IXYS
INTEGRATED CIRCUITS DIVISION


# CPC3710
# 250V N-Channel Depletion-Mode FET

| $V_{(BR)DSX}$ / $V_{(BR)DGX}$ | $R_{DS(on)}$ (max) | $I_{DSS}$ (min) | Package |
|---|---|---|---|
| $250V_P$ | 10Ω | 220mA | SOT-89 |

## Features

- Low $R_{DS(on)}$ at Cold Temperatures
- Low On-Resistance: 10Ω max. at 25ºC
- High Input Impedance
- High Breakdown Voltage: $250V_P$
- Low $V_{GS(off)}$ Voltage: -1.6 to -3.9V
- Small Package Size SOT-89

## Applications

- Ignition Modules
- Normally-On Switches
- Solid State Relays
- Converters
- Telecommunications
- Power Supply

## Description

The CPC3710 is an N-channel, depletion-mode, field effect transistor (FET) that utilizes IXYS Integrated Circuits Division's proprietary third-generation vertical DMOS process. The third-generation process realizes world class, high voltage MOSFET performance in an economical silicon gate process. Our vertical DMOS process yields a robust device, with high input impedance, for use in high-power applications. The CPC3710 is a highly reliable FET device that has been used extensively in our solid state relays for industrial and telecommunications applications.

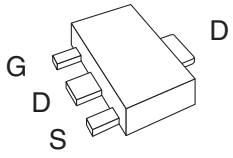
This device excels in power applications requiring low drain-source resistance, particularly in cold environments such as automotive ignition modules. The CPC3710 offers a low, 10Ω maximum, on-state resistance at 25ºC.

The CPC3710 has a minimum breakdown voltage of $250V_P$ , and is available in an SOT-89 package. As with all MOS devices, the FET structure prevents thermal runaway and thermal-induced secondary breakdown.

## Ordering Information

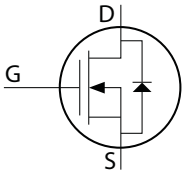
| Part # | Description |
|---|---|
| CPC3710CTR | N-Channel Depletion Mode FET, SOT-89 Pkg. Tape and Reel (1000/Reel) |

## Package Pinout




(SOT-89)

## Circuit Symbol




Pb RoHS e3

## Absolute Maximum Ratings @ 25ºC

| Parameter | Ratings | Units |
|---|---|---|
| Drain-to-Source Voltage | 250 | $V_P$ |
| Gate-to-Source Voltage | ±15 | $V_P$ |
| Pulsed Drain Current | 600 | mA |
| Total Package Dissipation [1] | 1.4 | W |
| Junction Temperature | 150 | ºC |
| Operational Temperature | -55 to +125 | ºC |
| Storage Temperature | -55 to +125 | ºC |

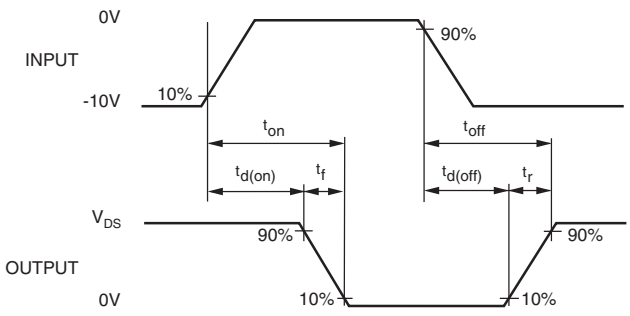
[1] Mounted on FR4 board 1"x1"x0.062"

