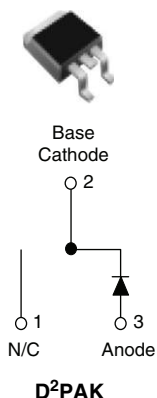


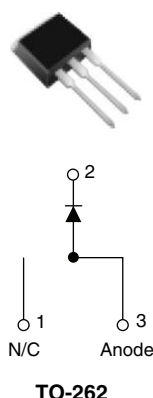
Hyperfast Rectifier



15ETH06SPbF



15ETH06-1PbF



FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Single die center tap module
- Lead (Pb)-free ("PbF" suffix)
- Designed and qualified for industrial level



RoHS*
COMPLIANT

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.

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

PRODUCT SUMMARY

t_{rr} (typical)	22 ns
$I_{F(AV)}$	15 A
V_R	600 V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	V_{RRM}		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 140\text{ °C}$	15	A
Non-repetitive peak surge current	I_{FSM}	$T_J = 25\text{ °C}$	120	
Peak repetitive forward current	I_{FM}		30	
Operating junction and storage temperatures	T_J, T_{Stg}		- 65 to 175	°C

ELECTRICAL CHARACTERISTICS ($T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_r	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	V_F	$I_F = 15\text{ A}, T_J = 25\text{ °C}$	-	1.8	2.2	
		$I_F = 15\text{ A}, T_J = 150\text{ °C}$	-	1.3	1.6	
Reverse leakage current	I_R	$V_R = V_R\text{ rated}$	-	0.2	50	μA
		$T_J = 150\text{ °C}, V_R = V_R\text{ rated}$	-	30	500	
Junction capacitance	C_T	$V_R = 600\text{ V}$	-	20	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

* Pb containing terminations are not RoHS compliant, exemptions may apply



DYNAMIC RECOVERY CHARACTERISTICS ($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 1\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	22	30	ns
		$I_F = 15\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	28	35	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	29	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	75	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	3.5	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	7	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	57	-	μC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	300	-	
Reverse recovery time	t_{rr}	$T_J = 125\text{ }^{\circ}\text{C}$ $I_F = 15\text{ A}$ $di_F/dt = 800\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	51	-	ns
Peak recovery current	I_{RRM}		-	20	-	A
Reverse recovery charge	Q_{rr}		-	580	-	nC

THERMAL - MECHANICAL CHARACTERISTICS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction temperature range	T_J		- 65	-	175	$^{\circ}\text{C}$
Maximum storage temperature range	T_{Stg}		- 65	-	175	
Thermal resistance, junction to case per leg	R_{thJC}		-	1.0	1.3	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient per leg	R_{thJA}	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0	-	12	kg-cm
			5.0	-	10	lbf · in
Marking device		Case style D ² PAK	15ETH06S			
		Case style TO-262	15ETH06-1			

