

## Diode

Fast Switching Emitter Controlled Diode

## IDW30E60

Emitter Controlled Diode series

Data sheet

Industrial & Multimarket

## Fast Switching Emitter Controlled Diode

### Features:

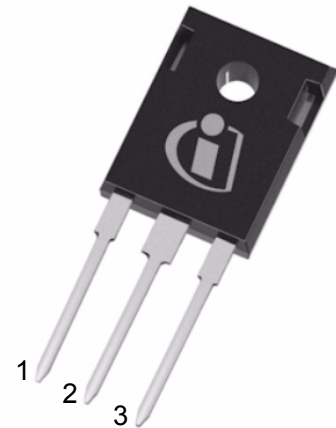
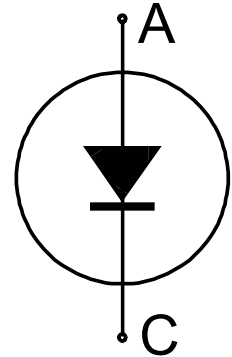
- Qualified according to JEDEC for target applications
- 600 V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage
- 175 °C junction operating temperature
- Easy paralleling
- Pb-free lead plating; RoHS compliant

### Applications:

- Switching diode for PFC applications with operating range up to 30kHz

### Package pin definition:

- Pin 1 - not connected
- Pin 2 - cathode
- Pin 3 - anode



### Key Performance and Package Parameters

| Type     | $V_{rrm}$ | $I_f$ | $V_f, T_{vj}=25^{\circ}\text{C}$ | $T_{vjmax}$ | Marking | Package    |
|----------|-----------|-------|----------------------------------|-------------|---------|------------|
| IDW30E60 | 600V      | 30A   | 1.65V                            | 175°C       | D30E60  | PG-TO247-3 |

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**Maximum ratings**

| Parameter                                                                                                      | Symbol      | Value        | Unit             |
|----------------------------------------------------------------------------------------------------------------|-------------|--------------|------------------|
| Repetitive peak reverse voltage                                                                                | $V_{RRM}$   | 600          | V                |
| Diode forward current, limited by $T_{vjmax}$<br>$T_C = 25^\circ\text{C}$<br>$T_C = 115^\circ\text{C}$         | $I_F$       | 60.0<br>30.0 | A                |
| Diode pulsed current, $t_p$ limited by $T_{vjmax}$                                                             | $I_{Fpuls}$ | 90.0         | A                |
| Diode surge non repetitive forward current<br>$T_C = 25^\circ\text{C}$ , $t_p = 10.0\text{ms}$ , sine halfwave | $I_{FSM}$   | 150.0        | A                |
| Power dissipation $T_C = 25^\circ\text{C}$                                                                     | $P_{tot}$   | 143.0        | W                |
| Operating junction temperature                                                                                 | $T_{vj}$    | -40...+175   | $^\circ\text{C}$ |
| Storage temperature                                                                                            | $T_{stg}$   | -55...+150   | $^\circ\text{C}$ |
| Soldering temperature,<br>wave soldering 1.6 mm (0.063 in.) from case for 10s                                  |             | 260          | $^\circ\text{C}$ |
| Mounting torque, M3 screw<br>Maximum of mounting processes: 3                                                  | $M$         | 0.6          | Nm               |

**Thermal Resistance**

| Parameter                                    | Symbol        | Conditions | Max. Value | Unit |
|----------------------------------------------|---------------|------------|------------|------|
| <b>Characteristic</b>                        |               |            |            |      |
| Diode thermal resistance,<br>junction - case | $R_{th(j-c)}$ |            | 1.05       | K/W  |
| Thermal resistance<br>junction - ambient     | $R_{th(j-a)}$ |            | 40         | K/W  |

**Electrical Characteristic, at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter               | Symbol | Conditions                                                         | Value  |              |                | Unit    |
|-------------------------|--------|--------------------------------------------------------------------|--------|--------------|----------------|---------|
|                         |        |                                                                    | min.   | typ.         | max.           |         |
| Static Characteristic   |        |                                                                    |        |              |                |         |
| Diode forward voltage   | $V_F$  | $I_F = 30.0A$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$ | -<br>- | 1.65<br>1.60 | 2.00           | V       |
| Reverse leakage current | $I_R$  | $V_R = 600V$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$  | -<br>- | -<br>-       | 40.0<br>1000.0 | $\mu A$ |

