

TIL111, TIL114, TIL116, TIL117 OPTOCOUPLED

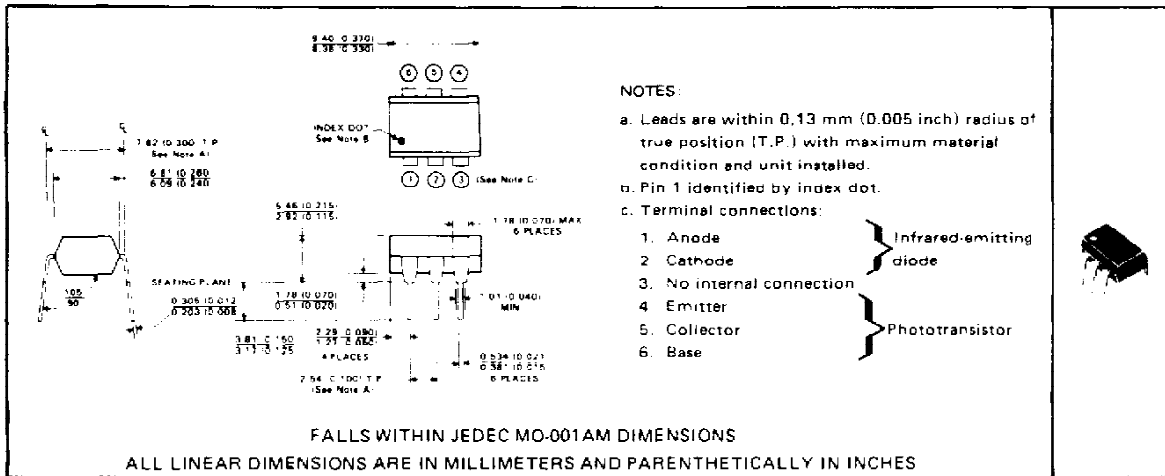
SOOS040 D1607, NOVEMBER 1973—REVISED FEBRUARY 1983

COMPATIBLE WITH STANDARD TTL INTEGRATED CIRCUITS

- Gallium Arsenide Diode Infrared Source Optically Coupled to a Silicon N-P-N Phototransistor
- High Direct-Current Transfer Ratio
- High-Voltage Electrical Isolation . . . 1.5-kV or 2.5-kV Rating
- Plastic Dual-In-Line Package
- High-Speed Switching: $t_r = 5 \mu s$, $t_f = 5 \mu s$ Typical

mechanical data

The package consists of a gallium arsenide infrared-emitting diode and an n-p-n silicon phototransistor mounted on a 6-lead frame encapsulated within an electrically nonconductive plastic compound. The case will withstand soldering temperature with no deformation and device performance characteristics remain stable when operated in high-humidity conditions. Unit weight is approximately 0.52 grams.



absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Input-to-Output Voltage:	TIL111	±1.5 kV
	TIL114, TIL116, TIL117	±2.5 kV
Collector-Base Voltage		70 V
Collector-Emitter Voltage (See Note 1)		30 V
Emitter-Collector Voltage		7 V
Emitter-Base Voltage		7 V
Input-Diode Reverse Voltage		3 V
Input Diode Continuous Forward Current at (or below) 25°C Free Air Temperature (See Note 2)		100 mA
Continuous Power Dissipation at (or below) 25°C Free-Air Temperature:		
Infrared-Emitting Diode (See Note 3)		150 mW
Phototransistor (See Note 4)		150 mW
Total, Infrared-Emitting Diode plus Phototransistor (See Note 5)		250 mW
Storage Temperature Range		-55°C to 150°C
Lead Temperature 1.6 mm (1/16 Inch) from Case for 10 Seconds		260°C

- NOTES:
1. This value applies when the base-emitter diode is open circuited.
 2. Derate linearly to 100°C free-air temperature at the rate of 1.33 mW/°C.
 3. Derate linearly to 100°C free air temperature at the rate of 2 mW/°C.
 4. Derate linearly to 100°C free air temperature at the rate of 2 mW/°C.
 5. Derate linearly to 100°C free air temperature at the rate of 3.33 mW/°C.