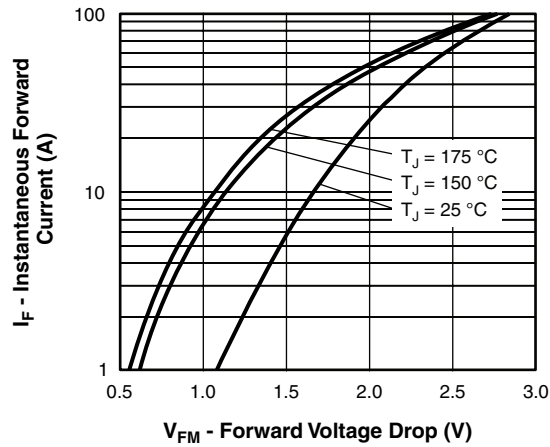


Fig. 1 - Maximum Forward Voltage Drop Characteristics

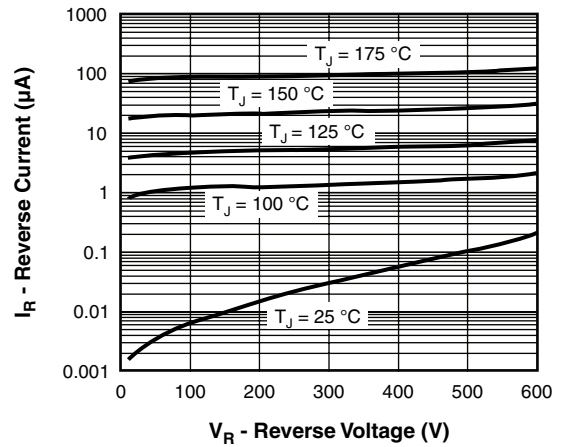


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

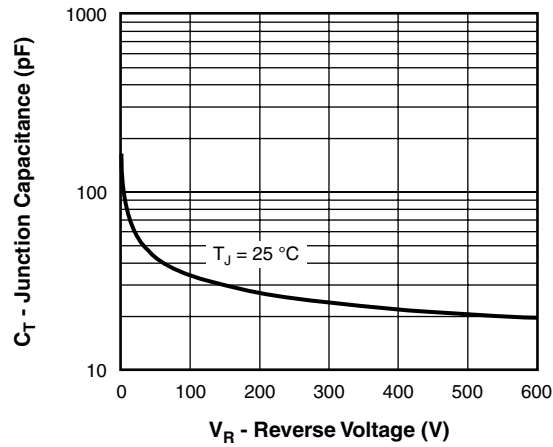


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

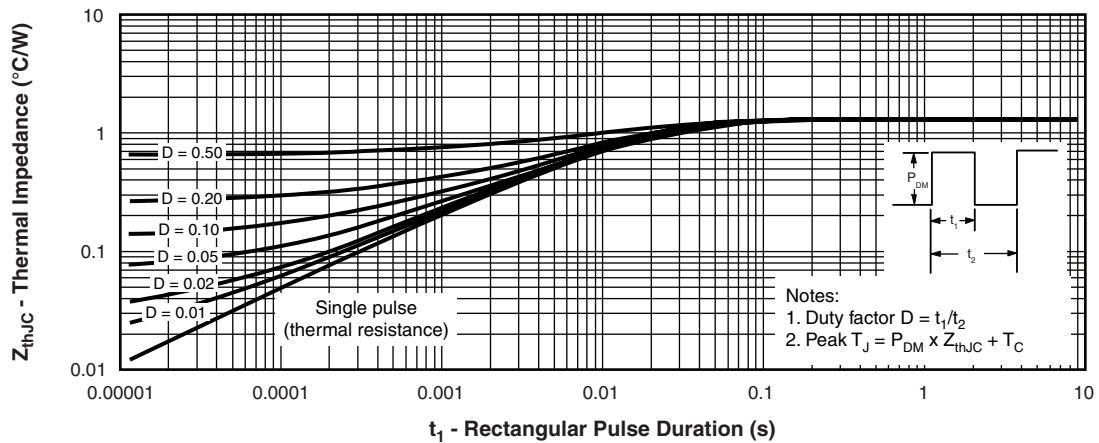


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

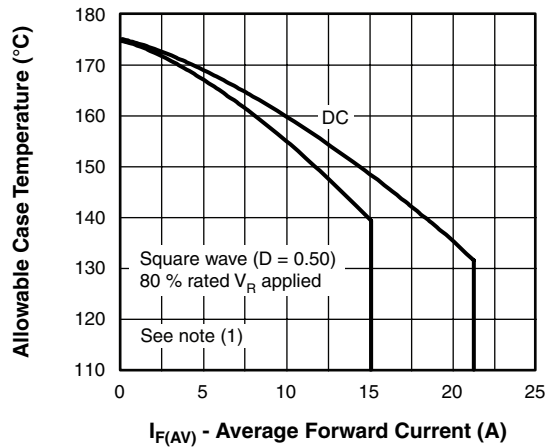