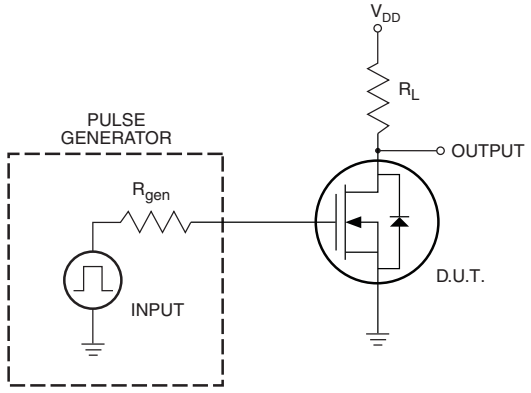
*Absolute Maximum Ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at conditions beyond those indicated in the operational sections of this data sheet is not implied.*

## Electrical Characteristics @ 25ºC (Unless Otherwise Noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSX}$ | $V_{GS}$= -5V, $I_D$=100µA | 250 | - | - | $V_P$ |
| Gate-to-Source Off Voltage | $V_{GS(off)}$ | $V_{DS}$= 5V, $I_D$=1mA | -1.6 | - | -3.9 | V |
| Change in $V_{GS(off)}$ with Temperatures | $dV_{GS(off)}/dT$ | $V_{DS}$= 5V, $I_D$=1µA | - | - | 4.5 | mV / ºC |
| Gate Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±15V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-to-Source Leakage Current | $I_{D(off)}$ | $V_{GS}$= -5V, $V_{DS}$=250V | - | - | 1 | µA |
| | | $V_{GS}$= -5V, $V_{DS}$=200V, $T_A$=125ºC | - | - | 1 | mA |
| Saturated Drain-to-Source Current | $I_{DSS}$ | $V_{GS}$= 0V, $V_{DS}$=15V | 220 | - | - | mA |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}$= 0V, $I_D$=220mA | - | - | 10 | Ω |
| Change in $R_{DS(on)}$ with Temperatures | $dR_{DS(on)}$ / dT | $V_{GS}$= 0V, $I_D$=220mA | - | - | 1.1 | % / ºC |
| Forward Transconductance | $G_{FS}$ | $I_D$= 100mA, $V_{DS}$ = 10V | 225 | - | - | m℧ |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$= -5V<br>$V_{DS}$= 25V<br>f= 1MHz | - | 100 | 350 | pF |
| Common Source Output Capacitance | $C_{OSS}$ | | | 30 | 80 | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 15 | 40 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$= 25V<br>$I_D$= 150mA<br>$V_{GS}$= 0V to -10V<br>$R_{gen}$= 50Ω | - | 23 | 35 | ns |
| Rise Time | $t_r$ | | | 8 | 20 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 17 | 25 | |
| Fall time | $t_f$ | | | 70 | 80 | |
| Source-Drain Diode Voltage Drop | $V_{SD}$ | $V_{GS}$= -5V, $I_{SD}$= 150mA | - | 0.6 | 1.8 | V |
| Thermal Resistance (Junction to Ambient) | $R_{\theta JA}$ | - | - | 90 | - | ºC/W |

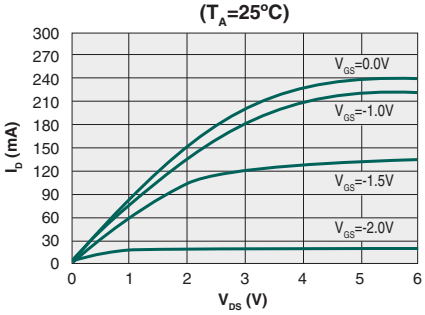
## Switching Waveform & Test Circuit



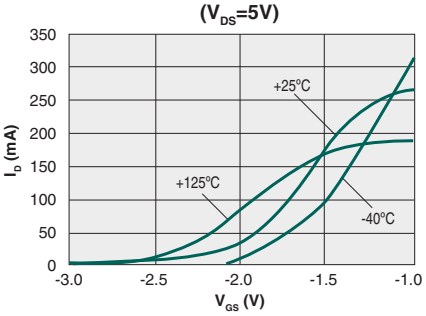



## PERFORMANCE DATA*

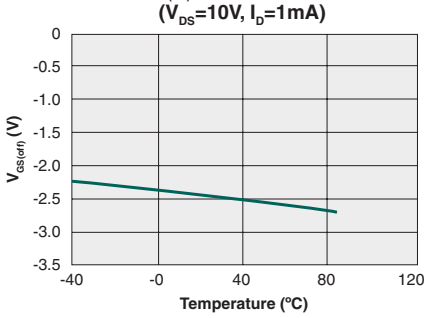
Output Characteristics
($T_A$=25°C)