**Electrical Characteristic, at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                                                         | Symbol | Conditions | Value |      |      | Unit |
|-------------------------------------------------------------------|--------|------------|-------|------|------|------|
|                                                                   |        |            | min.  | typ. | max. |      |
| Dynamic Characteristic                                            |        |            |       |      |      |      |
| Internal emitter inductance<br>measured 5mm (0.197 in.) from case | $L_E$  |            | -     | 13.0 | -    | nH   |

**Switching Characteristic, Inductive Load, at  $T_{vj} = 25^{\circ}\text{C}$** 

| Parameter | Symbol | Conditions | Value |      |      | Unit |
|-----------|--------|------------|-------|------|------|------|
|           |        |            | min.  | typ. | max. |      |

**Diode Characteristic, at  $T_{vj} = 25^{\circ}\text{C}$** 

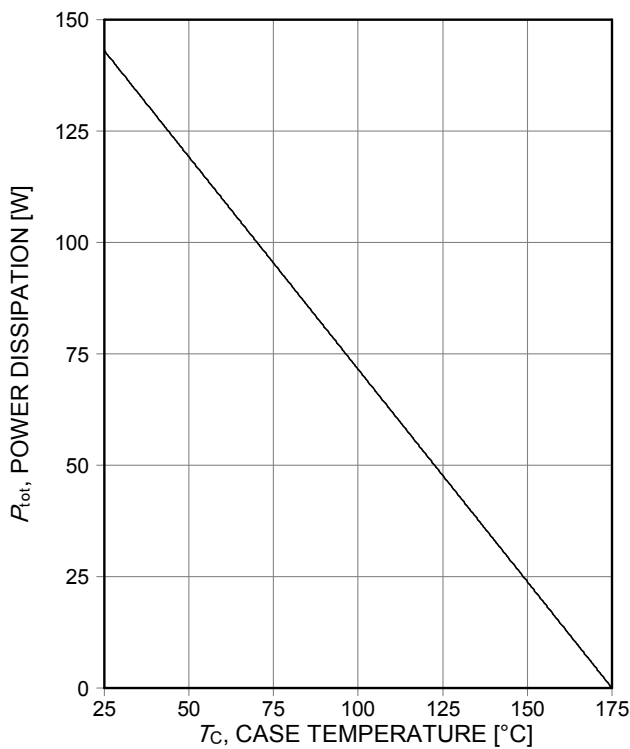
|                                                                  |              |                                                                                                                         |   |      |   |                        |
|------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C},$<br>$V_R = 400\text{V},$<br>$I_F = 30.0\text{A},$<br>$dI_F/dt = 1000\text{A}/\mu\text{s}$ | - | 143  | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                         | - | 1.20 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                         | - | 13.0 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                         | - | -108 | - | $\text{A}/\mu\text{s}$ |

