

# International IOR Rectifier

## 30ETH06SPbF 30ETH06-1PbF

### Hyperfast Rectifier

#### Features

- Hyperfast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 125°C Operating Junction Temperature
- Dual Diode Center Tap
- Lead-Free ("PbF" suffix)

$t_{rr} = 28\text{ns typ.}$   
 $I_{F(AV)} = 30\text{Amp}$   
 $V_R = 600\text{V}$

#### Description/ Applications

State of the art Hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, Hyperfast recover time, and soft recovery.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.


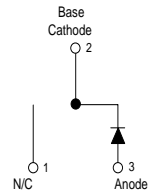

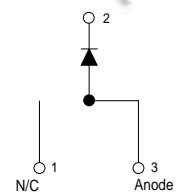
These devices are intended for use in PFC Boost stage in the AC-DC section of SMPS, inverters or as freewheeling diodes.

The IR extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

#### Absolute Maximum Ratings

Parameters	Max	Units
$V_{RRM}$ Peak Repetitive Reverse Voltage	600	V
$I_{F(AV)}$ Average Rectifier Forward Current @ $T_C = 103^\circ\text{C}$	30	A
$I_{FSM}$ Non Repetitive Peak Surge Current @ $T_J = 25^\circ\text{C}$	200	
$T_J$ Operating Junction Temperature	- 65 to 125	$^\circ\text{C}$
$T_{STG}$ Operating Storage Temperature	- 65 to 150	

#### Case Styles

<p><b>30ETH06SPbF</b></p>  <div style="text-align: center;">  <p>Base Cathode 2 1 N/C 3 Anode</p> <p><b>D<sup>2</sup>PAK</b></p> </div>	<p><b>30ETH06-1PbF</b></p>  <div style="text-align: center;">  <p>2 1 N/C 3 Anode</p> <p><b>TO-262</b></p> </div>
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**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

Parameters	Min	Typ	Max	Units	Test Conditions
V <sub>BR</sub> , V <sub>F</sub> Breakdown Voltage, Blocking Voltage	600	-	-	V	I <sub>R</sub> = 100μA
V <sub>F</sub> Forward Voltage	-	2.0	2.6	V	I <sub>F</sub> = 30A, T <sub>J</sub> = 25°C
	-	1.34	1.75	V	I <sub>F</sub> = 30A, T <sub>J</sub> = 150°C
I <sub>R</sub> Reverse Leakage Current	-	0.3	50	μA	V <sub>R</sub> = V <sub>R</sub> Rated
	-	60	500	μA	T <sub>J</sub> = 150°C, V <sub>R</sub> = V <sub>R</sub> Rated
C <sub>T</sub> Junction Capacitance	-	33	-	pF	V <sub>R</sub> = 600V
L <sub>S</sub> Series Inductance	-	8.0	-	nH	Measured lead to lead 5mm from package body

**Dynamic Recovery Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

Parameters	Min	Typ	Max	Units	Test Conditions
t <sub>rr</sub> Reverse Recovery Time	-	28	35	ns	I <sub>F</sub> = 1.0A, di <sub>F</sub> /dt = 50A/μs, V <sub>R</sub> = 30V
	-	31	-		T <sub>J</sub> = 25°C
	-	77	-		T <sub>J</sub> = 125°C
I <sub>RRM</sub> Peak Recovery Current	-	3.5	-	A	T <sub>J</sub> = 25°C
	-	7.7	-		T <sub>J</sub> = 125°C
Q <sub>rr</sub> Reverse Recovery Charge	-	65	-	nC	T <sub>J</sub> = 25°C
	-	345	-		T <sub>J</sub> = 125°C

I<sub>F</sub> = 30A  
V<sub>R</sub> = 200V  
di<sub>F</sub>/dt = 200A/μs

**Thermal - Mechanical Characteristics**

Parameters	Min	Typ	Max	Units
T <sub>J</sub> Max. Junction Temperature Range	- 65	-	125	°C
T <sub>Stg</sub> Max. Storage Temperature Range	- 65	-	150	
R <sub>thJC</sub> Thermal Resistance, Junction to Case	-	0.7	1.1	°C/W
R <sub>thJA</sub> ① Thermal Resistance, Junction to Ambient	-	-	70	
R <sub>thCS</sub> ② Thermal Resistance, Case to Heatsink	-	0.2	-	
Weight	-	2.0	-	g
	-	0.07	-	(oz)
Mounting Torque	6.0	-	12	Kg-cm
	5.0	-	10	lbf.in
Marking Device	30ETH06S		Case style D <sup>2</sup> Pak	
	30ETH06-1		Case style TO-262	

