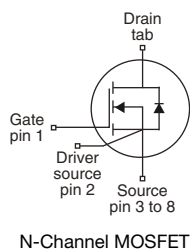
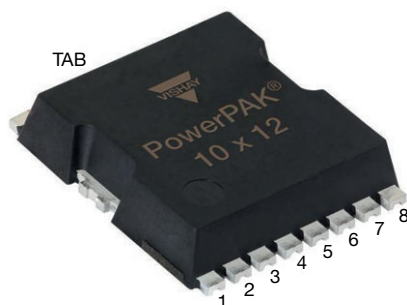


## E Series Power MOSFET

**PowerPAK® 10 x 12**


### FEATURES

- 4<sup>th</sup> generation E series technology
- Low figure-of-merit (FOM)  $R_{DS(on)} \times Q_g$
- Low effective capacitance ( $C_{o(er)}$ )
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Kelvin connection for reduced gate noise
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Industrial
  - Welding
  - Induction heating
  - Motor drives
  - Battery chargers
  - Solar (PV inverters)

### PRODUCT SUMMARY

|   |                 |       |
|---|-----------------|-------|
| $V_{DS}$ (V) at $T_J$ max.              | 700             |       |
| $R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C | $V_{GS} = 10$ V | 0.087 |
| $Q_g$ max. (nC)                         | 62              |       |
| $Q_{gs}$ (nC)                           | 16              |       |
| $Q_{gd}$ (nC)                           | 15              |       |
| Configuration                           | Single          |       |

### ORDERING INFORMATION

|                                 |                    |
|---------------------------------|--------------------|
| Package                         | PowerPAK 10 x 12   |
| Lead (Pb)-free and halogen-free | SiHK100N65E-T1-GE3 |

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

| PARAMETER  | SYMBOL           | LIMIT          | UNIT |
|--|------------------|----------------|------|
| Drain-source voltage                             | $V_{DS}$         | 650            | V    |
| Gate-source voltage                              | $V_{GS}$         | $\pm 30$       |      |
| Continuous drain current ( $T_J = 150$ °C)       | $V_{GS}$ at 10 V | $T_C = 25$ °C  | A    |
|  |                  | $T_C = 100$ °C |      |
| Pulsed drain current <sup>a</sup>                | $I_{DM}$         | 63             | W/°C |
| Linear derating factor                           |                  | 1.47           |      |
| Single pulse avalanche energy <sup>b</sup>       | $E_{AS}$         | 127            | mJ   |
| Maximum power dissipation                        | $P_D$            | 184            | W    |
| Operating junction and storage temperature range | $T_J, T_{stg}$   | -55 to +150    | °C   |
| Drain-source voltage slope                       | $dv/dt$          | 100            | V/ns |
| Reverse diode $dv/dt$ <sup>c</sup>               |                  | 11             |      |