**Switching Characteristic, Inductive Load, at  $T_{vj} = 175^{\circ}\text{C}$** 

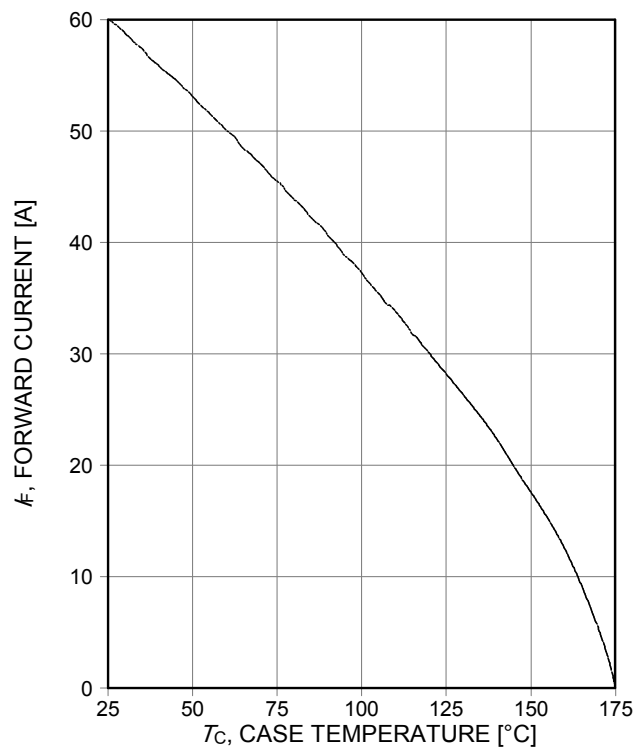
| Parameter | Symbol | Conditions | Value |      |      | Unit |
|-----------|--------|------------|-------|------|------|------|
|           |        |            | min.  | typ. | max. |      |

**Diode Characteristic, at  $T_{vj} = 175^{\circ}\text{C}$** 

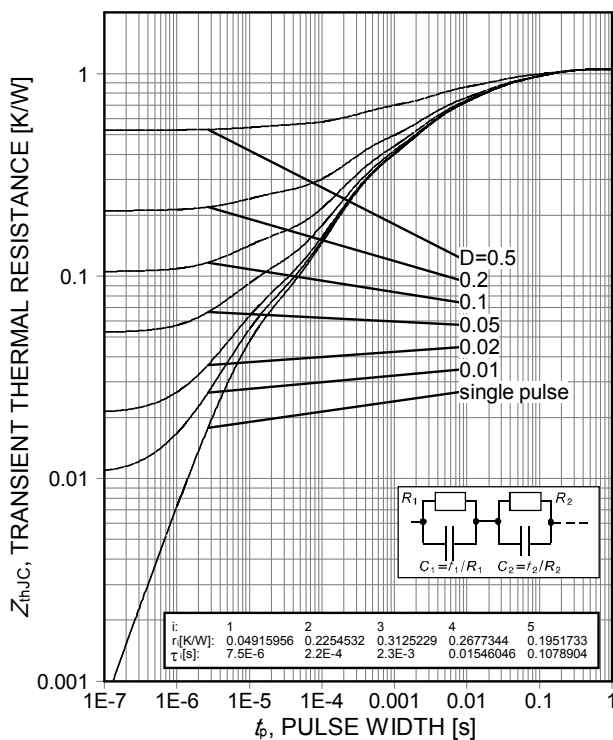
|                                                                  |              |                                                                                                                          |   |      |   |                        |
|------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 175^{\circ}\text{C},$<br>$V_R = 400\text{V},$<br>$I_F = 30.0\text{A},$<br>$dI_F/dt = 1000\text{A}/\mu\text{s}$ | - | 255  | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                          | - | 2.80 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                          | - | 23.0 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                          | - | -108 | - | $\text{A}/\mu\text{s}$ |



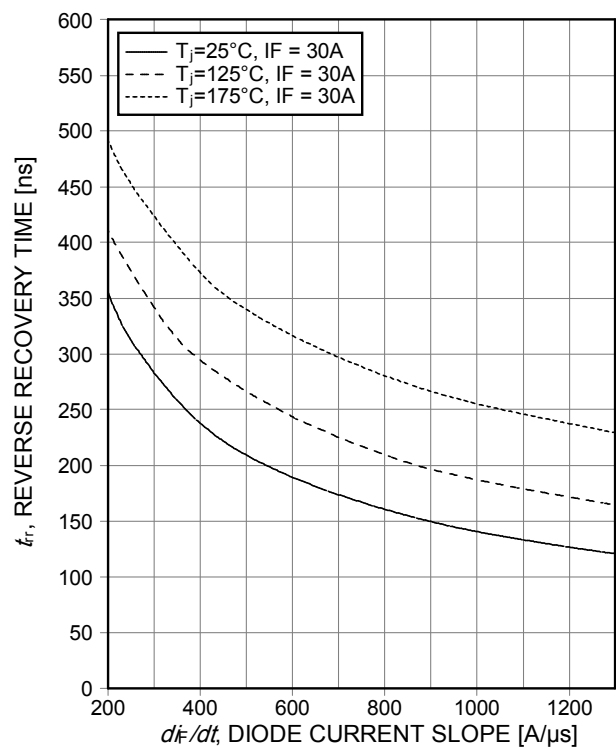
**Figure 1. Power dissipation as a function of case temperature**  
( $T_J \leq 175^\circ\text{C}$ )