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

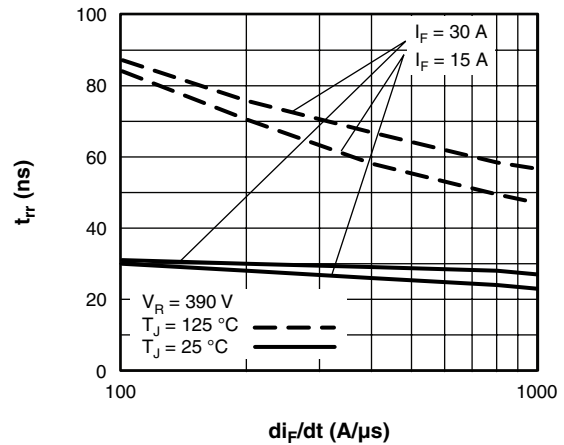


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

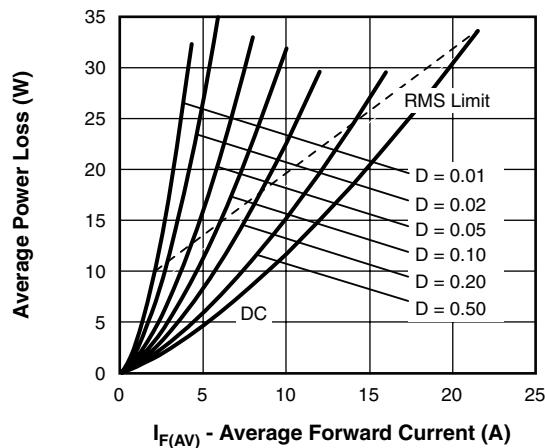


Fig. 6 - Forward Power Loss Characteristics

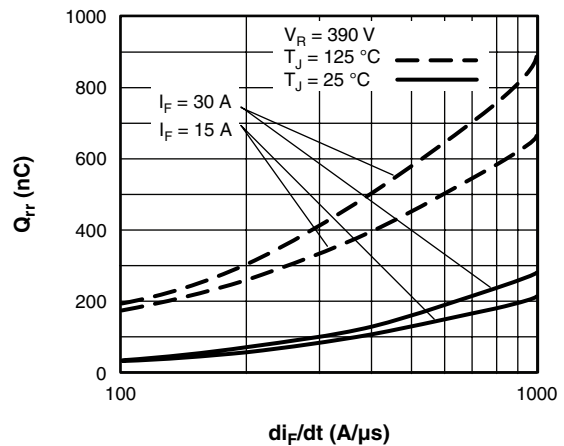


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
 P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

