ITC137P
Integrated Telecom Circuits

	ITC135P	Units
Relay Load Voltage	350	V
Relay Load Current	120	mA
Relay Max R_{ON}	15	Ω
Bridge Rectifier Reverse Voltage	100	V
Darlington Collector Current	120	mA
Darlington Current Gain	10,000	-

Description
The Integrated Telecom Circuit combines a 1-Form-A solid state relay, bridge rectifier, Darlington transistor, optocoupler and zener diodes into one 16 pin SOIC package, consolidating designs and reducing component count in telecom applications. The ITC137P's optocoupler provides for ful wave detection of the ring signal.

Features
- Small 16 Pin SOIC Package (PCMCIA Compatible)
- Board Space and Cost Savings
- 2mW Hookswitch Drive Power (Logic Compatible)
- No Moving Parts
- 3750V_{RMS} Input/Output Isolation
- FCC Compatible Part 68
- Full-Wave Bridge Rectifier
- Darlington Transistor for Electronic Inductor "Dry" Circuits
- Full Wave Current Detector for Ring Signal or Loop Current Detect
- JEDEC Standard Pin Out
- Includes Zener Diodes

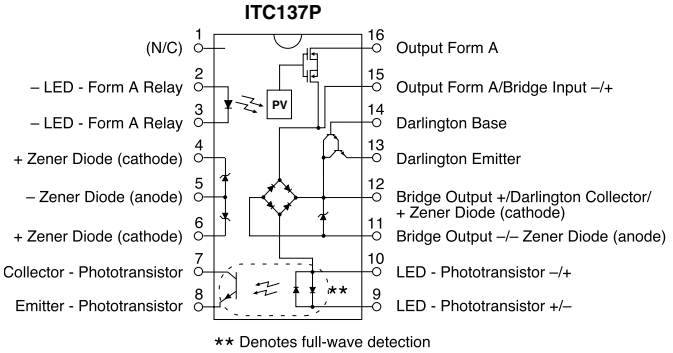
Approvals
- UL Recognized: File Number E76270
- CSA Certified: File Number LR 43639-12
- BSI Certified:
  - BS EN 60950:1992 (BS7002:1992) Certificate #: 7969
  - BS EN 41003:1993 Certificate #: 7969

Ordering Information

Part #	Description
ITC137P	16 Pin SOIC (50/Tube)
ITC137PTR	16 Pin SOIC (1000/Reel)

Applications
- Data/Fax Modem
- Voice Mail Systems
- Telephone Sets
- Computer Telephony Integration
- Set Top Box Modems

Pin Configuration



** Denotes full-wave detection

Absolute Maximum Ratings (@ 25˚ C)

Parameter	Min	Typ	Max	Units
Total Package Dissipation	-	-	1[1]	W
Isolation Voltage				
Input to Output	3750	-	-	V_{RMS}
Operational Temperature	-40	-	+85	°C
Storage Temperature	-40	-	+125	°C
Soldering Temperature (10 Seconds Max.)	-	-	+220	°C

[1] Above 25˚ derate linerity 8.33mw/°C

Total Power Dissipation (PD):

$P_D = P_{HOOKSWITCH} + P_{BRIDGE} + P_{DARLINGTON} + P_{LED}$

$P_D = (R_{DS}(on))(I^2_L) + 2(V_F)(I_L) + (V_{CE})(I_L) + (V_{LED})(I_F)$

WHERE:

$R_{DS}(on)$ = Maximum realy on resistance

I_L = Maximum loop current

V_F = Maximum diode forward voltage

V_{CE} = Maximum voltage collector to emitter

V_{LED} = Maximum LED forward voltage

I_F = Maximum LED current

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 these or any other conditions beyond those indicated in the operational sections of this data sheet is not implied. Exposure of the device to the absolute maximum ratings for an extended period may degrade the device and effect its reliability.