① Typical Socket Mount

② Mounting Surface, Flat, Smooth and Greased

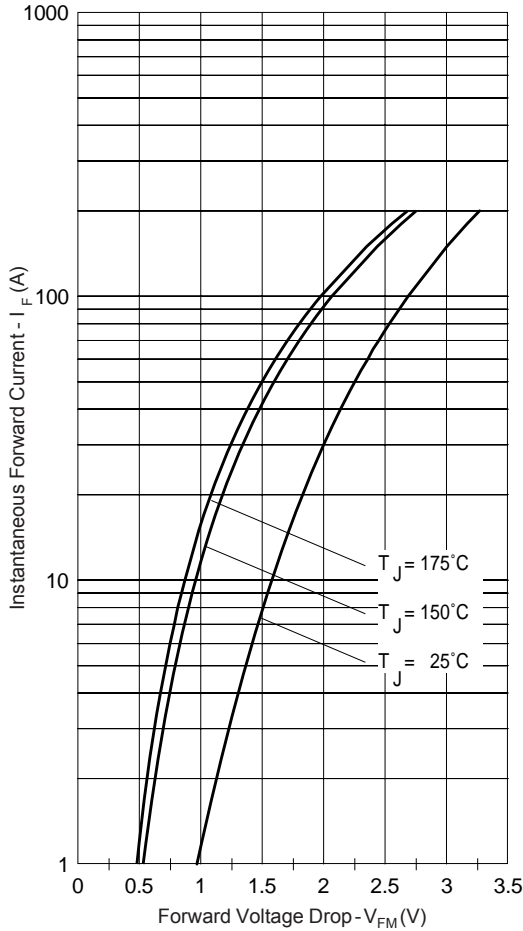


Fig. 1 - Typical Forward Voltage Drop Characteristics

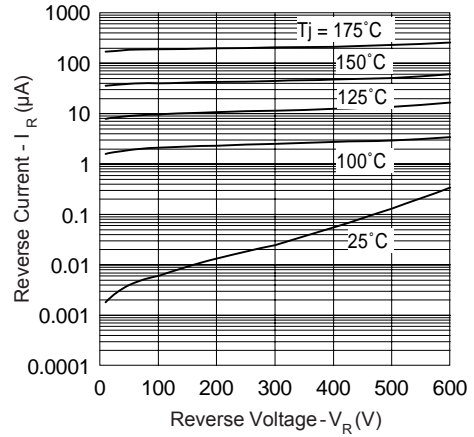


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

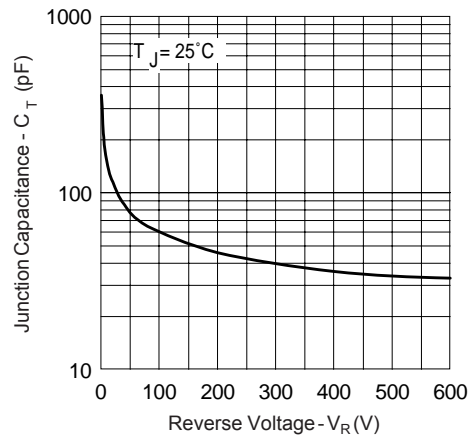


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

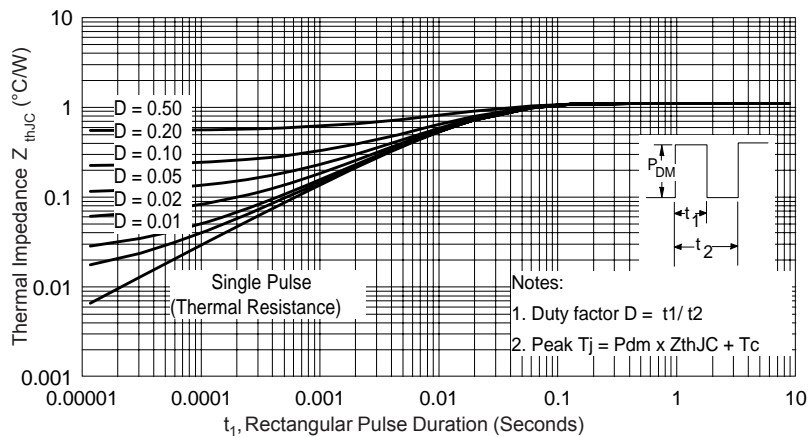
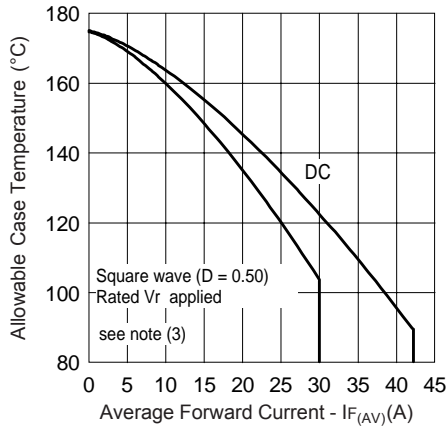
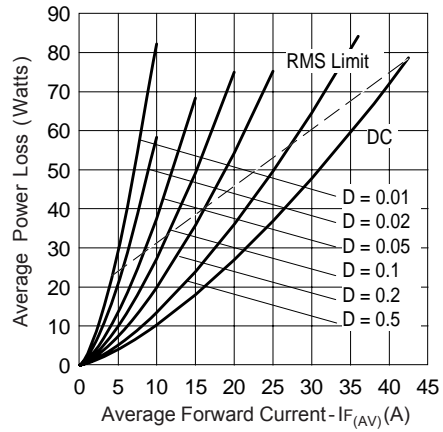


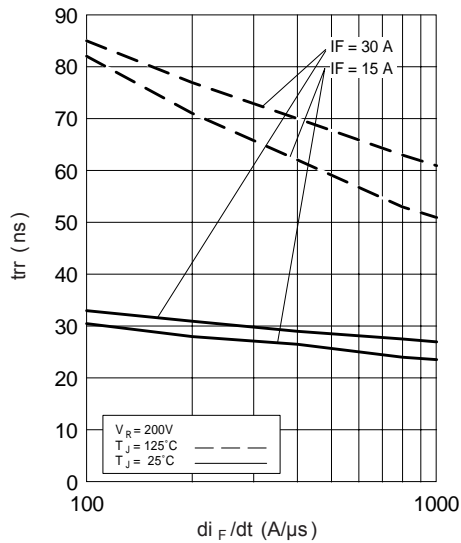
Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics



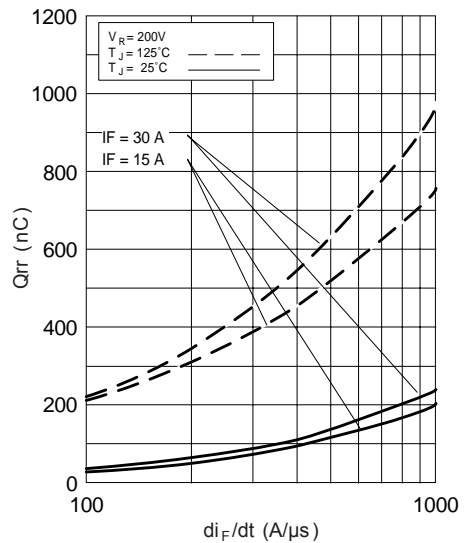
**Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current**



**Fig. 6 - Forward Power Loss Characteristics**



**Fig. 7 - Typical Reverse Recovery vs.  $di_F/dt$**



**Fig. 8 - Typical Stored Charge vs.  $di_F/dt$**

- (3) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd = \text{Forward Power Loss} = I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);  
 $Pd_{REV} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = \text{rated } V_R$