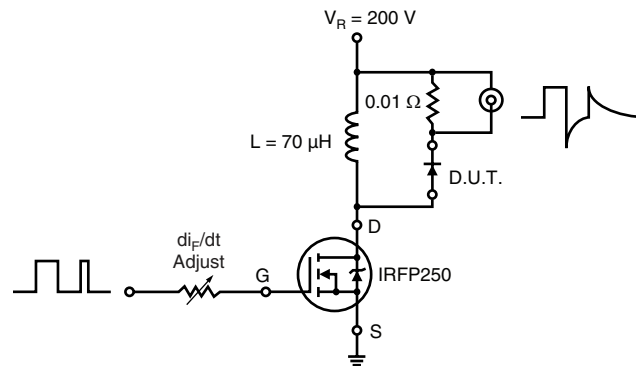


Fig. 9 - Reverse Recovery Parameter Test Circuit

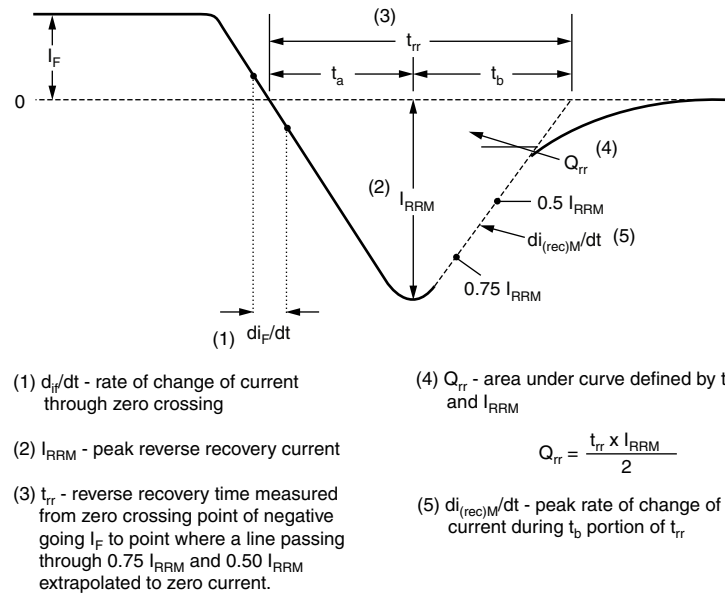
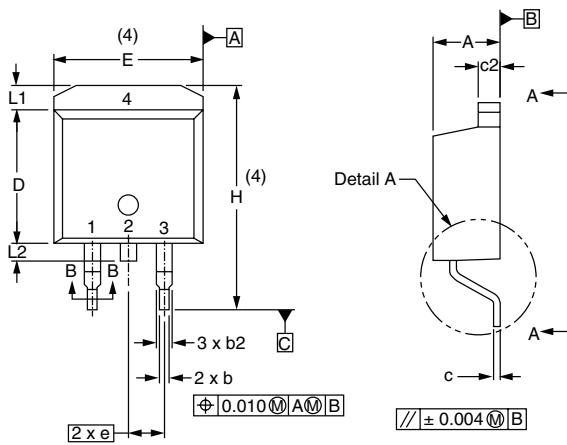


Fig. 10 - Reverse Recovery Waveform and Definitions

DIMENSIONS in millimeters (inches)**Lead Assignments****HEXFET**

- 1. - Gate
- 2., 4. - Drain
- 3. - Source

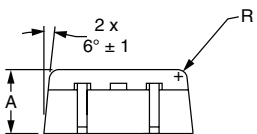
IGBTs, CoPACK

- 1. - Gate
- 2., 4. - Collector
- 3. - Emitter

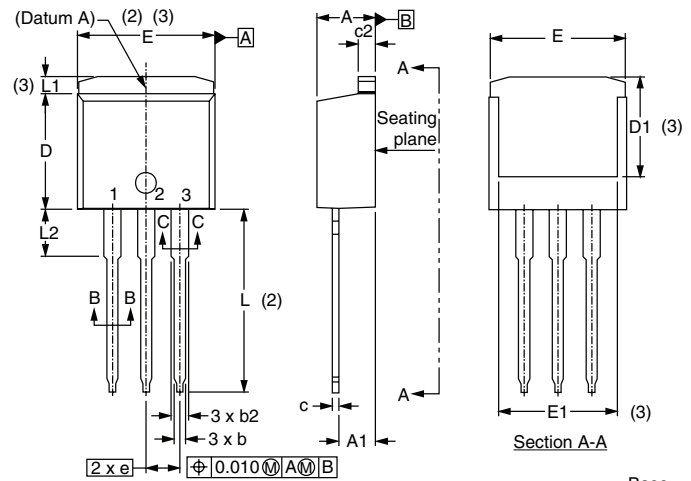
Diodes

- 1. - Anode *
- 2., 4. - Cathode
- 3. - Anode

* Part dependent



Conforms to JEDEC
outline D²PAK (SMD-220)