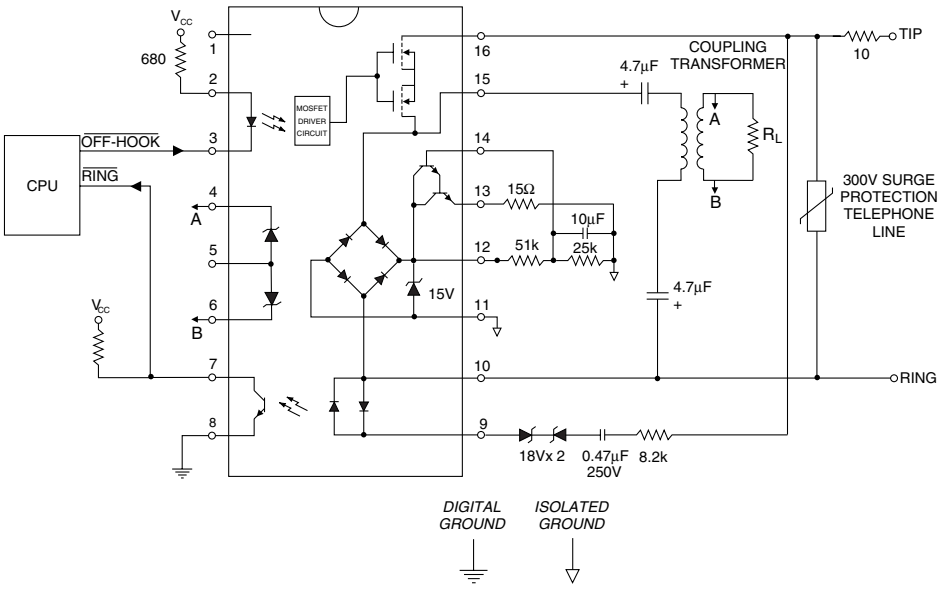
Electrical Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Relay Portion (Pins 15,16) Output Characteristics @ 25°C						
Load Voltage, DC or Peak AC	-	V_L	-	-	350	V
Load Current (Continuous)	-	I_L	-	-	120	mA
On-Resistance	I_L=120mA	R_{ON}	-	-	15	Ω
Off-State Leakage Current	V_L=350, T_J=25˚C	I_{LEAK}	-	-	1	µA
Switching Speeds						
Turn-On	I_F=5mA, V_L=10V	T_{ON}	-	-	3	ms
Turn-Off	I_F=5mA, V_L=10V	T_{OFF}	-	-	3	ms
Output Capacitance	50V, f=1MHz	C_{OUT}	-	25	-	pF
Relay Portion (Pins 2,3) Input Characteristics @ 25°C						
Input Control Current	I_L=120mA	I_F	5	-	50	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Reverse Input Voltage	-	V_R	-	-	5	V
Reverse Input Current	V_R=5V	I_R	-	-	10	µA
Detector Portion (Pins 7,8) Output Characteristics @ 25°C						
Phototransistor Blocking Voltage	I_C=10µA	BV_{CEO}	20	50	-	V
Phototransistor Dark Current	V_{CE}=5V, I_F=0mA	I_{CEO}	-	50	500	A
Saturation Voltage	I_C=2mA, I_F=16mA	V_{SAT}	-	0.3	0.5	V
Current Transfer Ratio	IF=6mA, V_{CE}=0.5V	CTR	33	400	-	%
Detector Portion (Pins 9,10) Input Characteristics @ 25°C						
Input Control Current	I_C=2mA, V_{CE}=0.5V	I_F	6	2	100	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Input Current (Detector must be off)	I_C=1µA, V_{CE}=5V	I_F	5	25	-	µA