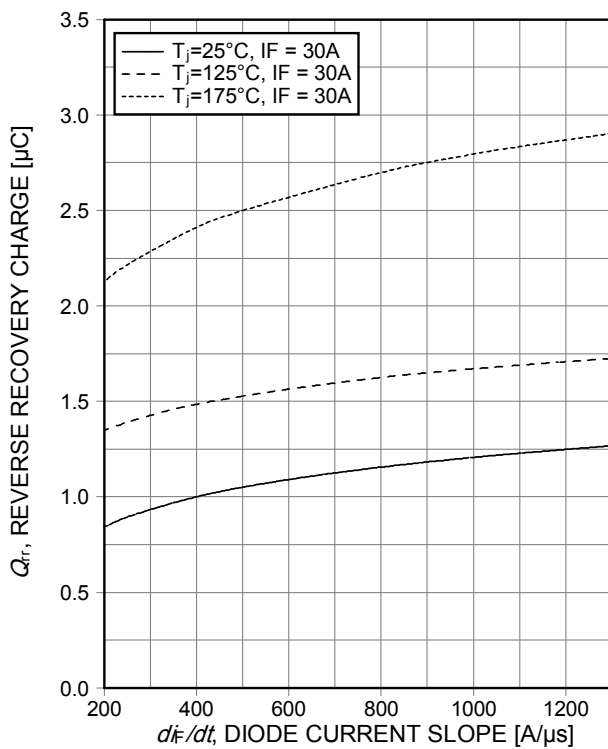
**Figure 2. Diode forward current as a function of case temperature**  
( $T_J \leq 175^\circ\text{C}$ )



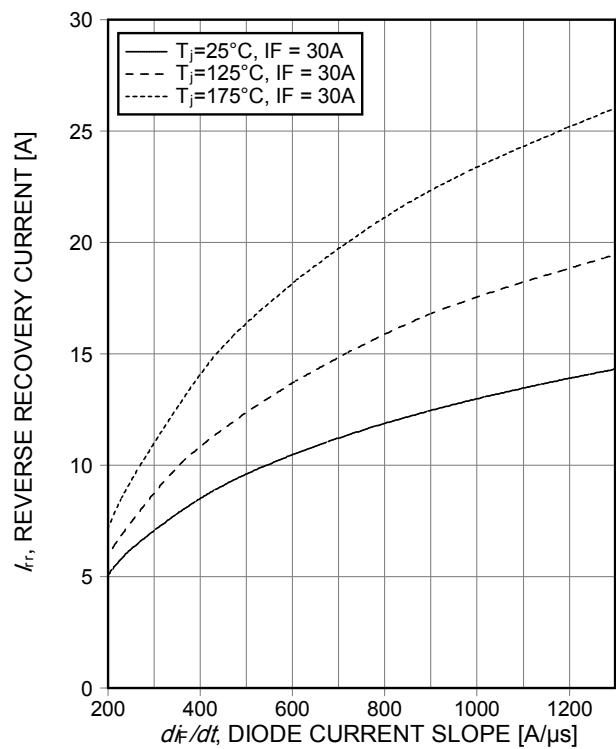
**Figure 3. Diode transient thermal impedance as a function of pulse width**  
( $D = t_p/T$ )