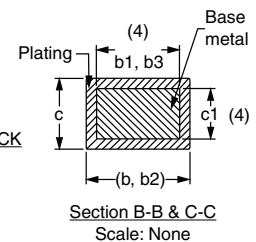
**Lead Assignments****HEXFET**

- 1. - Gate
- 2. - Drain
- 3. - Source
- 4. - Drain

IGBTs, CoPACK

- 1. - Gate
- 2. - Collector
- 3. - Emitter
- 4. - Collector

Modified JEDEC
outline TO-262

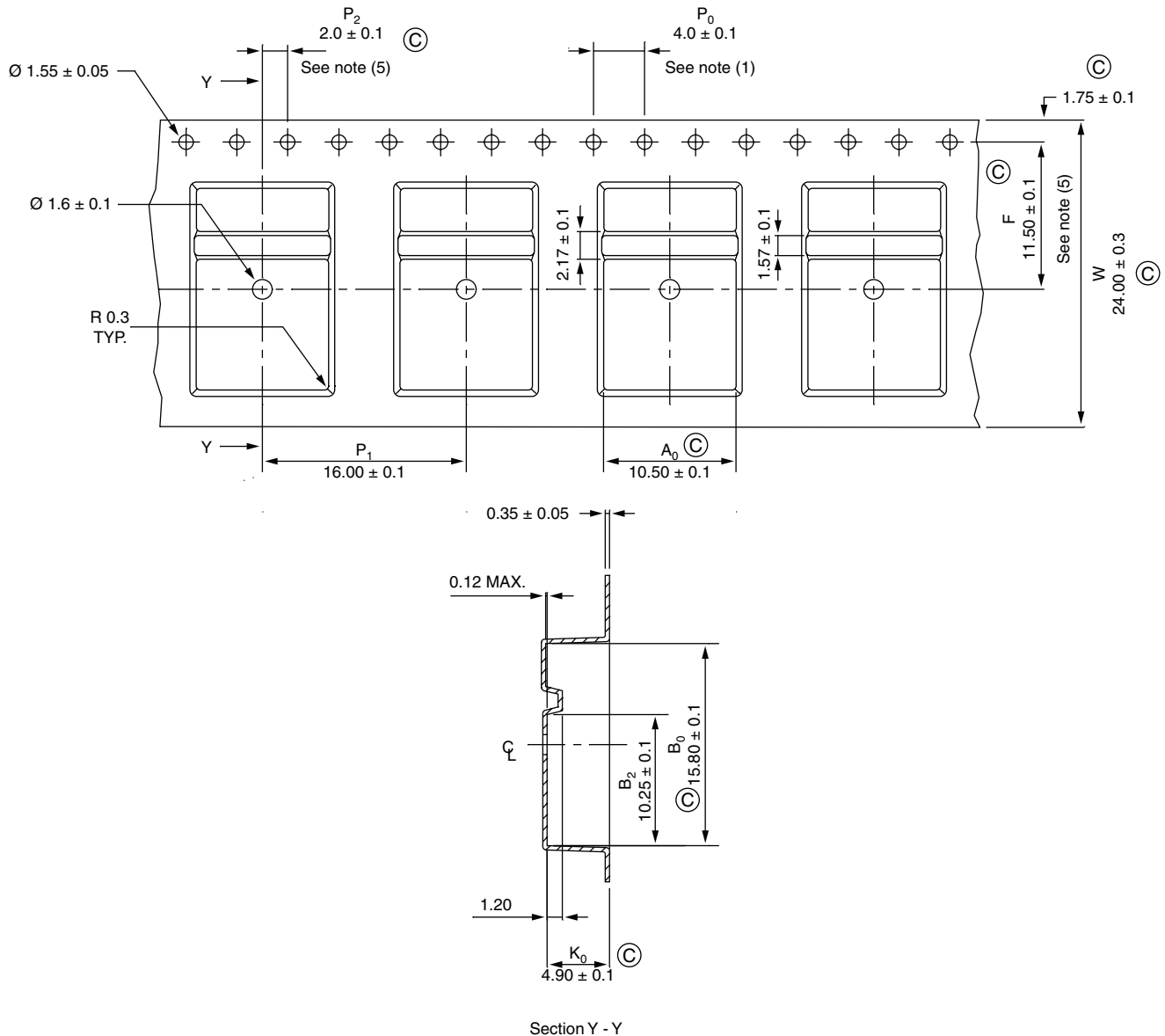


SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2
D1	6.86	-	0.270	-	
E	9.65	10.67	0.380	0.420	2
E1	6.22	-	0.245	-	
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.065	
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	
m	17.78	-	0.700	-	
m1	8.89	-	0.350	-	
n	11.43	-	0.450	-	
o	2.08	-	0.082	-	
p	3.81	-	0.150	-	
R	0.51	0.71	0.020	0.028	
θ	90°	93°	90°	93°	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	2.03	3.02	0.080	0.119	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.38	9.65	0.330	0.380	2
D1	6.86	-	0.270	-	3
E	9.65	10.67	0.380	0.420	2, 3
E1	6.22	-	0.245	-	3
e	2.54 BSC		0.100 BSC		
L	13.46	14.10	0.530	0.555	
L1	-	1.65	-	0.065	3
L2	3.56	3.71	0.140	0.146	

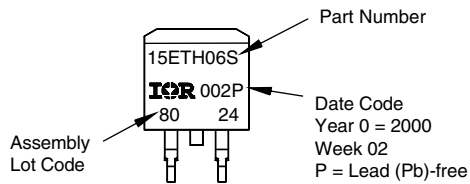
Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline

**TAPE AND REEL INFORMATION** in millimeters (inches)**Notes**

- (1) 10 sprocket hole pitch cumulative tolerance ± 0.02
- (2) Camber not to exceed 1 mm to 10 mm
- (3) Material: conductive black styrenic alloy
- (4) K₀ measured from a plane on the inside bottom of the pocket to the top surface of the carrier