Electrical Characteristics

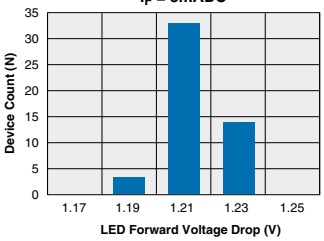
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Bridge Rectifier Electrical Ratings @ 25°C						
Reverse Voltage	-	V_{RD}	-	-	100	V
Forward Drop Voltage	I_{FD}=120mA	V_{FD}	-	-	1.5	V
Reverse Leakage Current	T_J=25˚C, V_R=100V	I_{RD}	-	-	10	µA
	T_J=85˚C		-	-	50	µA
Forward Current (Continuous)		I_{FD}	-	-	140	mA
Forward Current (Peak)	t=10mS	I_{FD}	-	-	0.5	A
Darlington Electrical Ratings @ 25°C						
Collector-Emitter Voltage	I_c=10mA DC, I_B=0	V_{CEO}	40	-	-	V
Collector-Current Continuous	V_C=3.5V	I_C	-	-	120	mA
Power Dissipation @ 25˚C	-	P_d	-	-	500	mW
Off-State Collector Emitter Leakage Current	V_{CE}=10V; I_B=0mA	I_{CEX}	-	-	1	µA
DC Current Gain	I_C =120mA, V_{CE} =10VDC	h_{FE}	10,000	-	-	
Saturation Voltage	I_C =120mA	$V_{CE(SAT)}$	-	-	1.5	V
Total Harmonic Distortion	fo=300Hz @ -10dBm I_C=40mA	-	-	-	-80	dB
Zener Characteristics @ 25°C						
Zener Voltage (Between pins 4+5 and 6+5)	I_{ZT}=20mA	V_z	-	4.3	-	V
Zener Voltage (Between pins 12+11)	I_{ZT}=20mA	V_z	-	15	-	V
Input to Output Capacitance	-	$C_{I/O}$	-	3	-	pF
Input to Output Isolation	-	$V_{I/O}$	3750	-	-	V_{RMS}

EXAMPLE CIRCUIT

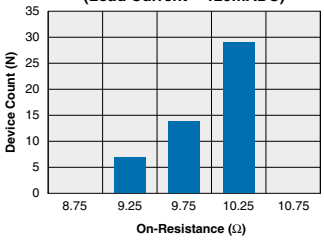


PERFORMANCE DATA*

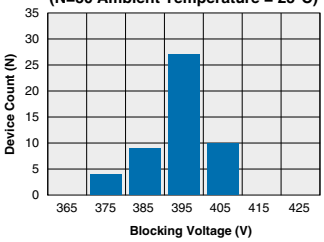
ITC137P
Typical LED Forward Voltage Drop
(N=50 Ambient Temperature = 25°C)
I_F = 5mADC



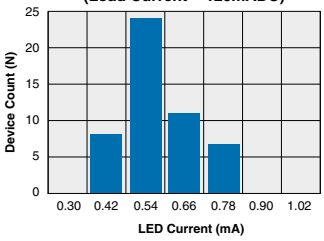
ITC137P
Typical On-Resistance Distribution
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC)



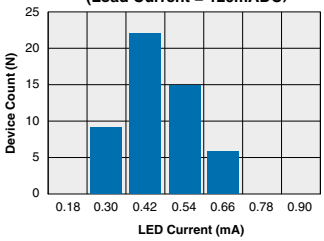
ITC137P
Typical Blocking Voltage Distribution
(N=50 Ambient Temperature = 25°C)



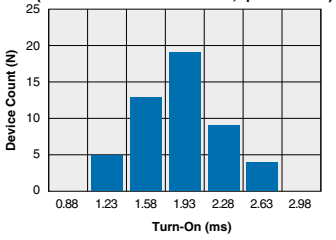
ITC137P
Typical I_F for Switch Operation
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC)



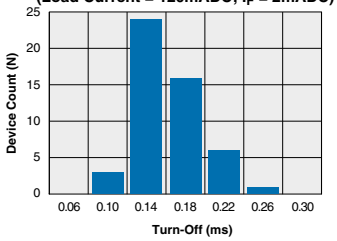
ITC137P
Typical I_F for Switch Dropout
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC)



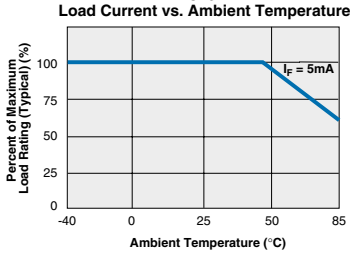
ITC137P
Typical Turn-On Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC; I_F = 2mADC)