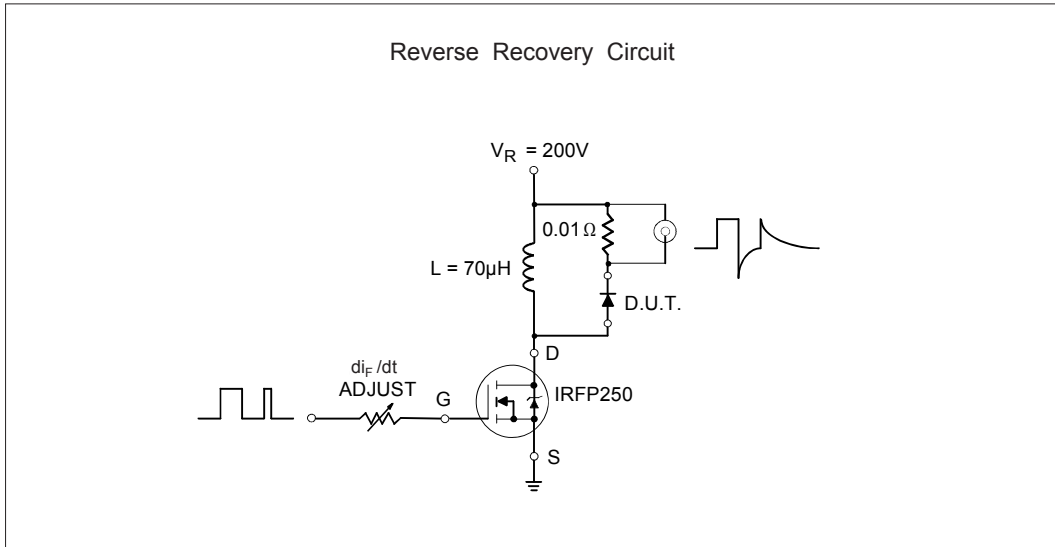


Fig. 9- Reverse Recovery Parameter Test Circuit

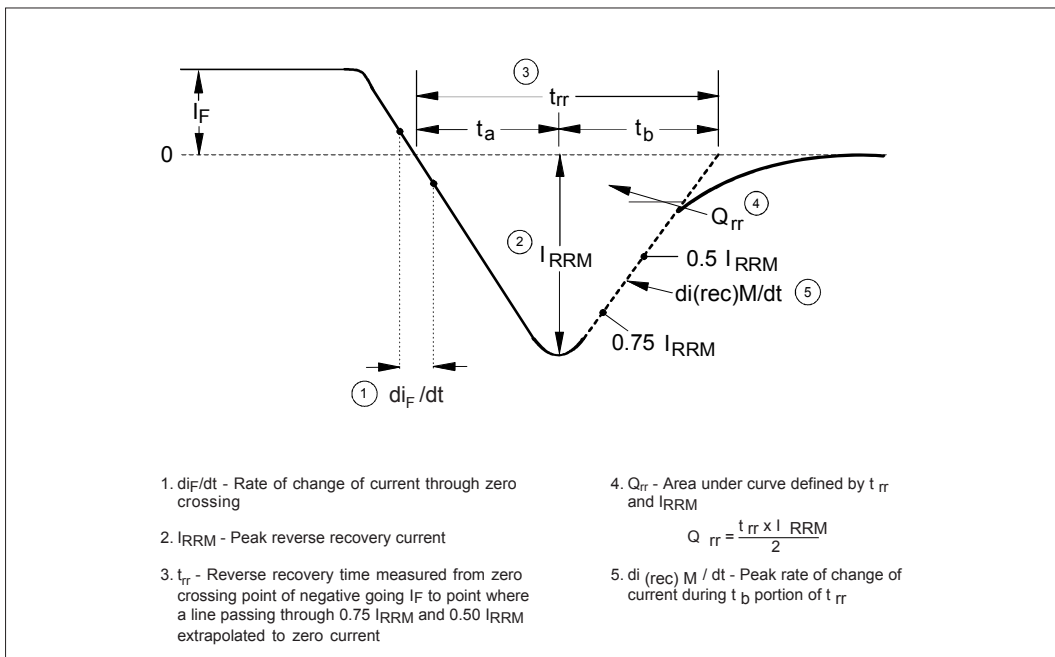


Fig. 10 - Reverse Recovery Waveform and Definitions

Outline Table

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
A	4.06	4.83	.160	.190	4
A1	0.90	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	4
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86	-	.270	-	
E	9.65	10.67	.380	.420	3
E1	6.22	-	.245	-	
e	2.54 BSC		.100 BSC		4
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	4
L1	-	1.65	-	.065	
L2	1.27	1.78	.050	.070	4
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	4
m	17.78	-	.700	-	
m1	8.89	-	.350	-	4
n	11.43	-	.450	-	
o	2.08	-	.082	-	4
p	3.81	-	.150	-	
R	0.51	0.71	.020	.028	4
θ	90°	93°	90°	93°	

**LEAD ASSIGNMENTS**

**HEXFET**

- 1.- GATE
- 2, 4.- DRAIN
- 3.- SOURCE

