

# International IOR Rectifier

## SCHOTTKY RECTIFIER

# 12CTQ... 12CTQ...S 12CTQ...-1

12 Amp

$$I_{F(AV)} = 12\text{Amp}$$

$$V_R = 35/45\text{V}$$

### Major Ratings and Characteristics




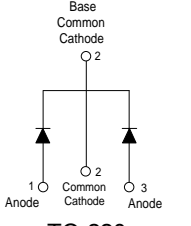
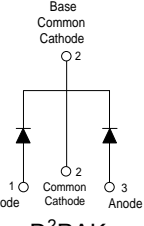
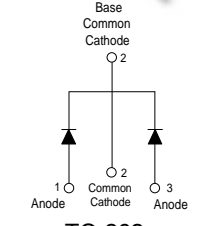
Characteristics	12CTQ	Units
$I_{F(AV)}$ Rectangular waveform	12	A
$V_{RRM}$ range	35/45	V
$I_{FSM}$ @ tp = 5 $\mu$ s sine	690	A
$V_F$ @ 6 Apk, $T_J = 125^\circ\text{C}$ (per leg)	0.53	V
$T_J$ range	-55 to 175	$^\circ\text{C}$

### Description/ Features

The 12CTQ center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175° C junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 175° C  $T_J$  operation
- Center tap TO-220 package
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability

### Case Styles

12CTQ...	12CTQ...S	12CTQ...-1
		
<p>Base Common Cathode</p> <p>2</p>  <p>1 Anode 2 Common Cathode 3 Anode</p> <p>TO-220</p>	<p>Base Common Cathode</p> <p>2</p>  <p>1 Anode 2 Common Cathode 3 Anode</p> <p>D<sup>2</sup>PAK</p>	<p>Base Common Cathode</p> <p>2</p>  <p>1 Anode 2 Common Cathode 3 Anode</p> <p>TO-262</p>

## 12CTQ... Series

Bulletin PD-20554 rev. C 07/06

International  
**IR** Rectifier

### Voltage Ratings

Part number	12CTQ035	12CTQ040	12CTQ045
$V_R$ Max. DC Reverse Voltage (V)	35	40	45
$V_{RWM}$ Max. Working Peak Reverse Voltage (V)			

### Absolute Maximum Ratings

Parameters	12CTQ	Units	Conditions
$I_{F(AV)}$ Max. Average Forward Current (Per Leg) * See Fig. 5 (Per Device)	6	A	50% duty cycle @ $T_C = 160^\circ\text{C}$ , rectangular wave form
	12		
$I_{FSM}$ Max. Peak One Cycle Non-Repetitive Surge Current (Per Leg) * See Fig. 7	690	A	5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse
	140		10ms Sine or 6ms Rect. pulse
$E_{AS}$ Non-Repetitive Avalanche Energy (Per Leg)	8	mJ	$T_J = 25^\circ\text{C}$ , $I_{AS} = 1.20$ Amps, $L = 11.10$ mH
$I_{AR}$ Repetitive Avalanche Current (Per Leg)	1.20	A	Current decaying linearly to zero in 1 $\mu\text{sec}$ Frequency limited by $T_J$ max. $V_A = 1.5 \times V_R$ typical

### Electrical Specifications

Parameters	12CTQ	Units	Conditions
$V_{FM}$ Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)	0.60	V	@ 6A
	0.73	V	@ 12A
	0.53	V	@ 6A
	0.64	V	@ 12A
$I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1)	0.8	mA	$T_J = 25^\circ\text{C}$
	7.0	mA	$T_J = 125^\circ\text{C}$
$V_{F(TO)}$ Threshold Voltage	0.35	V	$T_J = T_J$ max.
$r_t$ Forward Slope Resistance	18.23	m $\Omega$	
$C_T$ Max. Junction Capacitance (Per Leg)	400	pF	$V_R = 5V_{DC}$ (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$
$L_S$ Typical Series Inductance (Per Leg)	8.0	nH	Measured lead to lead 5mm from package body
dv/dt Max. Voltage Rate of Change	10000	V/ $\mu\text{s}$	(Rated $V_R$ )

