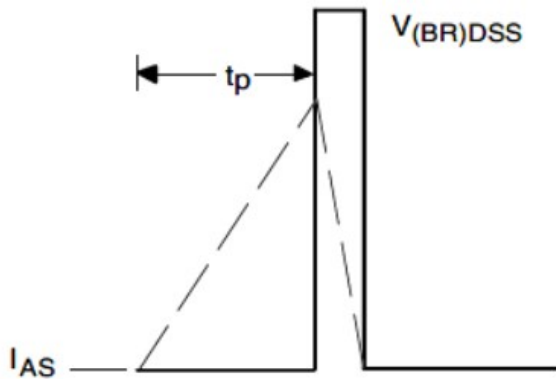


Fig. 12b. Unclamped Inductive Waveforms

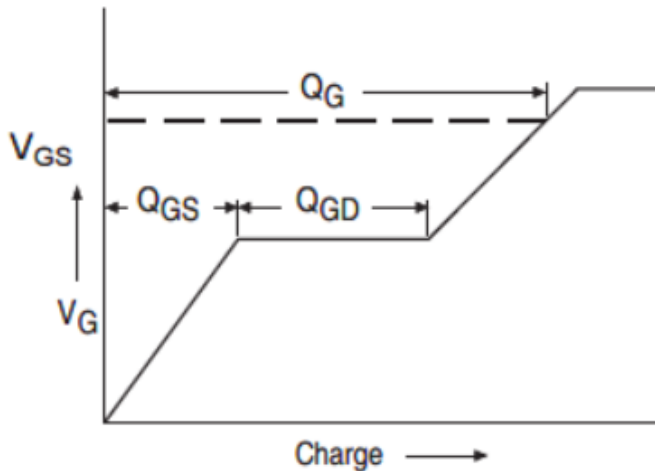


Fig 13a. Basic Gate Charge Waveform

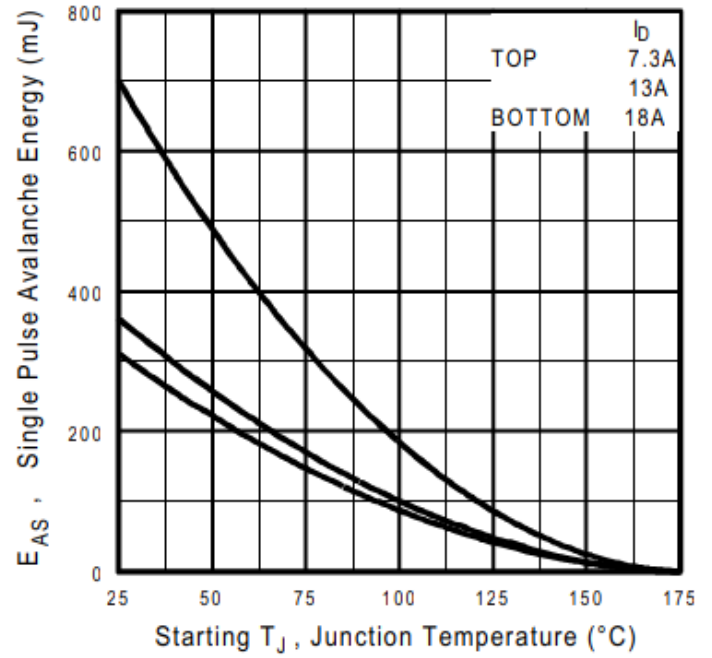