- (5) Measured from centerline of sprocket hole to centerline of pocket
- (6) Vendor: (optional)
- (7) Must also meet requirements of EIA standard EIA-481A taping of surface mount components for automatic placement
- (8) Surface resistivity of molded material must measure less or equal to 10⁶ Ω per square. Measured in accordance to procedure given in ASTM D-257 and ASTM D-991
- (9) Total length per reel must be 45 m
- (10) Ⓢ critical

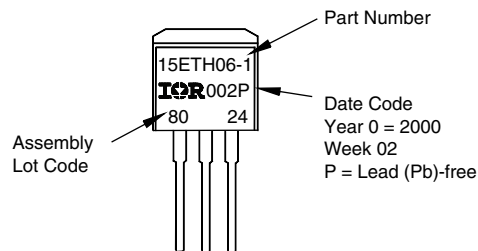
PART MARKING INFORMATION



D²PAK

Example: This is a 15ETH06S with
Assembly Lot Code 8024,
assembled on WW 02, 2000

Note: "P" in Assembly Line
position indicates "lead (Pb)-free"



TO-262

Example: This is a 15ETH06-1 with
Assembly Lot Code 8024
assembled on WW 02, 2000

Note: "P" in Assembly Line
position indicates "lead (Pb)-free"

ORDERING INFORMATION TABLE

Device code	15	E	T	H	06	S	TRL	PbF
	1	2	3	4	5	6	7	8

- 1** - Current rating (15 A)
- 2** - E = Single diode
- 3** - T = TO-220, D²PAK
- 4** - H = Hyperfast rectifier
- 5** - Voltage rating (06 = 600 V)
- 6** -
 - S = D²PAK
 - -1 = TO-262
- 7** -
 - None = Tube (50 pieces)
 - TRL = Tape and reel (left oriented, for D²PAK package)
 - TRR = Tape and reel (right oriented, for D²PAK package)
- 8** -
 - None = Standard production
 - PbF = Lead (Pb)-free



Notice

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