(1) Pulse Width < 300 $\mu\text{s}$ , Duty Cycle <2%

### Thermal-Mechanical Specifications

Parameters	12CTQ	Units	Conditions
$T_J$ Max. Junction Temperature Range	-55 to 175	$^\circ\text{C}$	
$T_{stg}$ Max. Storage Temperature Range	-55 to 175	$^\circ\text{C}$	
$R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Leg)	3.50	$^\circ\text{C}/\text{W}$	DC operation * See Fig. 4
$R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Package)	1.75	$^\circ\text{C}/\text{W}$	DC operation
$R_{thCS}$ Typical Thermal Resistance, Case to Heatsink	0.50	$^\circ\text{C}/\text{W}$	Mounting surface, smooth and greased
wt Approximate Weight	2 (0.07)	g (oz.)	
T Mounting Torque	Min.	6 (5)	Kg-cm (lbf-in)
	Max.	12 (10)	

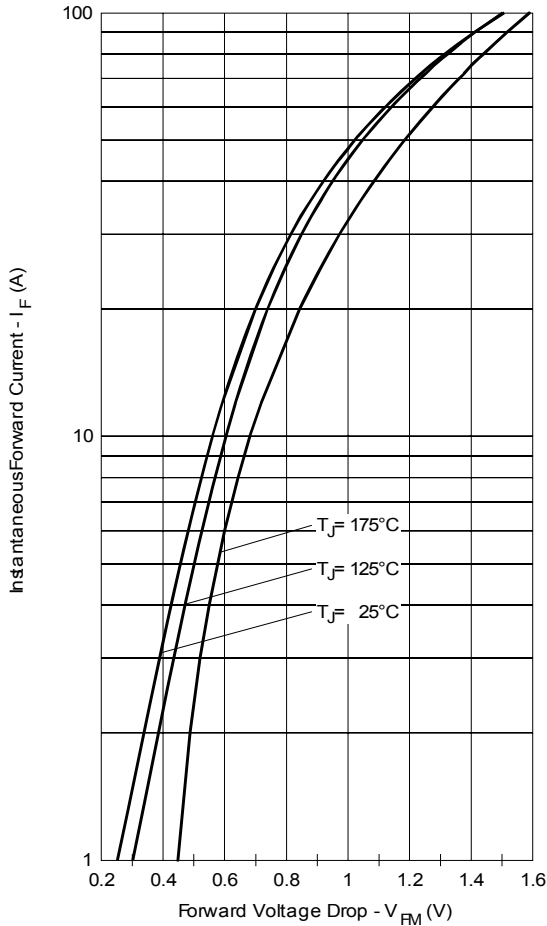


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

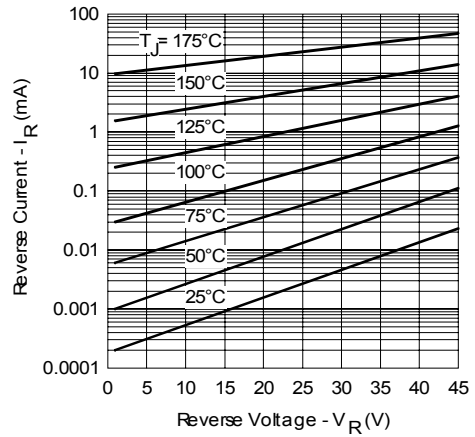


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

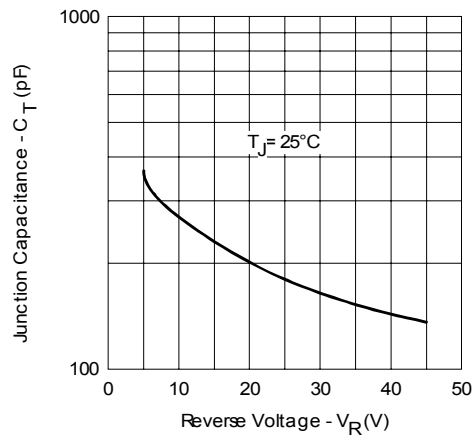


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