#### Notes

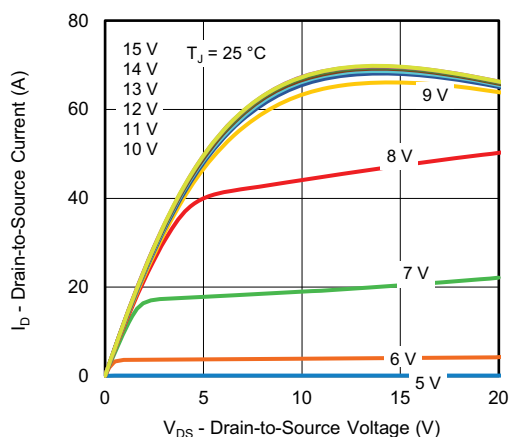
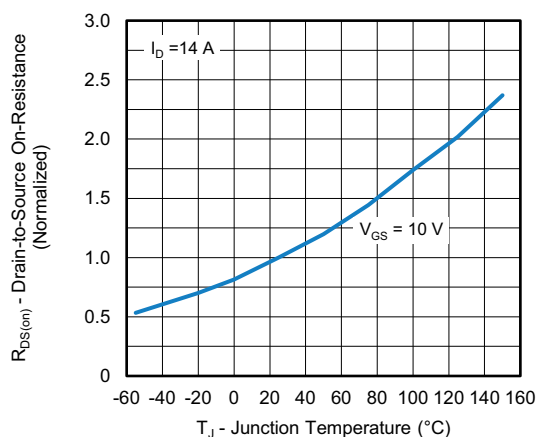
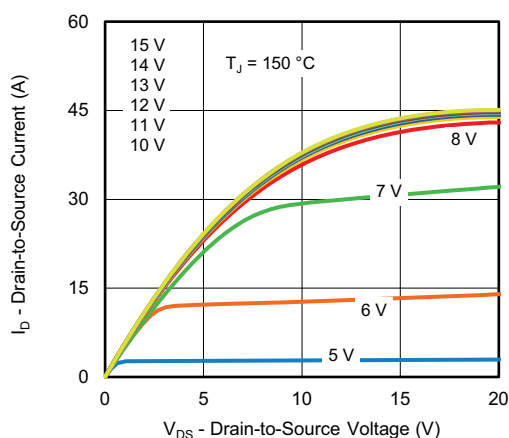
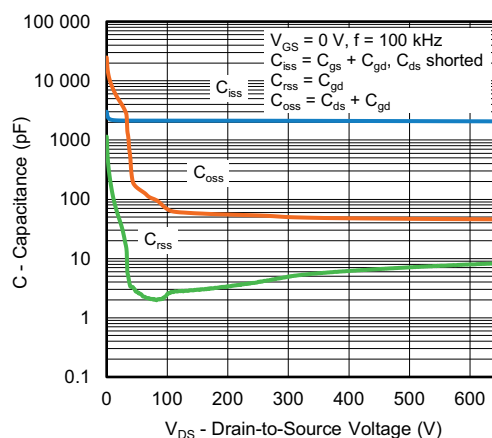
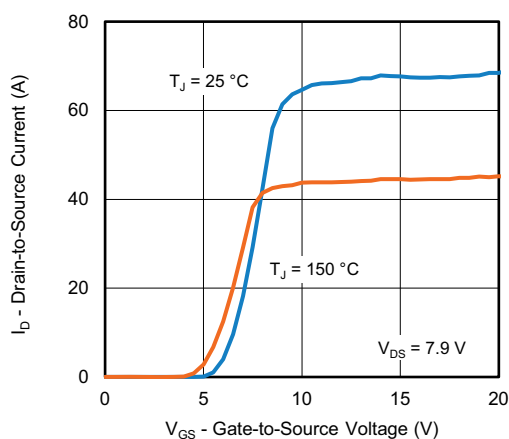
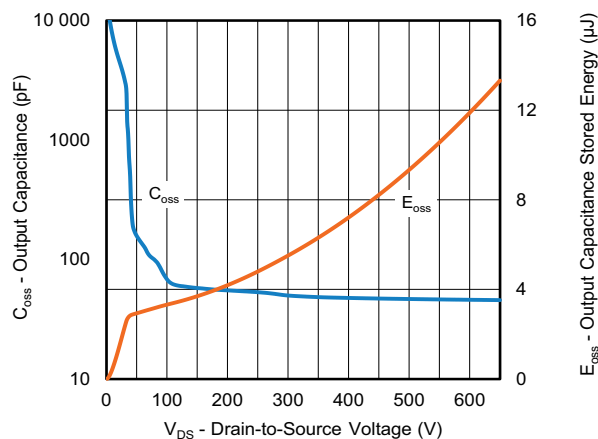
- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 3.0$  A
- $I_{SD} \leq I_D$ ,  $di/dt = 100$  A/ $\mu$ s, starting  $T_J = 25$  °C