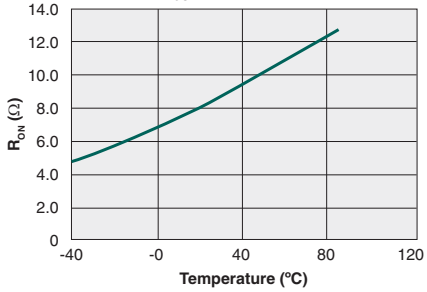

Transfer Characteristics
($V_{DS}$=5V)



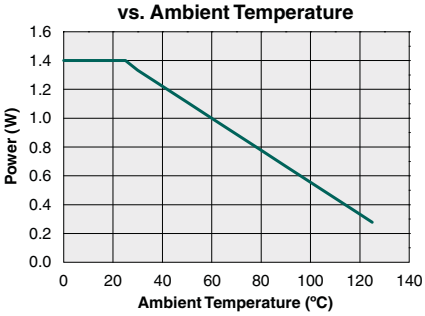

$V_{GS(off)}$ vs. Temperature
($V_{DS}$=10V, $I_D$=1mA)



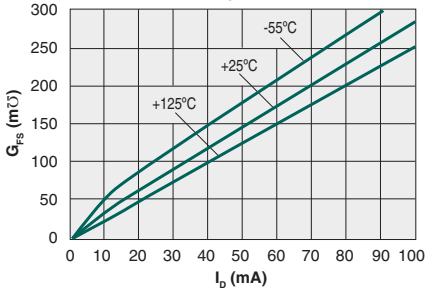

$R_{ON}$ vs. Temperature
($V_{GS}$=0V, $I_D$=100mA)



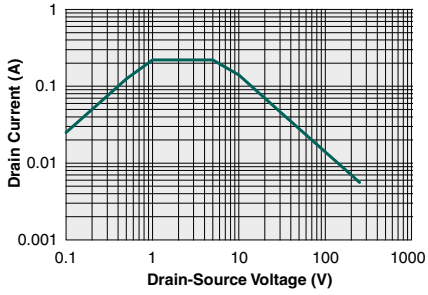

Power Dissipation
vs. Ambient Temperature



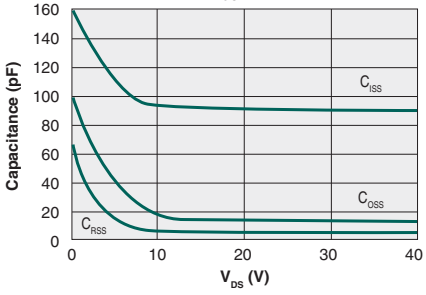

Transconductance Vs. Drain Current
($V_{DS}$=10V)



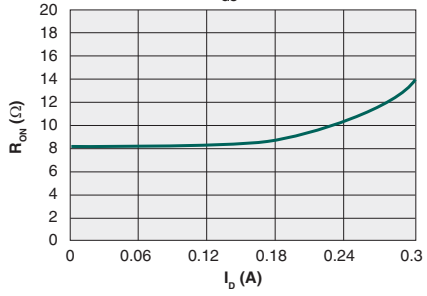

Max Rated Safe Operating Area




Capacitance vs. Drain Source Voltage
($V_{GS}$=-5V)




On-Resistance vs. Drain Current
($V_{GS}$=0V)




*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

## Manufacturing Information

### Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingression. IXYS Integrated Circuits Division classified all of its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a **Moisture Sensitivity Level (MSL) rating** as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

| Device | Moisture Sensitivity Level (MSL) Rating |
|---|---|
| CPC3710C | MSL 1 |

### ESD Sensitivity

This product is **ESD Sensitive**, and should be handled according to the industry standard **JESD-625**.

### Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

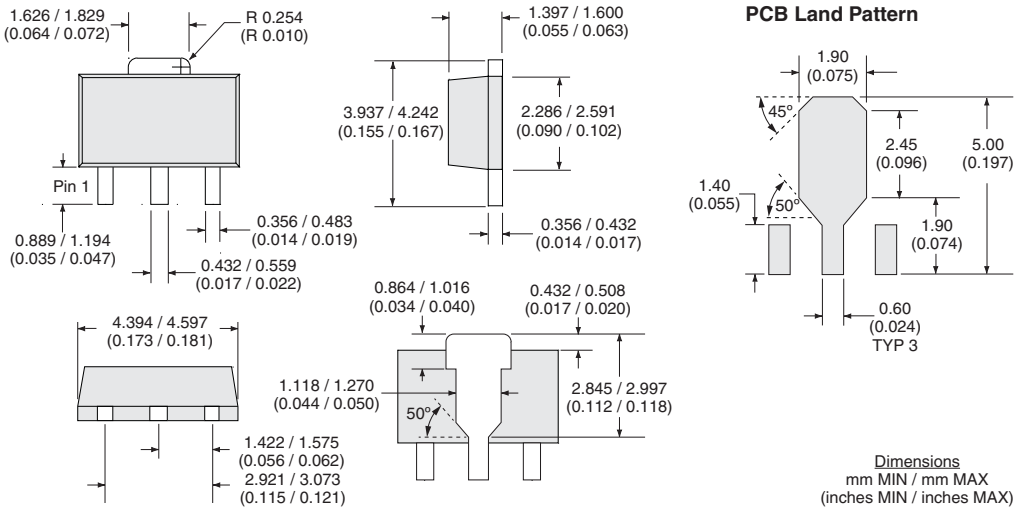
| Device | Maximum Temperature x Time |
|---|---|
| CPC3710C | 260°C for 30 seconds |

### Board Wash

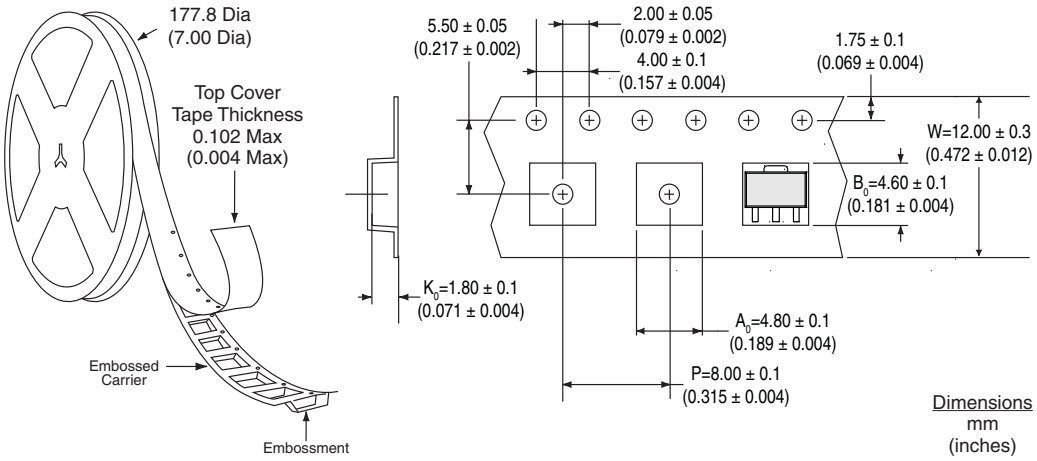
IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable, and the use of a short drying bake may be necessary. Chlorine-based or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

# MECHANICAL DIMENSIONS

## CPC3710C




## CPC3710CTR Tape & Reel

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Specification: DS-CPC3710-R02

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