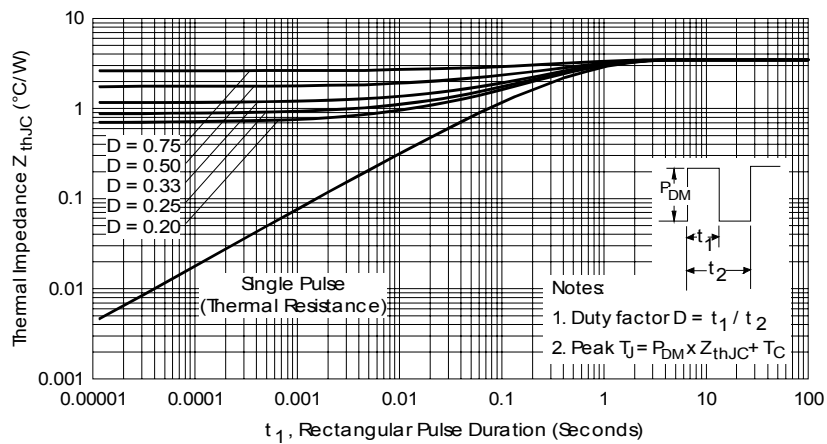


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

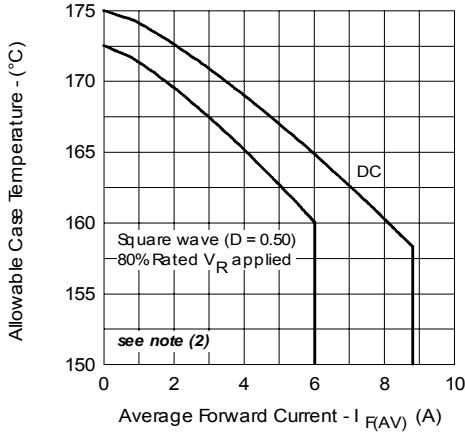


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

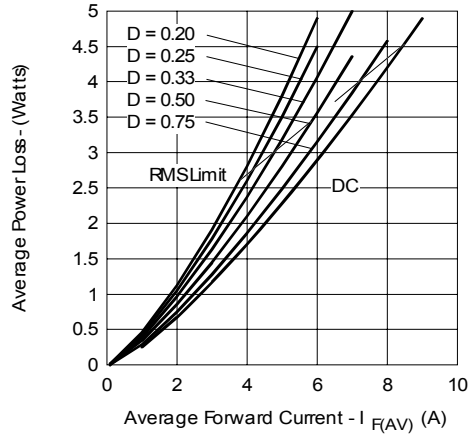


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

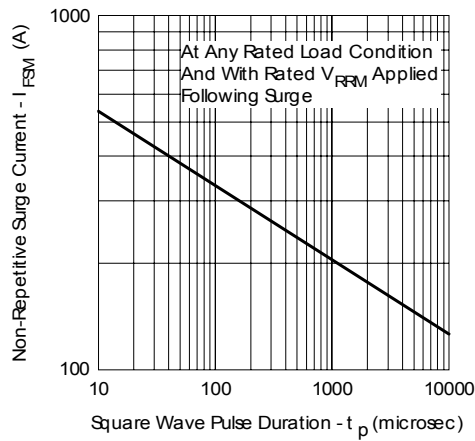


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

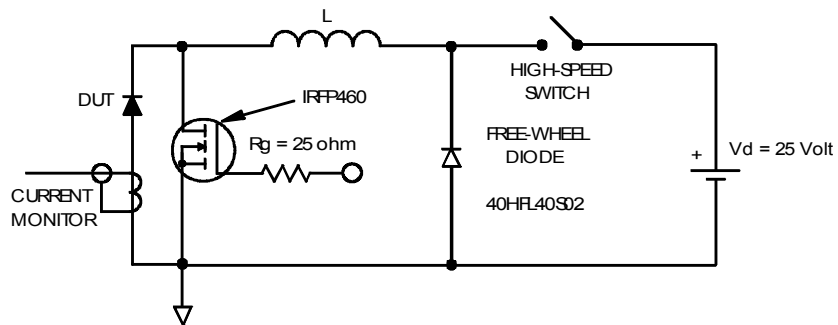
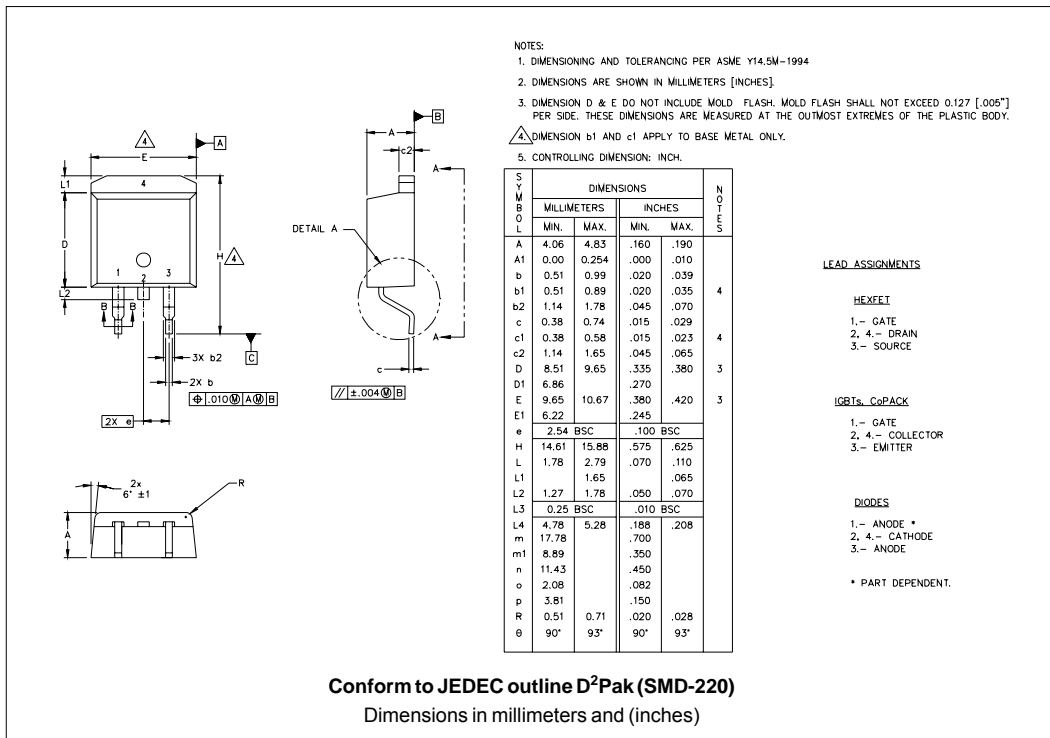
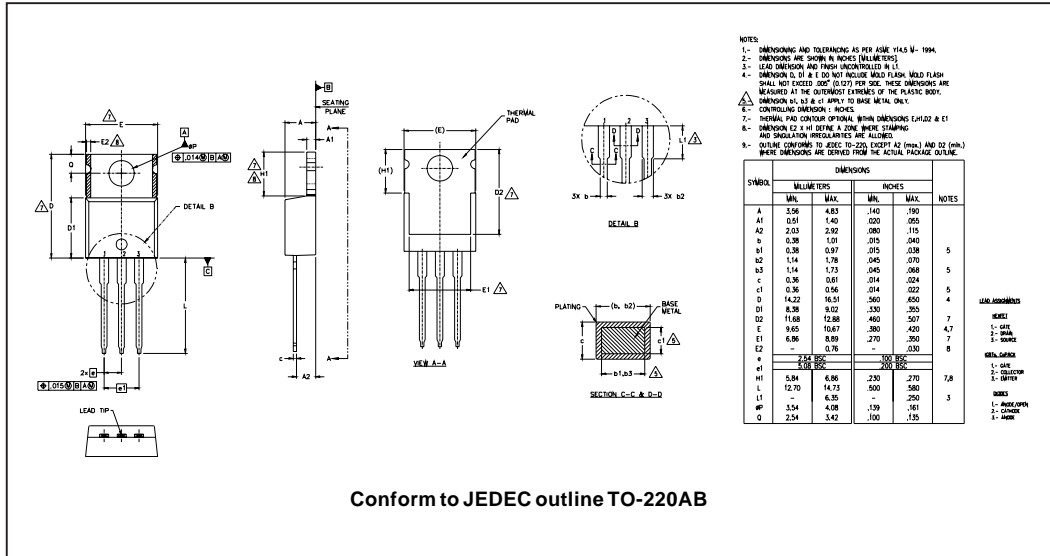