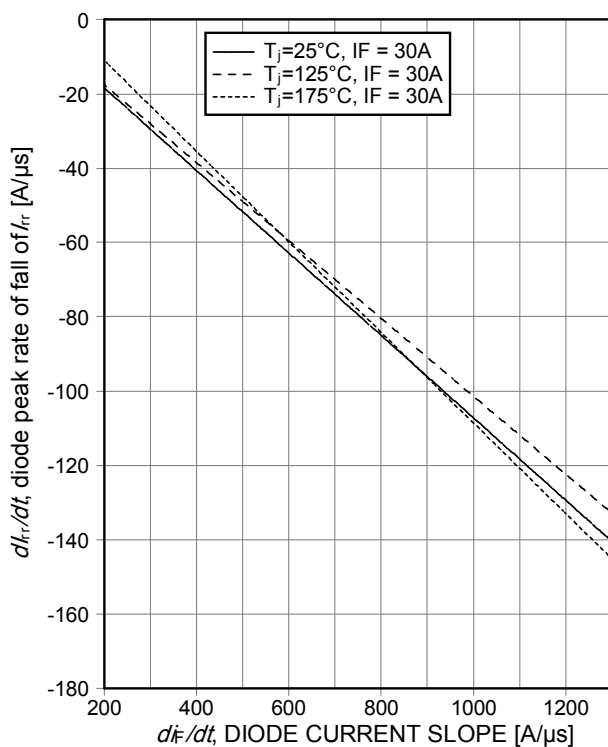
**Figure 4. Typical reverse recovery time as a function of diode current slope**  
( $V_R = 400\text{V}$ ,  $I_F = 30\text{A}$ , Dynamic test circuit in Figure E)



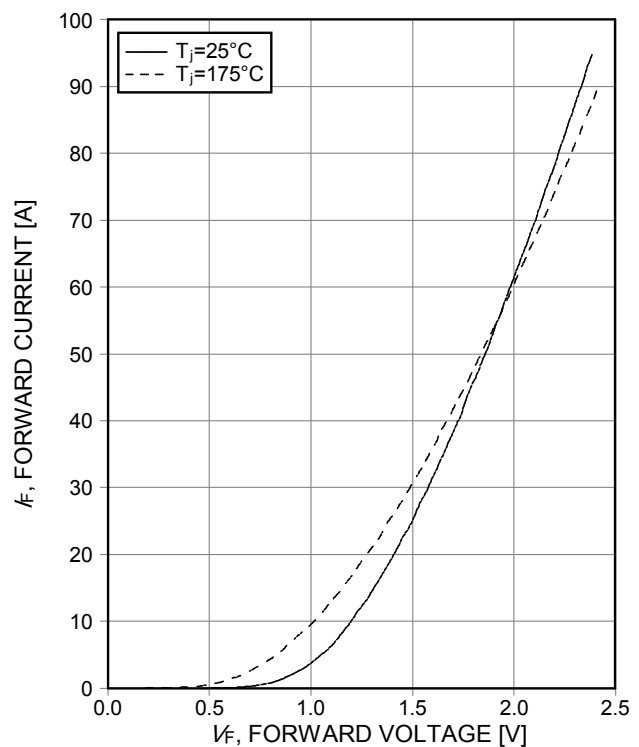
**Figure 5. Typical reverse recovery charge as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)



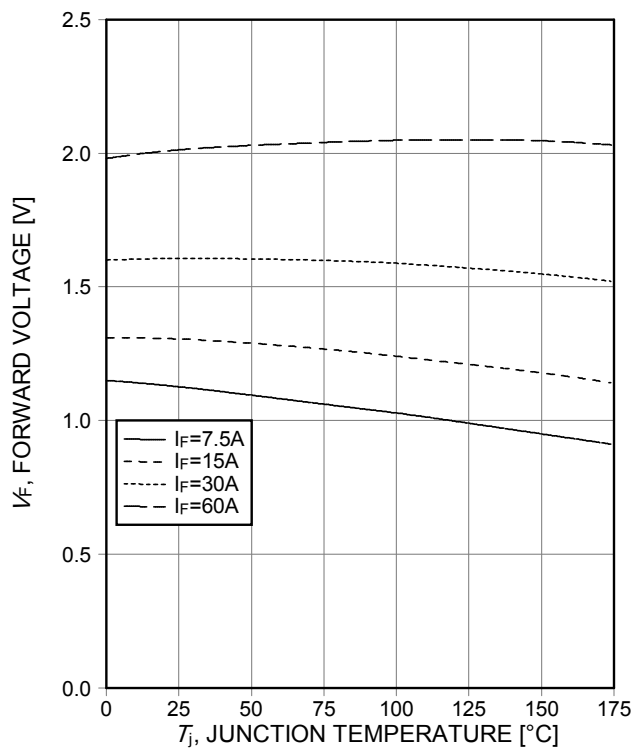
**Figure 6. Typical reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)