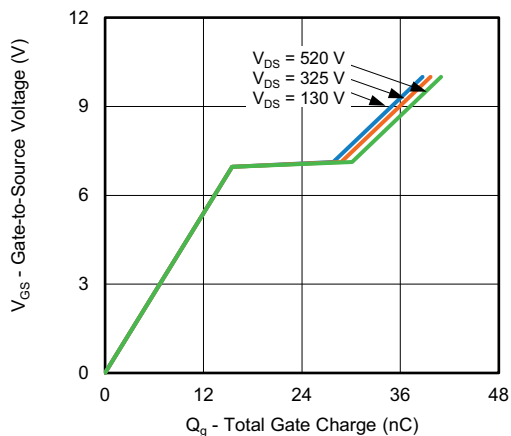
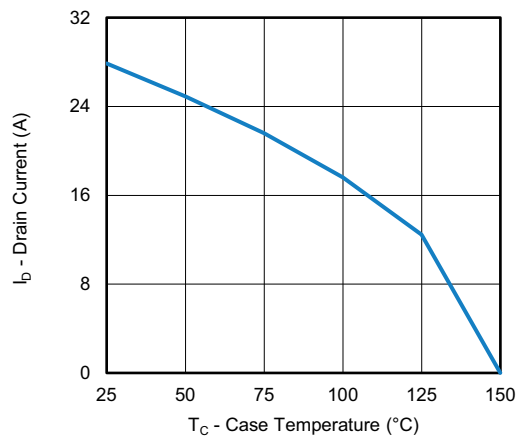
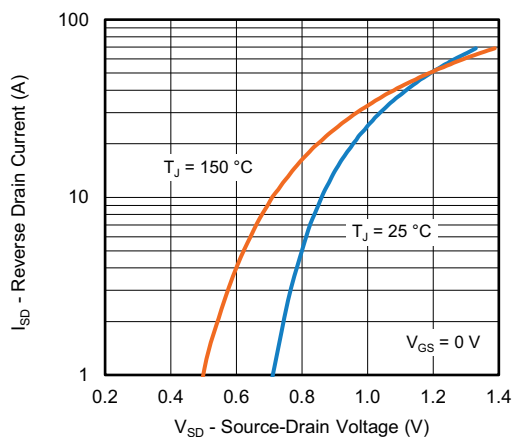
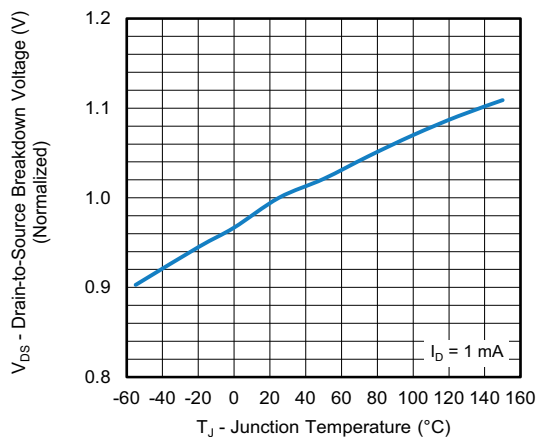
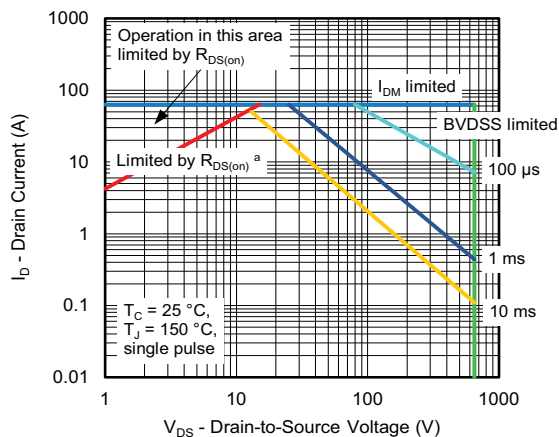
**THERMAL RESISTANCE RATINGS**

| PARAMETER                        | SYMBOL     | TYP. | MAX. | UNIT |
|----------------------------------|------------|------|------|------|
| Maximum junction-to-ambient      | $R_{thJA}$ | 40   | 42   | °C/W |
| Maximum junction-to-case (drain) | $R_{thJC}$ | 0.51 | 0.68 |      |