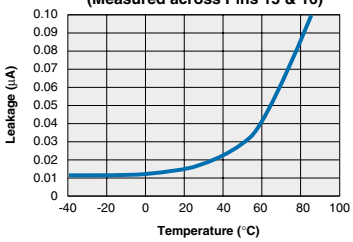
ITC137P
Typical Turn-Off Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC; I_F = 2mADC)



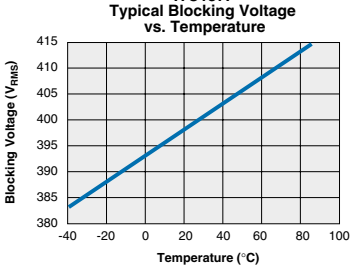
ITC137P
Load Current vs. Ambient Temperature



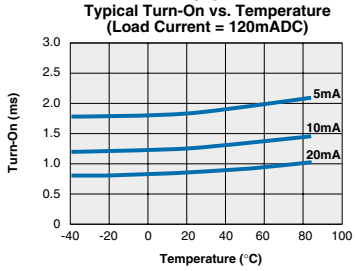
ITC137P
Typical Leakage vs. Temperature
(Measured across Pins 15 & 16)



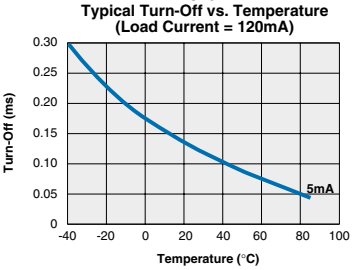
ITC137P
Typical Blocking Voltage
vs. Temperature



ITC137P
Typical Turn-On vs. Temperature
(Load Current = 120mADC)



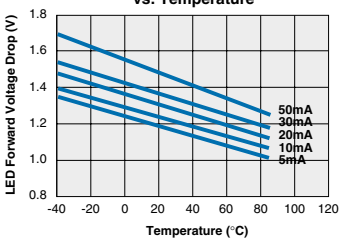
ITC137P
Typical Turn-Off vs. Temperature
(Load Current = 120mA)



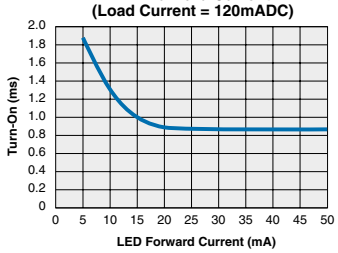
The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA*

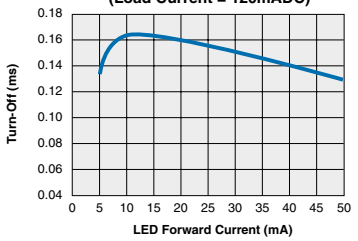
ITC137P
Typical LED Forward Voltage Drop vs. Temperature



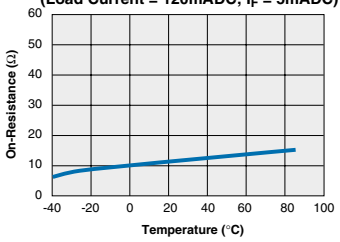
ITC137P
Typical Turn-On vs. LED Forward Current (Load Current = 120mADC)



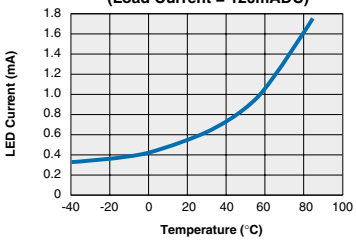
ITC137P
Typical Turn-Off vs. LED Forward Current (Load Current = 120mADC)



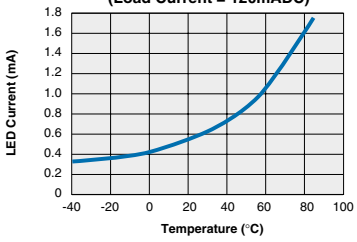
ITC137P
Typical On-Resistance vs. Temperature (Load Current = 120mADC; I_F = 5mADC)