**Figure 7. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)



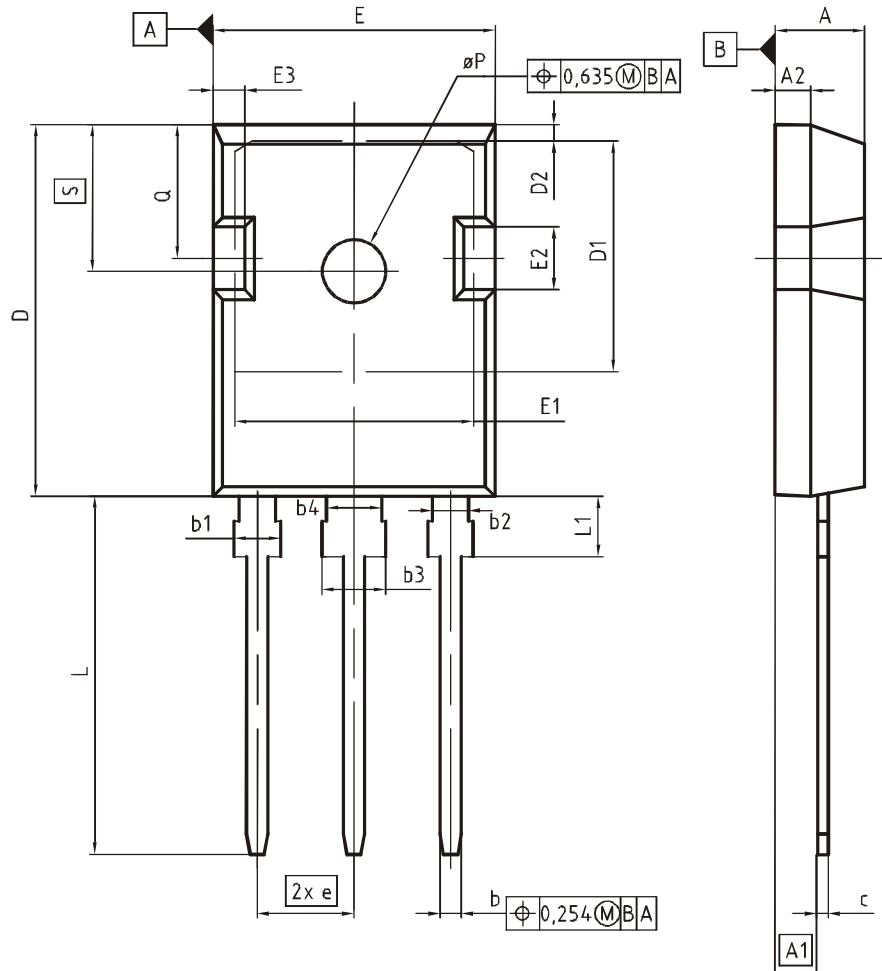
**Figure 8. Typical diode forward current as a function of forward voltage**



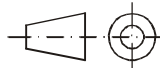
**Figure 9. Typical diode forward voltage as a function of junction temperature**