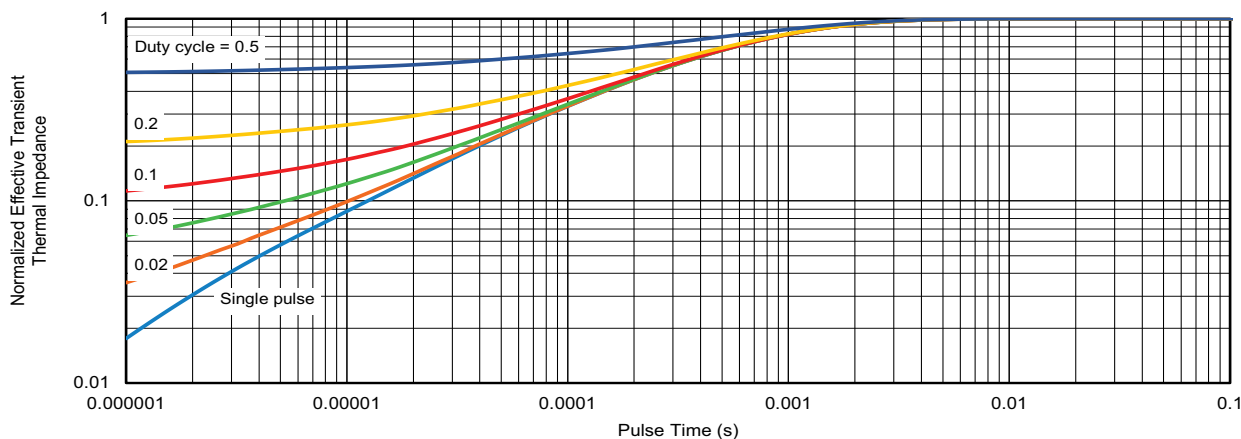
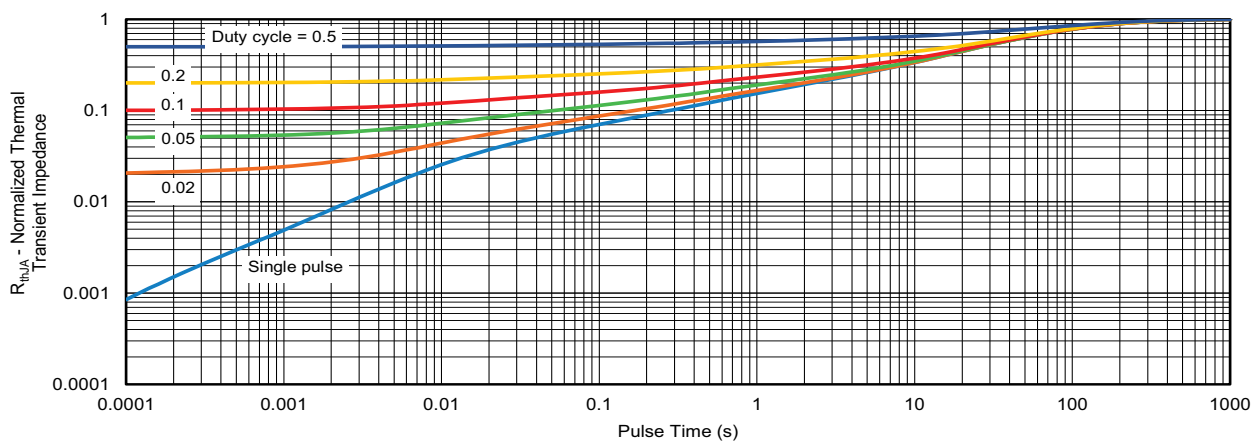
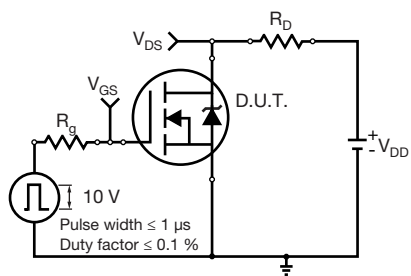
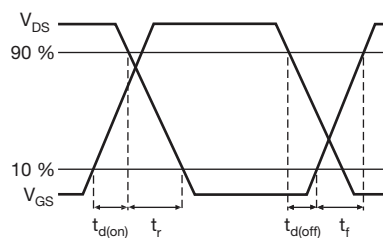
**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)