**IGBTs, CoPACK**

- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

**DIODES**

- 1.- ANODE \*
- 2, 4.- CATHODE
- 3.- ANODE

\* PART DEPENDENT.

**Conform to JEDEC outline D<sup>2</sup>Pak (SMD-220)**  
Dimensions in millimeters and (inches)

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION: INCH.
- 7.- OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
A	4.06	4.83	.160	.190	5
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	5
b3	1.14	1.73	.045	.068	
c	0.38	0.74	.015	.029	5
c1	0.38	0.58	.015	.023	
c2	1.14	1.65	.045	.065	4
D	8.38	9.65	.330	.380	
D1	6.86	-	.270	-	3, 4
E	9.65	10.67	.380	.420	
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
L	13.46	14.10	.530	.555	4
L1	-	1.65	-	.065	
L2	3.56	3.71	.140	.146	4
L3	-	-	-	-	

**LEAD ASSIGNMENTS**

**HEXFET**

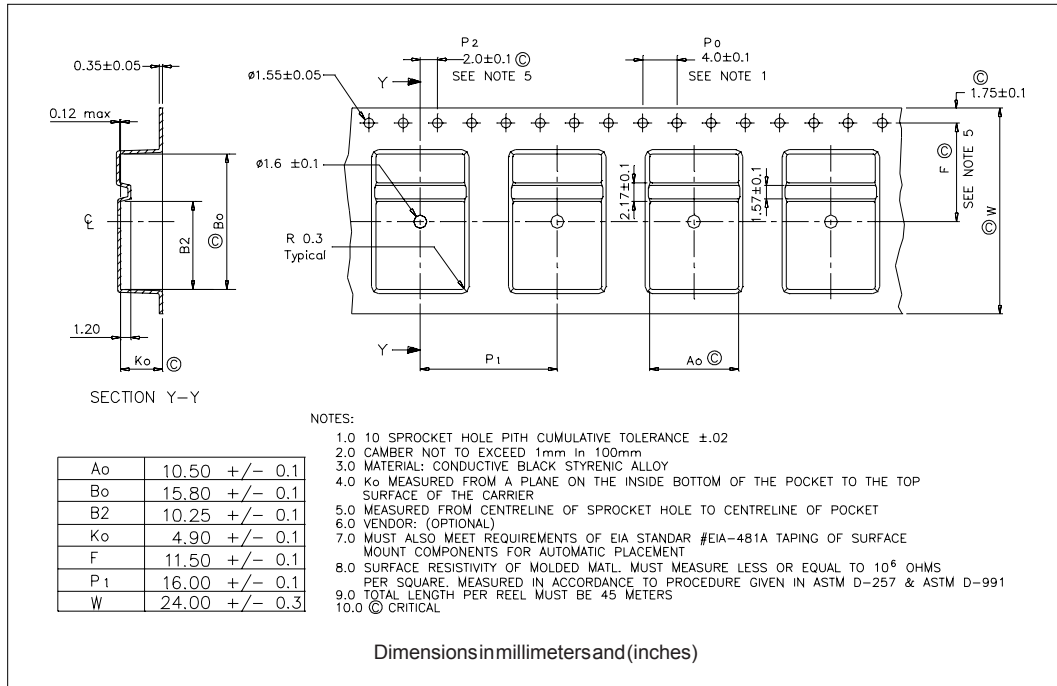
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