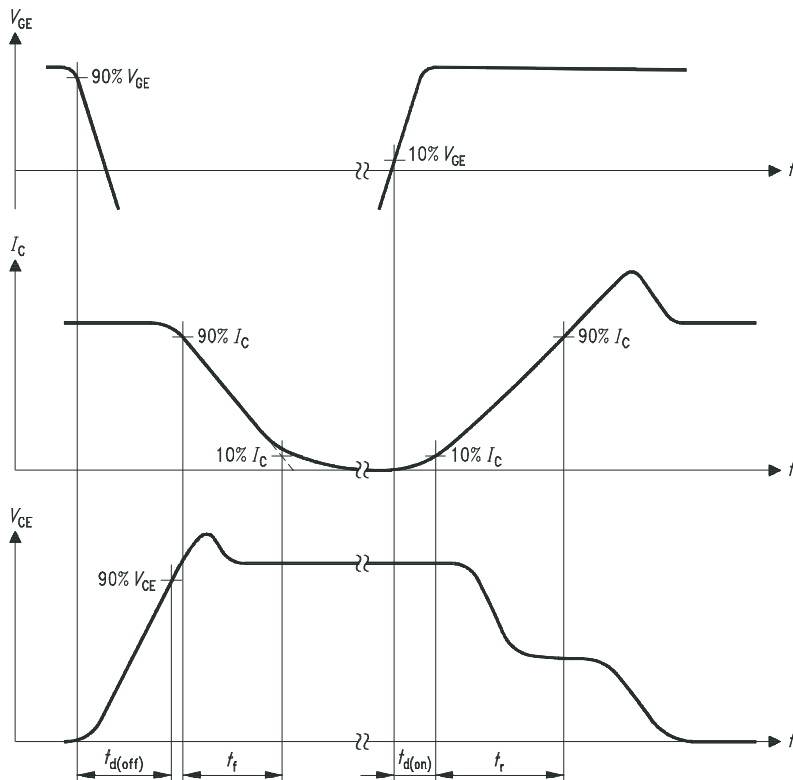


## PG-TO247-3

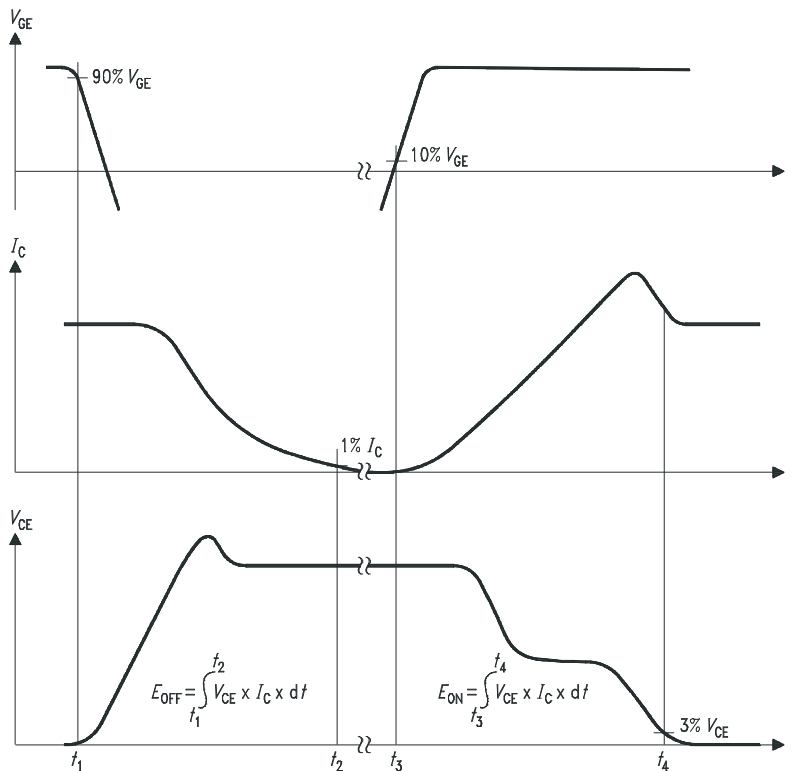


| DIM | MILLIMETERS |       | INCHES      |       |
|-----|-------------|-------|-------------|-------|
|     | MIN         | MAX   | MIN         | MAX   |
| A   | 4.83        | 5.21  | 0.190       | 0.205 |
| A1  | 2.27        | 2.54  | 0.089       | 0.100 |
| A2  | 1.85        | 2.16  | 0.073       | 0.085 |
| b   | 1.07        | 1.33  | 0.042       | 0.052 |
| b1  | 1.90        | 2.41  | 0.075       | 0.095 |
| b2  | 1.90        | 2.16  | 0.075       | 0.085 |
| b3  | 2.87        | 3.38  | 0.113       | 0.133 |
| b4  | 2.87        | 3.13  | 0.113       | 0.123 |
| c   | 0.55        | 0.68  | 0.022       | 0.027 |
| D   | 20.80       | 21.10 | 0.819       | 0.831 |
| D1  | 16.25       | 17.65 | 0.640       | 0.695 |
| D2  | 0.95        | 1.35  | 0.037       | 0.053 |
| E   | 15.70       | 16.13 | 0.618       | 0.635 |
| E1  | 13.10       | 14.15 | 0.516       | 0.557 |
| E2  | 3.68        | 5.10  | 0.145       | 0.201 |
| E3  | 1.00        | 2.60  | 0.039       | 0.102 |
| e   | 5.44 (BSC)  |       | 0.214 (BSC) |       |
| N   | 3           |       | 3           |       |
| L   | 19.80       | 20.32 | 0.780       | 0.800 |
| L1  | 4.10        | 4.47  | 0.161       | 0.176 |
| øP  | 3.50        | 3.70  | 0.138       | 0.146 |
| Q   | 5.49        | 6.00  | 0.216       | 0.236 |