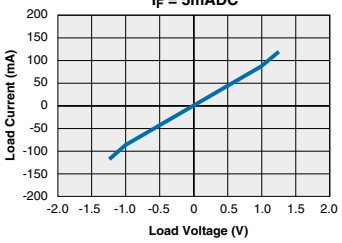
ITC137P
Typical I_F for Switch Operation vs. Temperature (Load Current = 120mADC)



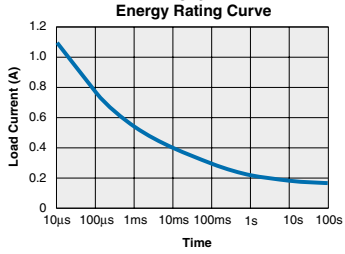
ITC137P
Typical I_F for Switch Dropout vs. Temperature (Load Current = 120mADC)



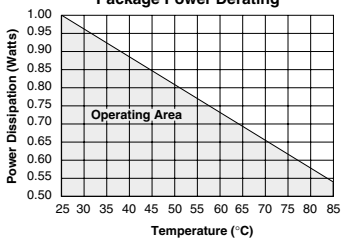
ITC137P
Typical Load Current vs. Load Voltage (Ambient Temperature = 25°C) I_F = 5mADC



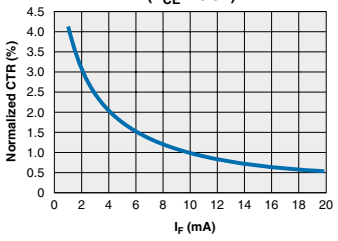
ITC137P
Energy Rating Curve



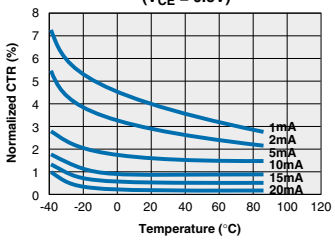
ITC137P
Package Power Derating



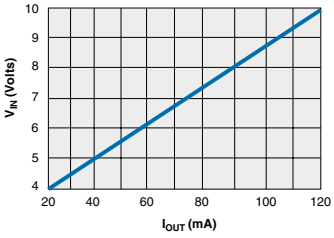
ITC137P
Single Transistor
Typical Normalized CTR vs. Forward Current (V_{CE} = 0.5V)



ITC137P
Single Transistor
Typical Normalized CTR vs. Temperature (V_{CE} = 0.5V)



ITC137P
V-I Characteristics for Test Circuit



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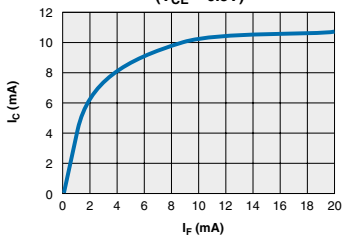
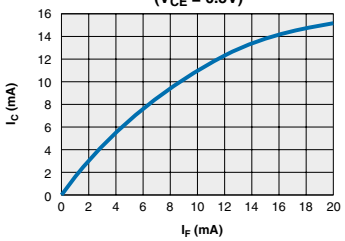
PERFORMANCE DATA*

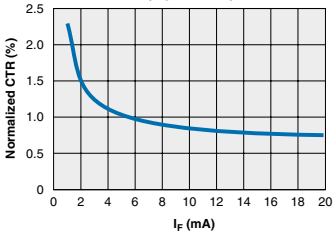
ITC137P
Single Transistor
Typical Collector Current vs. Forward Current
(V_{CE} = 0.5V)



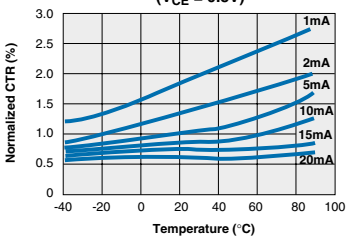
ITC137P
Darlington Transistor
Typical Collector Current vs. Forward Current
(V_{CE} = 0.5V)