Fig 12c. Maximum Avalanche Energy vs. Drain Current

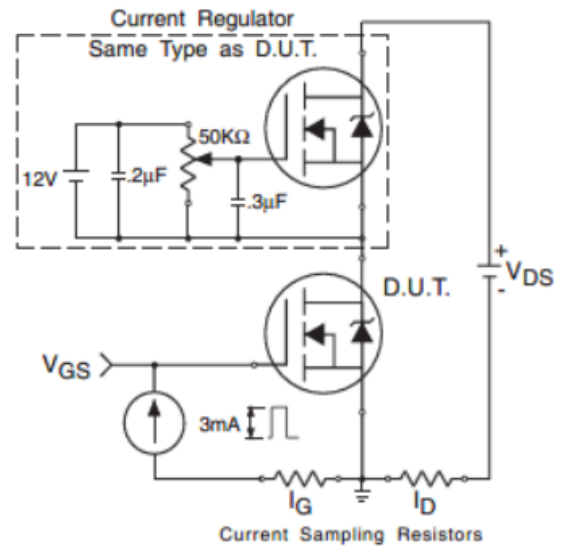
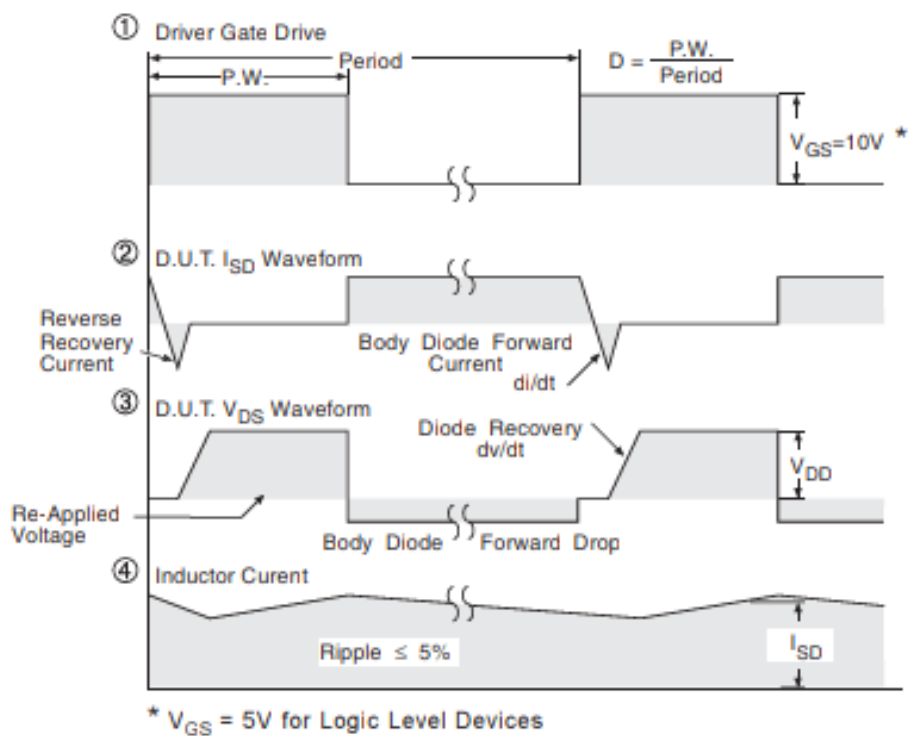
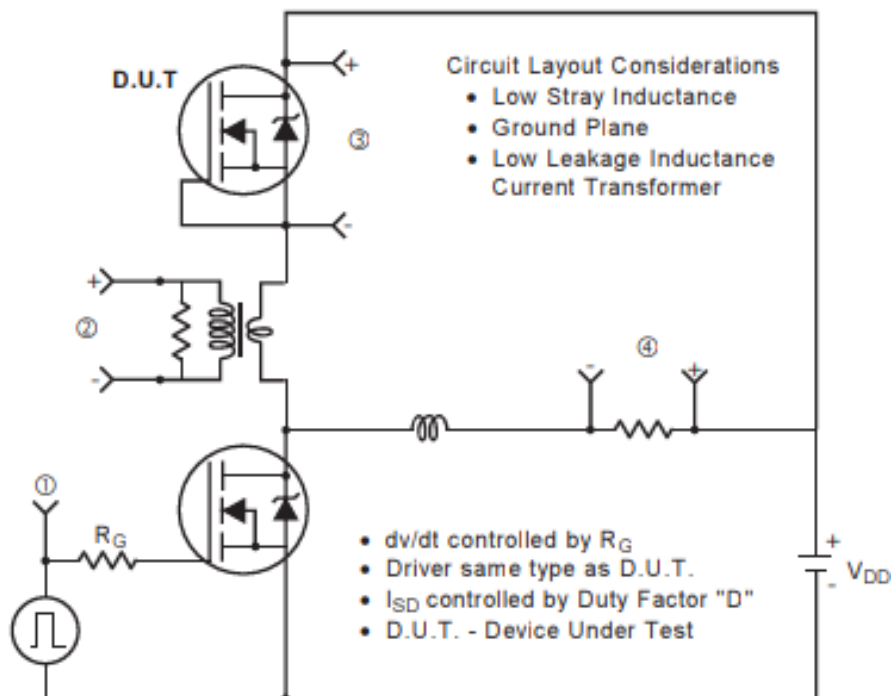
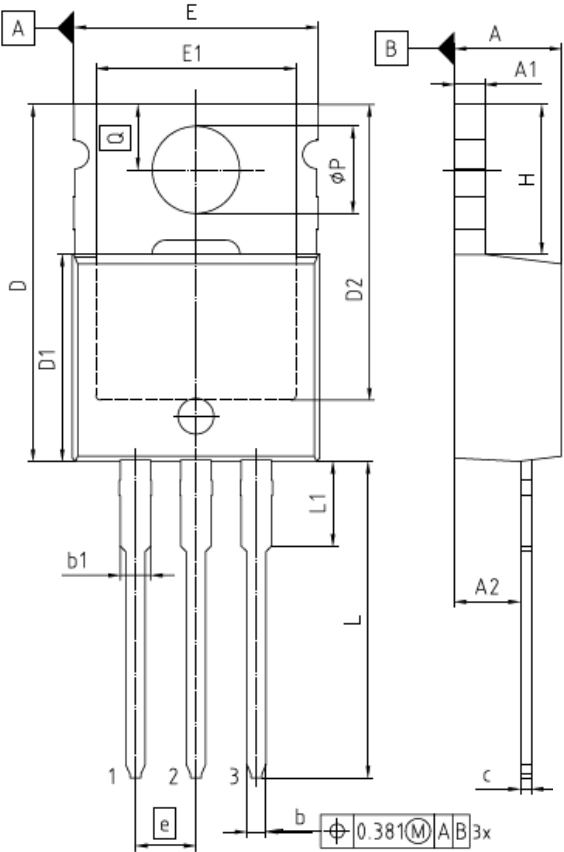