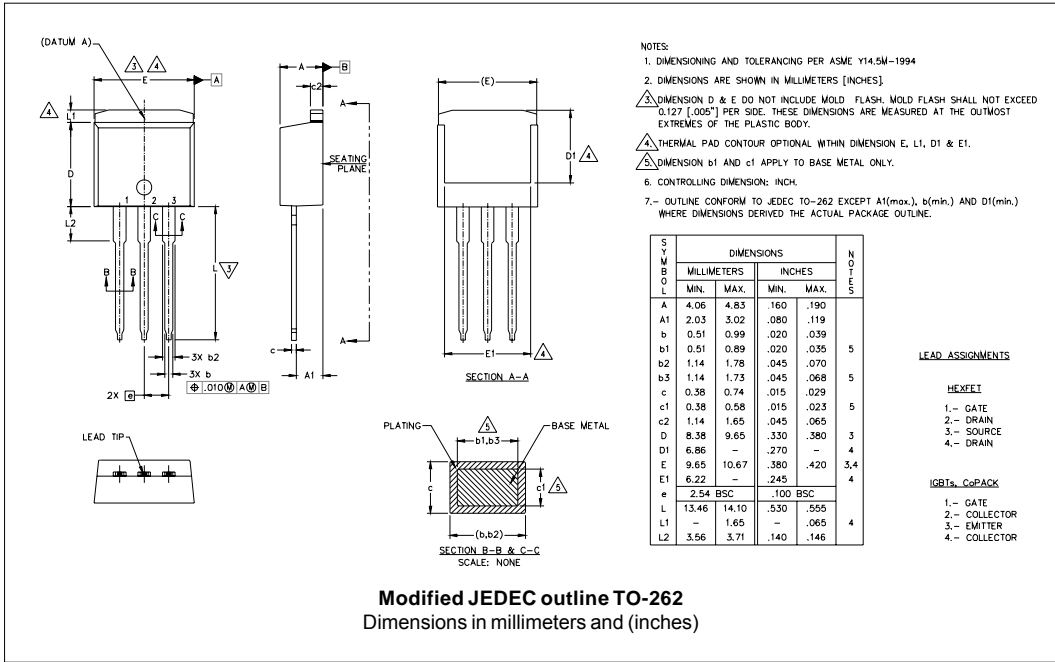
Fig. 8 - Unclamped Inductive Test Circuit

- (2) 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);  
 $Pd_{REV} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = 80\% \text{ rated } V_R$