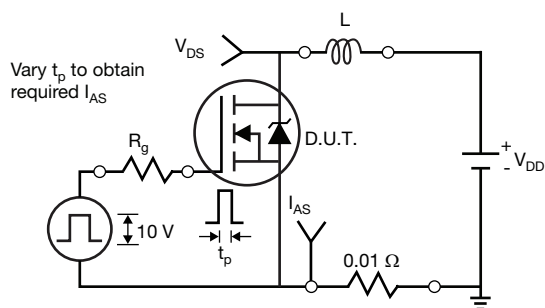
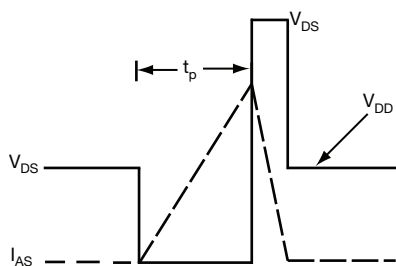
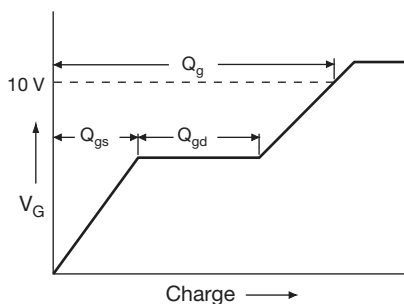
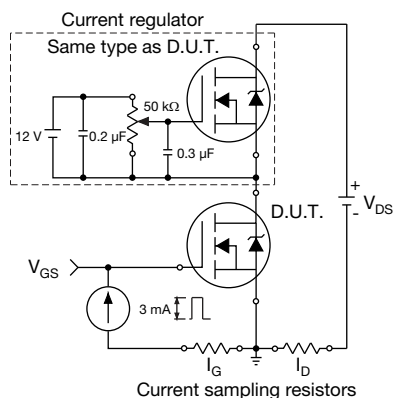
| PARAMETER   | SYMBOL                           | TEST CONDITIONS  |  | MIN. | TYP.  | MAX.  | UNIT |
|---|----------------------------------|--|--|------|-------|-------|------|
| Static  |                                  |  |  |      |       |       |      |
| Drain-source breakdown voltage                            | V <sub>DS</sub>                  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA   |  | 650  | -     | -     | V    |
| V <sub>DS</sub> temperature coefficient                   | ΔV <sub>DS</sub> /T <sub>J</sub> | Reference to 25 °C, I <sub>D</sub> = 1 mA  |  | -    | 0.68  | -     | V/°C |
| Gate-source threshold voltage (N)                         | V <sub>GS(th)</sub>              | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA  |  | 3.0  | -     | 5.0   | V    |
| Gate-source leakage                                       | I <sub>GSS</sub>                 | V <sub>GS</sub> = ± 20 V   |  | -    | -     | ± 100 | nA   |
|   |                                  | V <sub>GS</sub> = ± 30 V   |  | -    | -     | ± 1   | μA   |
| Zero gate voltage drain current                           | I <sub>DSS</sub>                 | V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V   |  | -    | -     | 1     | μA   |
|   |                                  | V <sub>DS</sub> = 520 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C  |  | -    | -     | 10    |      |
| Drain-source on-state resistance                          | R <sub>DS(on)</sub>              | V <sub>GS</sub> = 10 V   | I <sub>D</sub> = 12 A                          | -    | 0.087 | 0.100 | Ω    |
| Forward transconductance <sup>a</sup>                     | g <sub>fs</sub>                  | V <sub>DS</sub> = 8 V, I <sub>D</sub> = 14 A   |  | -    | 12    | -     | S    |
| Dynamic   |                                  |  |  |      |       |       |      |
| Input capacitance   | C <sub>iss</sub>                 | V <sub>GS</sub> = 0 V,<br>V <sub>DS</sub> = 100 V,<br>f = 1 MHz  |  | -    | 2137  | -     | pF   |
| Output capacitance  | C <sub>oss</sub>                 |  |  | -    | 89    | -     |      |
| Reverse transfer capacitance                              | C <sub>rss</sub>                 |  |  | -    | 2     | -     |      |
| Effective output capacitance, energy related <sup>a</sup> | C <sub>o(er)</sub>               | V <sub>DS</sub> = 0 V to 400 V, V <sub>GS</sub> = 0 V  |  | -    | 90    | -     |      |
| Effective output capacitance, time related <sup>b</sup>   | C <sub>o(tr)</sub>               |  |  | -    | 633   | -     |      |
| Total gate charge   | Q <sub>g</sub>                   | V <sub>GS</sub> = 10 V   | I <sub>D</sub> = 14 A, V <sub>DS</sub> = 520 V | -    | 41    | 62    | nC   |
| Gate-source charge  | Q <sub>gs</sub>                  |  |  | -    | 16    | -     |      |
| Gate-drain charge   | Q <sub>gd</sub>                  |  |  | -    | 15    | -     |      |
| Turn-on delay time  | t <sub>d(on)</sub>               | V <sub>DD</sub> = 520 V, I <sub>D</sub> = 14 A,<br>V <sub>GS</sub> = 10 V, R <sub>g</sub> = 9.1 Ω  |  | -    | 28    | 56    | ns   |
| Rise time   | t <sub>r</sub>                   |  |  | -    | 68    | 136   |      |
| Turn-off delay time                                       | t <sub>d(off)</sub>              |  |  | -    | 50    | 100   |      |
| Fall time   | t <sub>f</sub>                   |  |  | -    | 32    | 64    |      |
| Gate input resistance                                     | R <sub>g</sub>                   | f = 1 MHz  |  | 0.5  | 1.1   | 2.2   | Ω    |
| Drain-Source Body Diode Characteristics                   |                                  |  |  |      |       |       |      |
| Continuous source-drain diode current                     | I <sub>S</sub>                   | MOSFET symbol showing the integral reverse p - n junction diode<br> |  | -    | -     | 28    | A    |
| Pulsed diode forward current                              | I <sub>SM</sub>                  |  |  | -    | -     | 63    |      |
| Diode forward voltage                                     | V <sub>SD</sub>                  | T <sub>J</sub> = 25 °C, I <sub>S</sub> = 14 A, V <sub>GS</sub> = 0 V   |  | -    | -     | 1.2   | V    |
| Reverse recovery time                                     | t <sub>rr</sub>                  | T <sub>J</sub> = 25 °C, I <sub>F</sub> = I <sub>S</sub> = 14A,<br>di/dt = 100 A/μs, V <sub>R</sub> = 25 V  |  | -    | 362   | 724   | ns   |
| Reverse recovery charge                                   | Q <sub>rr</sub>                  |  |  | -    | 5.0   | 10    | μC   |
| Reverse recovery current                                  | I <sub>RRM</sub>                 |  |  | -    | 22    | -     | A    |

