XTR2N0807

High Temperature 80V N-Channel Small Signal MOSFET

Rev 4 – November 2023 (DS-00418-13)

Data Sheet

PRODUCTION

CDFP8
XTR2N0807

TO18-3
XTR2N0807

FEATURES

- Minimum BV_{DSS} = 90V.
- Allowed V_{GS} range –5.5V to +5.5V.
- Operational beyond the -60°C to +230°C temperature range.
- Low $R_{DS(on)}$
  - XTR2N0807: 9.5Ω @ 230°C
- Maximum I_D:
  - XTR2N0807: 600mA @ 230°C
- On-time ($t_{d(on)}$+t_r):
  - XTR2N0807: 12nsec @ 230°C
- Off-time ($t_{d(off)}$+t_f):
  - XTR2N0807: 33nsec @ 230°C
- Available in ruggedized SMT and thru-hole packages.
- Parts are also available as bare dies.

APPLICATIONS

- Reliability-critical, Automotive, Aeronautics & Aerospace, Down-hole.
- Linear regulators, switching applications, sensor driving, level shifting.

DESCRIPTION

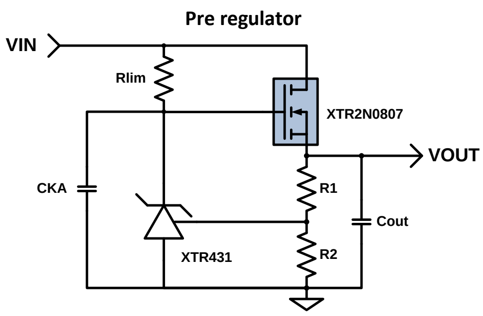
XTR2N0807 is an N-channel small signal MOSFETs designed to reliably operate over a wide range of temperatures. Full functionality is guaranteed from -60°C to +230°C, though operation well below and above this temperature range is achieved.

Fabricated on a Silicon-on-Insulator (SOI) process, XTR2N0807 family parts offer reduced leakage currents while providing high drain currents and low $R_{DS(on)}$. These features allow XTR2N0807 parts to be ideally suited for switching applications.

XTR2N0807 family parts have been designed to reduce system cost and ease adoption by reducing the learning curve and providing smart and easy to use features.

XTR2N0807 parts are available ruggedized SMT and thru-hole packages. Parts are also available as bare dies.

PRODUCT HIGHLIGHT



ORDERING INFORMATION

X	TR	2N	0807
Source : X = X-REL Semi	Process: TR = HiTemp, HiRel	Part family	Part number

Product Reference	Temperature Range	Package	Pin Count	Marking
XTR2N0807-TD	-60°C to +230°C	Tested bare die		
XTR2N0807-FE	-60°C to +230°C	Gull-wing flat pack with ePad	8	XTR2N0807
XTR2N0807-T	-60°C to +230°C	TO-18 metal can	3	XTR2N0807

Other packages and packaging configurations possible upon request. For some packages or packaging configurations, MOQ may apply.

ABSOLUTE MAXIMUM RATINGS

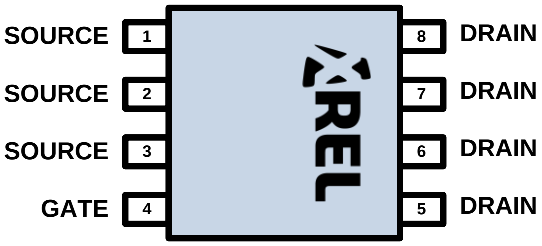
Drain-source voltage	-2V to +90V
Gate-source voltage	±6.0V
Storage temperature range	-70°C to +230°C
Operating junction temperature range	-70°C to +300°C
ESD classification	1kV HBM MIL-STD-750

Caution: *Stresses beyond those listed in "ABSOLUTE MAXIMUM RATINGS" may cause permanent damage to the device. These are stress ratings only and functionality of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to "ABSOLUTE MAXIMUM RATINGS" conditions for extended periods may permanently affect device reliability.*