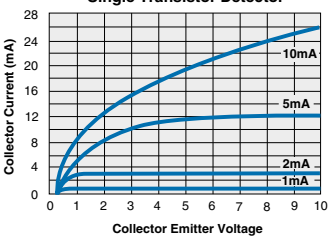
ITC137P
Darlington Transistor
Typical Normalized CTR vs. Forward Current
(V_{CE} = 0.8V)



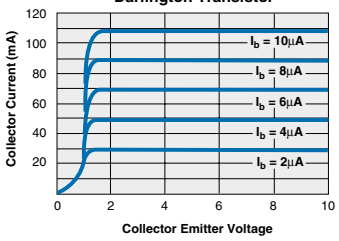
ITC137P
Darlington Transistor
Typical Normalized CTR vs. Temperature
(V_{CE} = 0.8V)



ITC137P
Typical Transfer Characteristics of
Single Transistor Detector



ITC137P
Typical Transfer Characteristics of
Darlington Transistor



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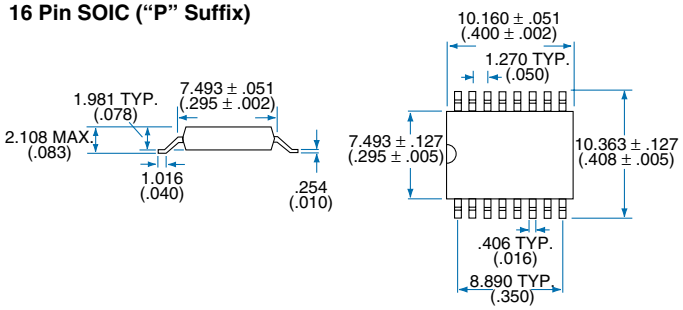
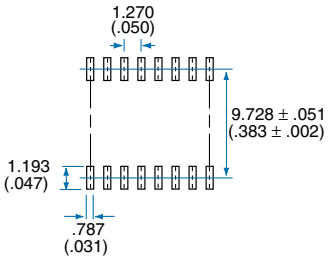
Mechanical Dimensions

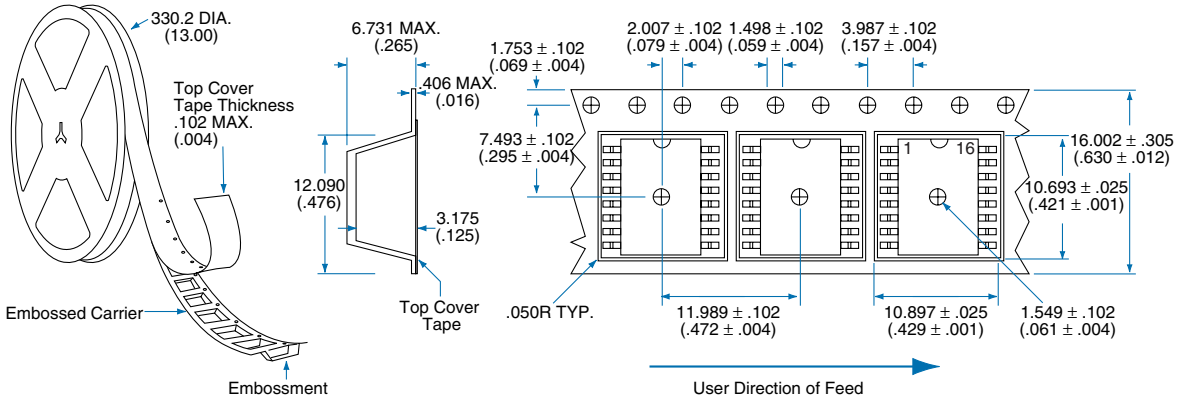
16 Pin SOIC (“P” Suffix)



PC Board Pattern (Top View)



Tape and Reel Packaging for 16 Pin SOIC Package



Dimensions
mm
(inches)

CLARE

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MACRO SOLUTIONS.

Worldwide Sales Offices

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