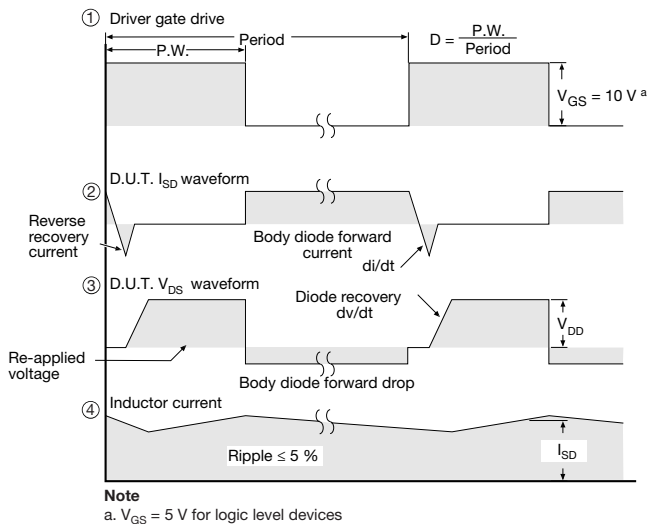
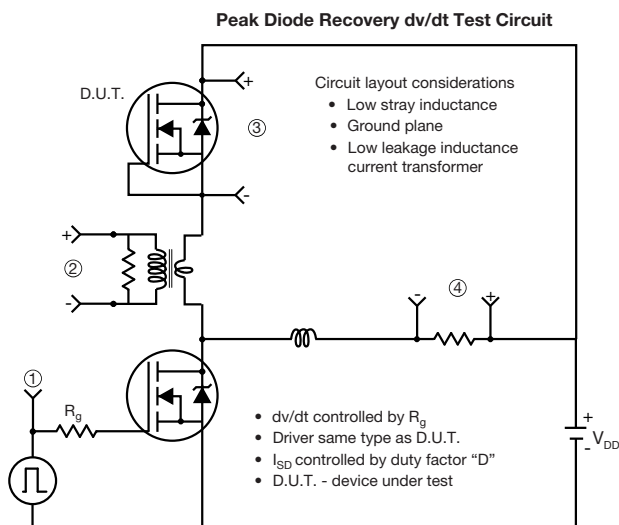
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Fig. 1 - Typical Output Characteristics**

**Fig. 4 - Normalized On-Resistance vs. Temperature**

**Fig. 2 - Typical Output Characteristics**

**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

**Fig. 3 - Typical Transfer Characteristics**

**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{DS}$**


**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**

**Fig. 10 - Maximum Drain Current vs. Case Temperature**

**Fig. 8 - Typical Source-Drain Diode Forward Voltage**

**Fig. 11 - Temperature vs. Drain-to-Source Voltage**

**Fig. 9 - Maximum Safe Operating Area**
**Note**

a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified


**Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case**

**Fig. 13 - Normalized Thermal Transient Impedance, Junction-to-Ambient**

**Fig. 14 - Switching Time Test Circuit**

**Fig. 15 - Switching Time Waveforms**


**Fig. 16 - Unclamped Inductive Test Circuit**

**Fig. 17 - Unclamped Inductive Waveforms**

**Fig. 18 - Basic Gate Charge Waveform**

**Fig. 19 - Gate Charge Test Circuit**



**Fig. 20 - For N-Channel**

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