PRODUCT VARIANTS

CDFP8 with ePad
XTR2N0807-FE

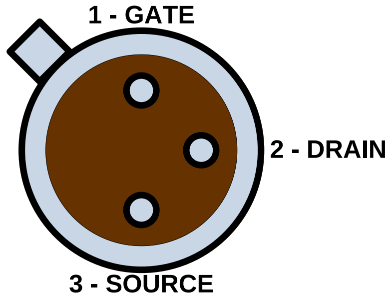
Top view



ePAD (bottom of package) <u>must be</u> connected to SOURCE

TO-18
XTR2N0807-T

Bottom view



Package case connected to SOURCE

THERMAL CHARACTERISTICS

Parameter	Condition	Min	Typ	Max	Units
XTR2N0807-FE (DFP8 with exposed pad)					
Thermal Resistance: J-C R_{Th_J-C}	Measured on ePAD.		15		°C/W
Thermal Resistance: J-A R_{Th_J-A}	ePAD thermally connected to 3cm² PCB copper.		85		°C/W
XTR2N0807-T (TO-18)					
Thermal Resistance: J-C R_{Th_J-C}			55		°C/W
Thermal Resistance: J-A R_{Th_J-A}			300		°C/W

RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Typ	Max	Units
Drain-source voltage V_{DS}	-1.5		80	V
Gate-source voltage V_{GS}	-5.5		+5.5	V
Junction Temperature[1] T_j	-60		230	°C

[1] *Operation beyond the specified temperature range is achieved. The -60°C to +230°C range for the case temperature is considered for the case where $I_D \leq I_{D(DC)}$ for a given case temperature.*

XTR2N0807 SPECIFICATIONS

Unless otherwise stated, specification applies for -60°C<T_j<230°C.

Parameter	Condition	Min	Typ	Max	Units
DC Characteristics					
Drain-source breakdown voltage BV_{DSS}	V_{GS}=0V, I_{DS}=100µA, T_j=25°C	90			V
Static drain-source on-state resistance $R_{DS(on)}$	V_{GS}=+5V, V_{DS}=50mV T_C=-60°C T_C=85°C T_C=230°C		 3.5 6.1 9.5	 4.6 8.0 12.4	⍰
Continuous drain current $I_{D(DC)}$	V_{GS}=+5V for T0-18 T_J=-60°C T_J=85°C T_J=230°C	 190 140 105	 270 200 150		mA
Gate threshold voltage $V_{GS(th)}$	V_{DS}=V_{GS}, I_{DS}=1mA T_C=-60°C T_C=85°C T_C=230°		 1.84 1.53 1.18		V
Temperature drift of gate threshold voltage $\Delta V_{GS(TH)}/\Delta T_j$	V_{DS}=V_{GS}, I_{DS}=1mA		-2.27		mV/°C
Off-state drain current I_{DSS}	V_{DS}=80V, V_{GS}=0V T_C=85°C T_C=230°C		 0.004 2.0	 0.03 10	µA
Gate Leakage current I_{GSS}	V_{GS}=±5V, V_{DS}=0V T_C=85°C T_C=230°C		 ±0.9 ±100	 ±5 ±700	nA
AC Characteristics					
Input capacitance C_{iss}	V_{DS}=40V, V_{GS}=0V, f=1MHz		38		pF
Output capacitance C_{oss}			8.3		pF
Reverse transfer capacitance C_{rss}			1.5		pF
Switching Characteristics					
Pulsed drain current I_{DM}	V_{DS}=40V, $V_{GS\ sweep}$=0 to +5V, d=0.2%, ⍰=1ms T_C=-60°C T_C=85°C T_C=230°C	 770 560 420	 1110 800 600		mA
Total gate charge Q_g	V_{DS}=40V, $V_{GS\ sweep}$=0 to +5V		0.62		nC
Turn-on delay time $t_{d(on)}$	V_{DS}=20V, $V_{GS\ sweep}$=0 to +5V, R_D=100Ω, d=0.2%, ⍰=1ms		7.2		ns
Rise time t_r	V_{DS}=20V, $V_{GS\ sweep}$=0 to +5V, R_D=100Ω, d=0.2%, ⍰=1ms		4.7		
Turn-off delay time $t_{d(off)}$	V_{DS}=20V, $V_{GS\ sweep}$=0 to +5V, R_D=100Ω, d=0.2%, ⍰=1ms		10.3		
Fall time t_f	V_{DS}=20V, $V_{GS\ sweep}$=0 to +5V, R_D=100Ω, d=0.2%, ⍰=1ms		22		
Drain-Source Diode Characteristics					
Forward diode voltage V_{SD_100mA}	V_{GS}=0V, I_{DS}=-100mA T_C=-60°C T_C=85°C T_C=230°C		 1.16 1.05 0.95		V