**IGBTs, CoPACK**

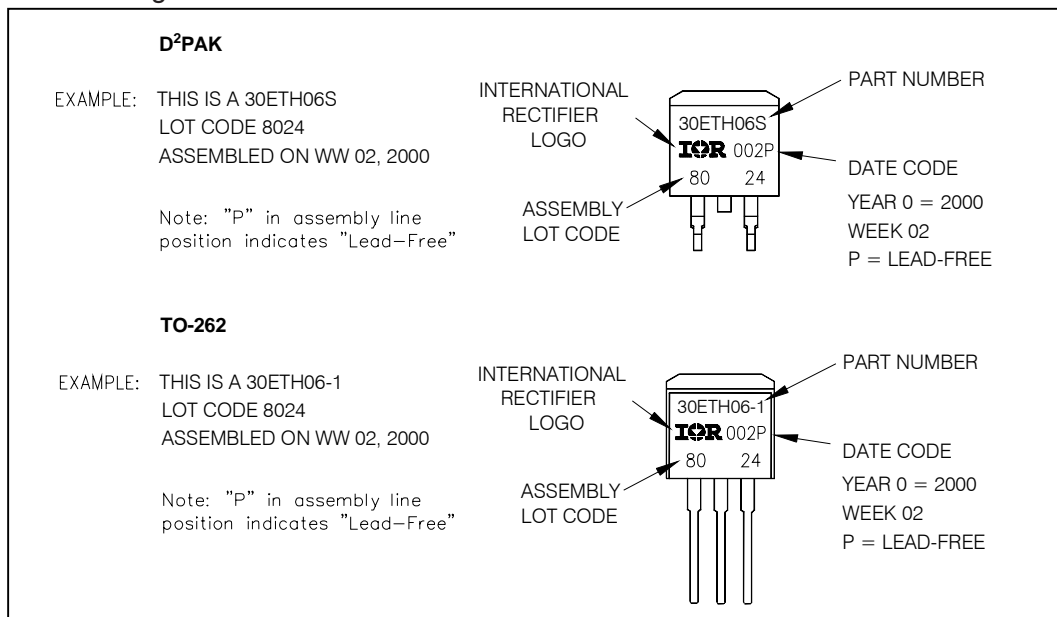
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

**Modified JEDEC outline TO-262**  
Dimensions in millimeters and (inches)

**Tape & Reel Information**



**Part Marking Information**



Ordering Information Table

Device Code									
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">30</td> <td style="padding: 5px;">E</td> <td style="padding: 5px;">T</td> <td style="padding: 5px;">H</td> <td style="padding: 5px;">06</td> <td style="padding: 5px;">S</td> <td style="padding: 5px;">TRL</td> <td style="padding: 5px;">PbF</td> </tr> </table>	30	E	T	H	06	S	TRL	PbF
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	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">①</td> <td style="padding: 5px;">②</td> <td style="padding: 5px;">③</td> <td style="padding: 5px;">④</td> <td style="padding: 5px;">⑤</td> <td style="padding: 5px;">⑥</td> <td style="padding: 5px;">⑦</td> <td style="padding: 5px;">⑧</td> </tr> </table>	①	②	③	④	⑤	⑥	⑦	⑧
①	②	③	④	⑤	⑥	⑦	⑧		
<b>1</b>	- Current Rating (30 = 30A)								
<b>2</b>	- E = Single Diode								
<b>3</b>	- T = TO-220, D <sup>2</sup> Pak								
<b>4</b>	- H = HyperFast Recovery								
<b>5</b>	- Voltage Rating (06 = 600V)								
<b>6</b>	- • S = D <sup>2</sup> Pak • -1 = TO-262								
<b>7</b>	- • none = Tube (50 pieces) • TRL = Tape & Reel (Left Oriented, for D <sup>2</sup> PAK package) • TRR = Tape & Reel (Right Oriented, for D <sup>2</sup> PAK package)								
<b>8</b>	- • none = Standard Production • PbF = Lead-Free								

Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level and Lead-Free.  
Qualification Standards can be found on IR's Web site.