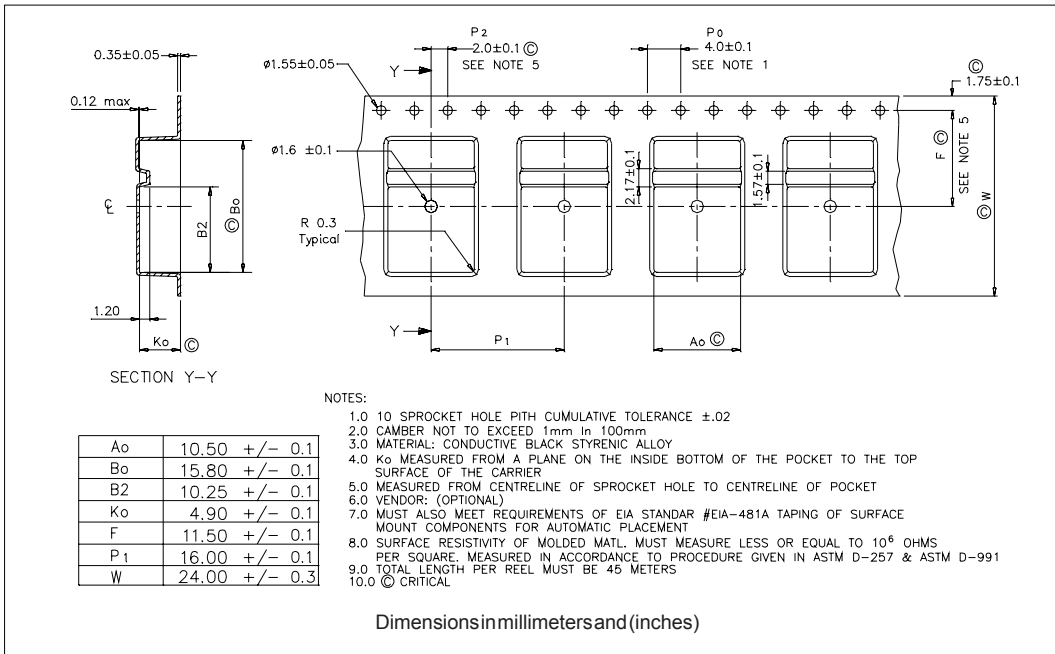
Outline Table



Outline Table



Tape & Reel Information



Part Marking Information

<p><b>TO-220</b></p> <p>EXAMPLE: THIS IS A 12CTQ045                  LOT CODE 1789                  ASSEMBLED ON WW 19, 2000                  IN THE ASSEMBLY LINE "C"</p>	<p>INTERNATIONAL RECTIFIER LOGO</p> <p>ASSEMBLY LOT CODE</p> <p>PART NUMBER</p> <p>DATE CODE                  YEAR 0 = 2000                  WEEK 19                  LINE C</p>
<p><b>D<sup>2</sup>PAK</b></p> <p>EXAMPLE: THIS IS A 12CTQ045S                  LOT CODE 8024                  ASSEMBLED ON WW 02, 2003                  IN ASSEMBLY LINE "C"</p>	<p>INTERNATIONAL RECTIFIER LOGO</p> <p>ASSEMBLY LOT CODE</p> <p>PART NUMBER</p> <p>DATE CODE                  YEAR 3 = 2003                  WEEK 02                  LINE C</p>
<p><b>TO-262</b></p> <p>EXAMPLE: THIS IS A 12CTQ045-1                  LOT CODE 1789                  ASSEMBLED ON WW 19, 2002                  IN ASSEMBLY LINE "C"</p>	<p>INTERNATIONAL RECTIFIER LOGO</p> <p>ASSEMBLY LOT CODE</p> <p>PART NUMBER</p> <p>DATE CODE                  YEAR 2 = 2002                  WEEK 19                  LINE C</p>

Ordering Information Table

Device Code							
12	C	T	Q	045	S	TRL	-
①	②	③	④	⑤	⑥	⑦	⑧
<b>1</b>	-	Current Rating (12A)					
<b>2</b>	-	Circuit Configuration					
		C = Common Cathode					
<b>3</b>	-	T = TO-220					
<b>4</b>	-	Schottky "Q" Series					
<b>5</b>	-	Voltage Ratings					
<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 only)					
		• TRR = Tape & Reel (Right Oriented - for D <sup>2</sup> Pak only)					
<b>8</b>	-	• none = Standard Production					
		• PbF = Lead-Free					

035 = 35V  
 040 = 40V  
 045 = 45V

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