TYPICAL PERFORMANCE

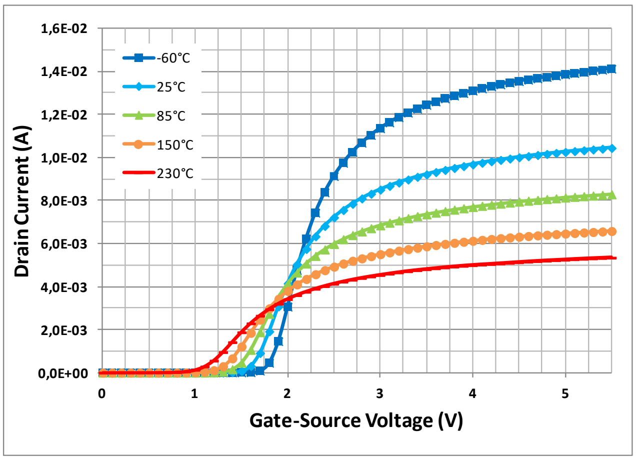


Figure 1. Drain Current (I_{DS}) vs Gate-Source Voltage for several case temperatures. V_{DS}=50mV.

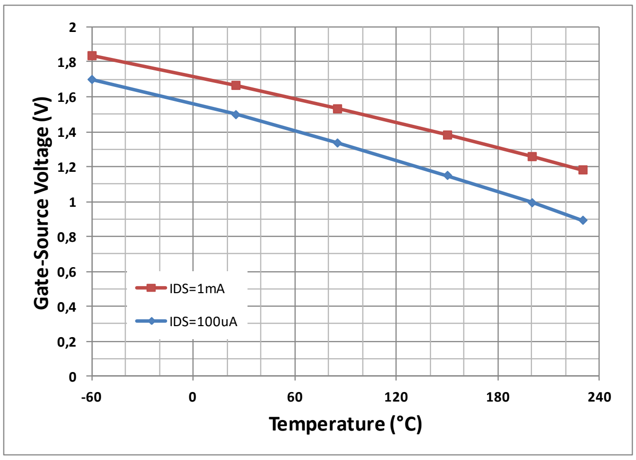


Figure 2. Gate-Source Threshold Voltage ($V_{GS(th)}$) vs Case temperatures. V_{GS}= V_{DS}.

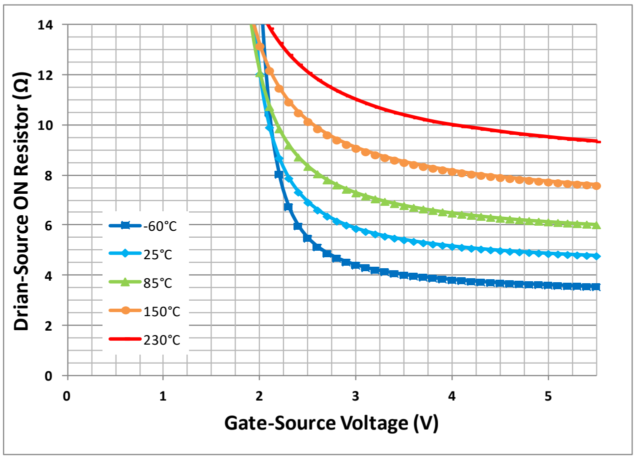


Figure 3. Drain-Source ON Resistance ($R_{DS(on)}$) vs Gate-Source Voltage for several case temperatures. V_{DS}=50mV.

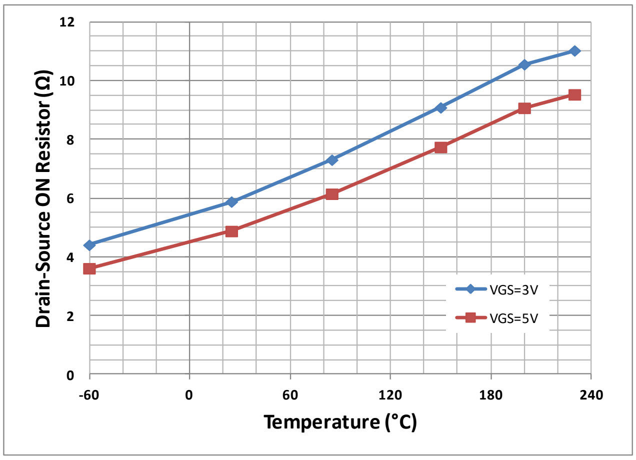


Figure 4. Drain-Source ON Resistance ($R_{DS(on)}$) vs Case Temperature. V_{DS}=50mV.