Fig 13b. Gate Charge Test Circuit



**Fig 14. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs**

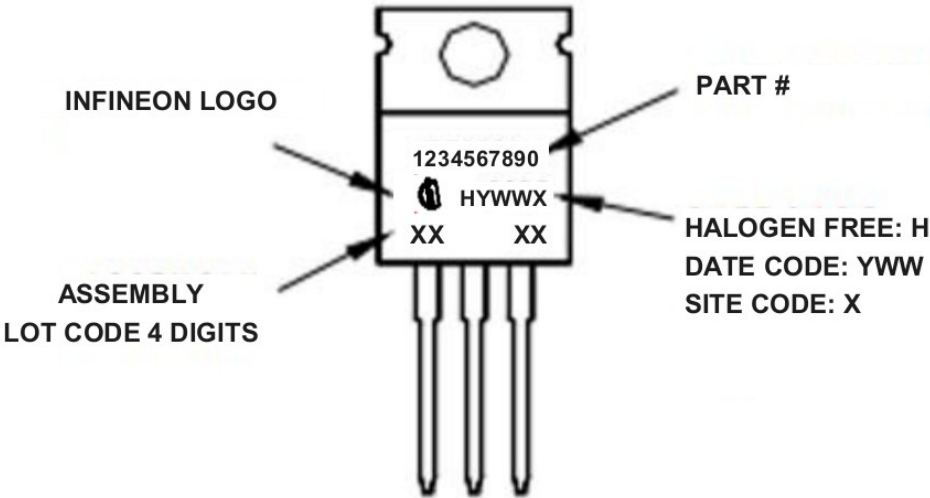
TO-220 Package Outline (Dimensions are shown in millimeters (inches))



NOTES:  
DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS  
GATE BURRS ARE LESS THAN 0.5 mm

| PACKAGE - GROUP<br>NUMBER: PG-TO220-3-U05 |             |       |
|-------------------------------------------|-------------|-------|
| DIMENSIONS                                | MILLIMETERS |       |
|                                           | MIN.        | MAX.  |
| A                                         | 3.56        | 4.83  |
| A1                                        | 1.14        | 1.40  |
| A2                                        | 2.03        | 2.92  |
| b                                         | 0.38        | 1.01  |
| b1                                        | 1.14        | 1.78  |
| c                                         | 0.36        | 0.61  |
| D                                         | 14.22       | 16.51 |
| D1                                        | 8.38        | 9.20  |
| D2                                        | 11.68       | 12.88 |
| E                                         | 9.65        | 10.67 |
| E1                                        | 6.86        | 8.89  |
| e                                         | 2.54        |       |
| N                                         | 3           |       |
| H                                         | 5.84        | 6.86  |
| L                                         | 12.70       | 14.73 |
| L1                                        | 3.56        | 4.06  |
| øP                                        | 3.54        | 4.08  |
| Q                                         | 2.54        | 3.42  |

TO-220 Part Marking Information



TO-220 packages are not recommended for Surface Mount Application.

## Revision History

| Date       | Rev. | Comments                                                                                                                                                                                |
|------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2026-08-18 | 2.1  | <ul style="list-style-type: none"> <li>Update datasheet to Infineon format</li> <li>Updated Package Outline and Part marking –page 8</li> <li>Added disclaimer on last page.</li> </ul> |

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