| S   | 6.04        | 6.30  | 0.238       | 0.248 |

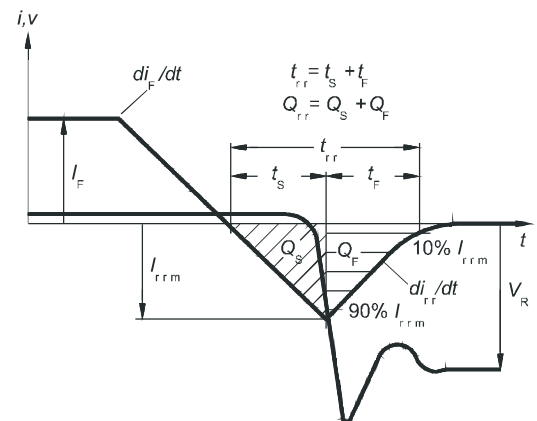
|                                                                                                              |
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| DOCUMENT NO.<br>Z8B00003327                                                                                  |
| SCALE<br>0 5 5 7.5mm                                                                                         |
| EUROPEAN PROJECTION<br> |
| ISSUE DATE<br>09-07-2010                                                                                     |
| REVISION<br>05                                                                                               |



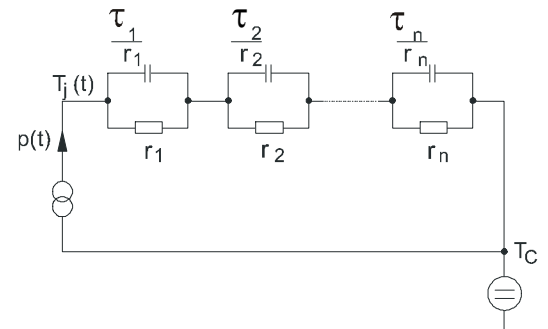
### Figure A. Definition of switching times



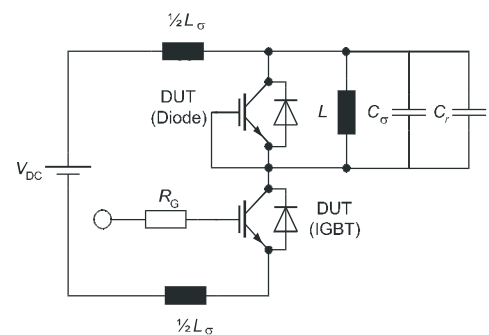
### Figure B. Definition of switching losses



### Figure C. Definition of diodes switching characteristics



**Figure D. Thermal equivalent circuit**



### Figure E. Dynamic test circuit

Parasitic inductance  $L_{\sigma}$ ,  
Parasitic capacitor  $C_{\sigma}$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

**Revision History**

IDW30E60

**Revision: 2011-11-10, Rev. 1.1**

Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.1      | 2011-11-10 | Preliminary data sheet                       |

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