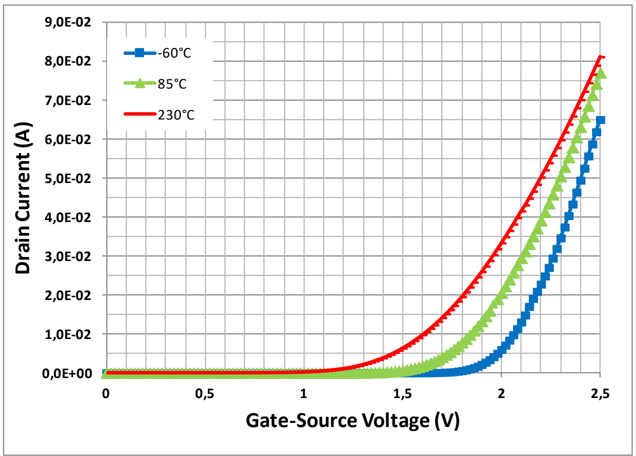


Figure 5. Drain Current (I_{DS}) vs Gate-Source Voltage for several case temperatures. V_{GS}=V_{DS}

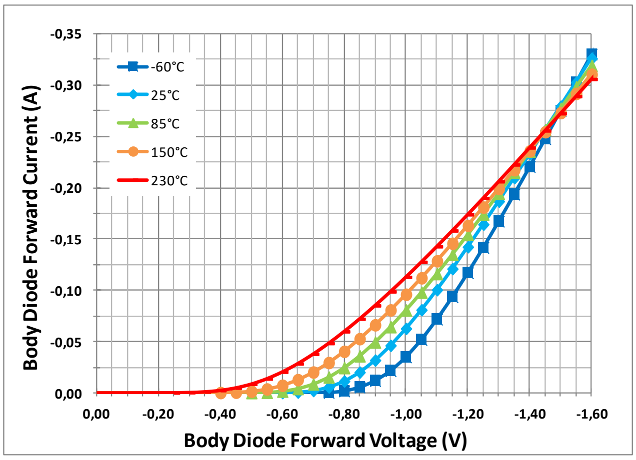


Figure 6. Body Diode Forward Current (I_{FD}) vs Forward Voltage for several case temperature. V_{GS}=0V.

TYPICAL PERFORMANCE (CONTINUED)

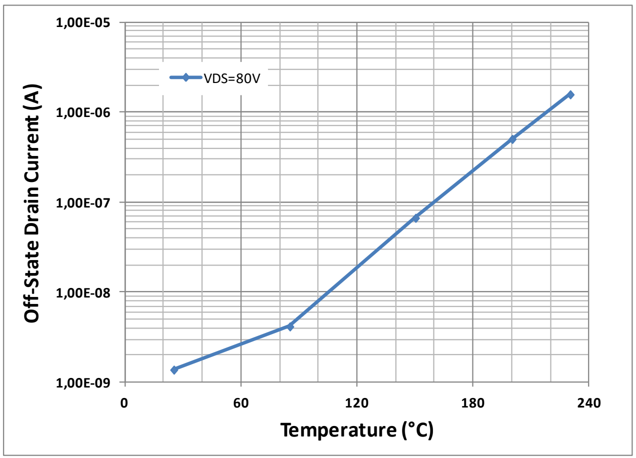


Figure 7. Off-State Drain Current (I_{DSS}) vs Case Temperature. V_{DS}=80V, V_{GS}=0V.

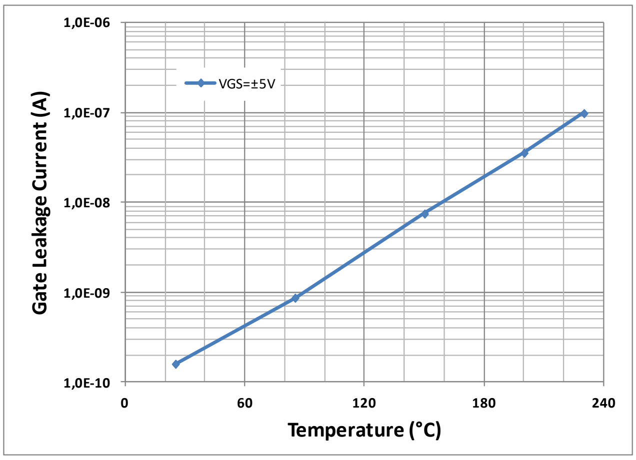


Figure 8. Gate Leakage Current (I_{GSS}) vs Case Temperature. V_{GS}=±5V, V_{DS}=0V.

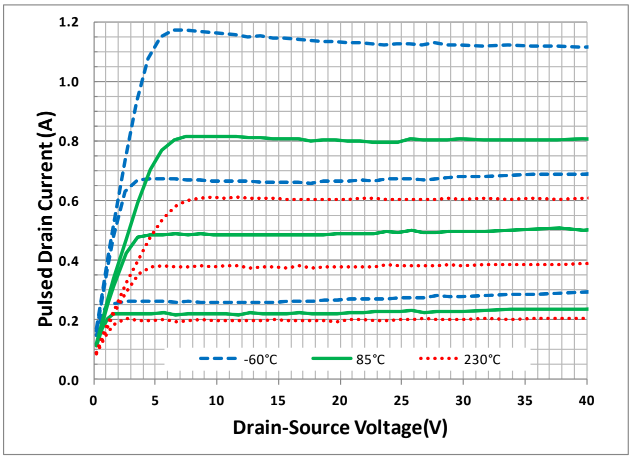


Figure 9. Pulsed Drain Current (I_{DM}) vs Drain-Source Voltage for several case temperatures. V_{GS}=3V, 4V and 5V.

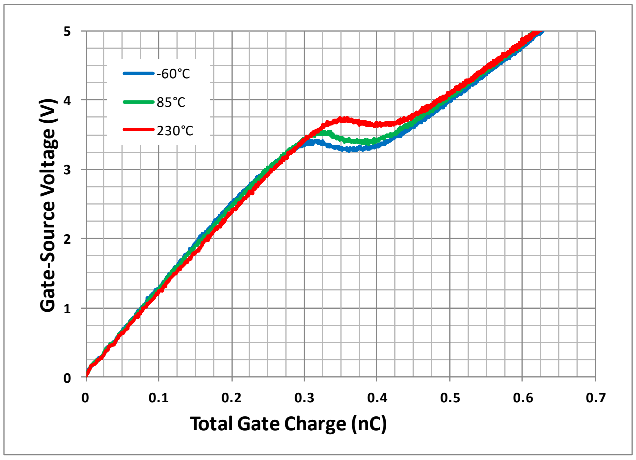


Figure 10. Total Gate Charge (Q_g) vs Gate-Source Voltage for several case temperatures. I_{DS}=200mA.

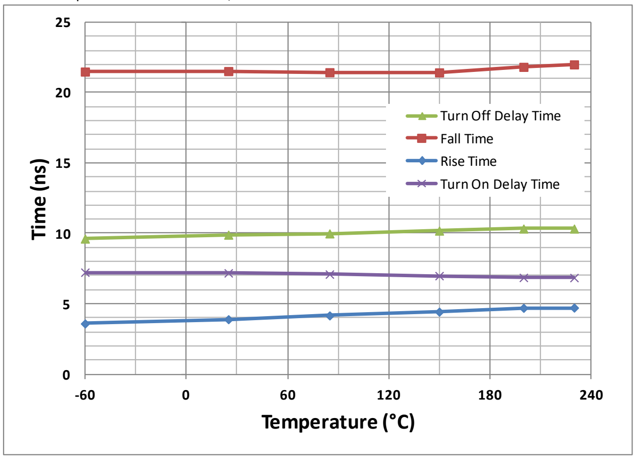


Figure 11. Timing Characteristics vs Case Temperature. V_{DS}=20V, $V_{GS\ sweep}$= 0 to 5V.

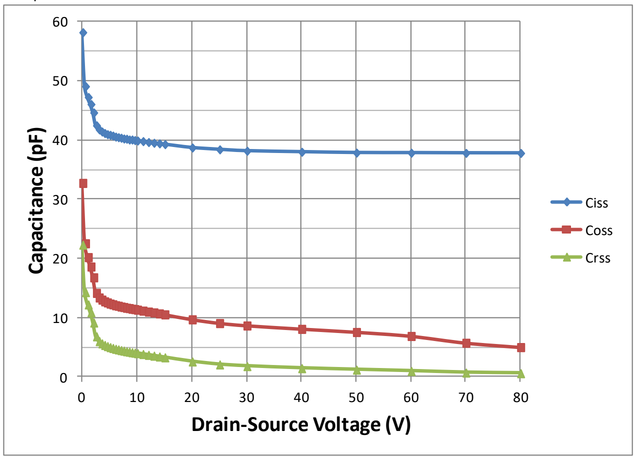


Figure 12. Capacitance vs Drain-Source Voltage at Tc=25°C.

PARAMETER DEFINITION

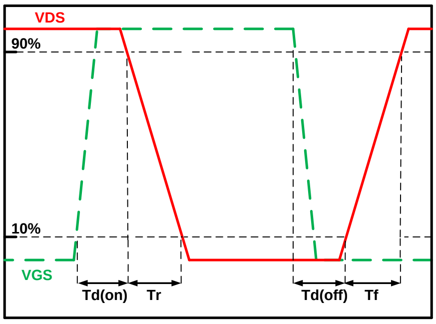
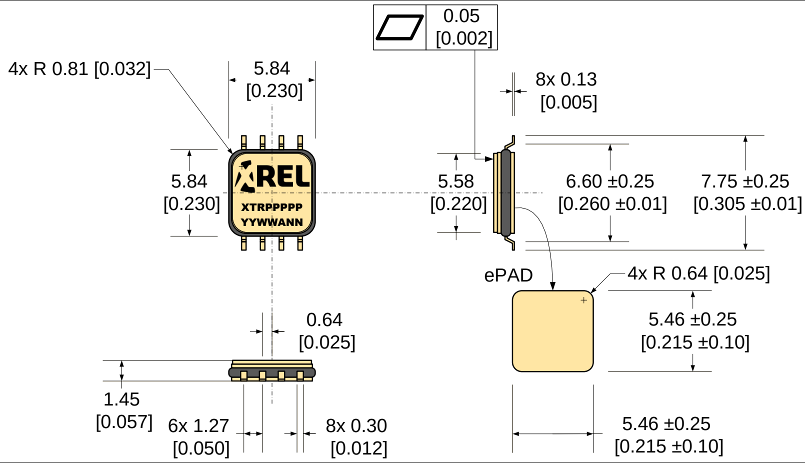


Figure 13. Timing diagram definition.

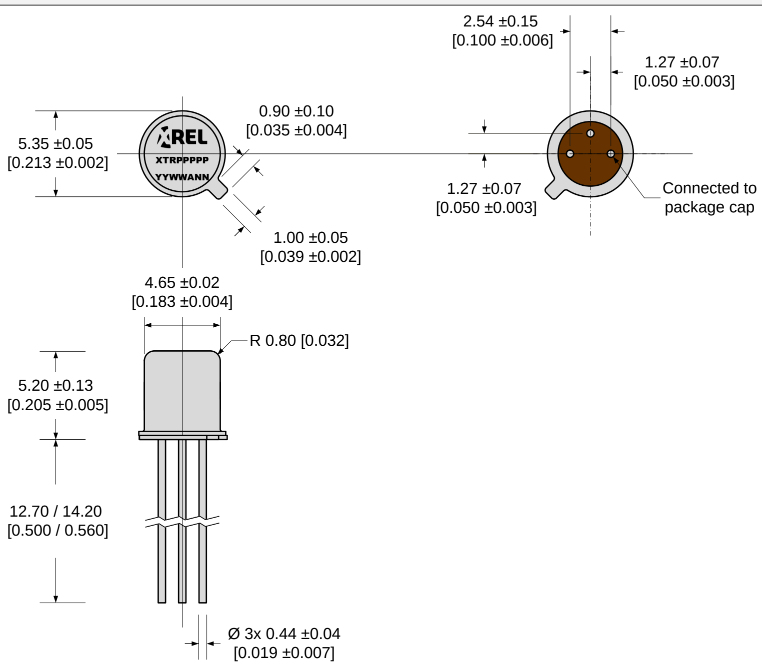
PACKAGE OUTLINES

Dimensions shown in mm [inches]. Tolerances ±0.13 mm [±0.005 in] unless otherwise stated.

Ceramic Gull-wing Flat Pack with ePad CDFP8



TO-18 Metal Can



Part Marking Convention	
Part Reference: XTRPPPPP	
XTR	X-REL Semiconductor, high-temperature, high-reliability product (XTRM Series).
PPPPP	Part number (0-9, A-Z).
Unique Lot Assembly Code: YYWWANN	
YY	Two last digits of assembly year (e.g. 11 = 2011).
WW	Assembly week (01 to 52).
A	Assembly location code.
NN	Assembly lot code (01 to 99).

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90, Avenue Leon Blum 38100 Grenoble -– France
✆ : +33 456 580 580
✉ : support.XREL@easii-ic.com