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



Copyright © 1983, Texas Instruments Incorporated

TIL111, TIL114, TIL116, TIL117 OPTOCOUPERS

electrical characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS	TIL111 TIL114			TIL116			TIL117			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \mu A, I_E = 0, I_F = 0$	70			70			70			V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1 mA, I_B = 0, I_F = 0$	30			30			30			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu A, I_C = 0, I_F = 0$	7			7			7			V
I_R	Input Diode Static Reverse Current	$V_R = 3 V$			10			10			10	μA
$I_{C(on)}$	On-State Collector Current	Phototransistor Operation $V_{CE} = 0.4 V, I_B = 0, I_F = 16 mA$	2	7								mA
		$V_{CE} = 10 V, I_B = 0, I_F = 10 mA$				2	5		5	9		
	Photodiode Operation $V_{CB} = 0.4 V, I_E = 0, I_F = 16 mA$	7	20		7	20		7	20			μA
$I_{C(off)}$	Off-State Collector Current	Phototransistor Operation $V_{CE} = 10 V, I_B = 0, I_F = 0$		1	50		1	50		1	50	nA
		Photodiode Operation $V_{CB} = 10 V, I_E = 0, I_F = 0$		0.1	20		0.1	20		0.1	20	
h_{FE}	Transistor Static Forward Current Transfer Ratio	$V_{CE} = 5 V, I_C = 10 mA, I_F = 0$	100	300					200	550		
		$V_{CE} = 5 V, I_C = 100 \mu A, I_F = 0$				100	300					
V_F	Input Diode Static Forward Voltage	$I_F = 16 mA$	1.2	1.4					1.2	1.4		V
		$I_F = 50 mA$				1.25	1.5					
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 2 mA, I_B = 0, I_F = 16 mA$	0.25	0.4								V
		$I_C = 2.2 mA, I_B = 0, I_F = 15 mA$				0.25	0.4					
		$I_C = 0.5 mA, I_B = 0, I_F = 10 mA$							0.25	0.4		
r_{iO}	Input-to-Output Internal Resistance	$V_{in-out} = \pm 1.5 kV$ for TIL111, $\pm 2.5 kV$ for all others, See Note 6	10^{11}			10^{11}			10^{11}			Ω
C_{iO}	Input-to-Output Capacitance	$V_{in-out} = 0, f = 1 MHz$, See Note 6	1	1.3		1	1.3		1	1.3		pF

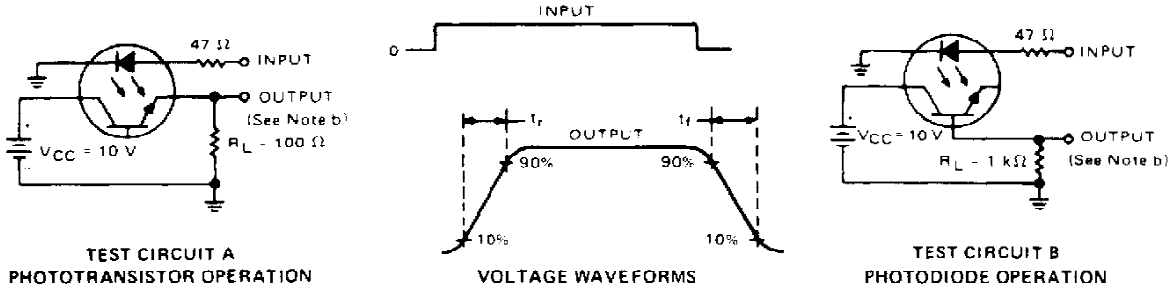
NOTE 6 These parameters are measured between both input diode leads shorted together and all the phototransistor leads shorted together.

switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS	TIL111 TIL114			TIL116			TIL117			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise Time	Phototransistor Operation $V_{CC} = 10 V, R_L = 100 \Omega, I_{C(on)} = 2 mA$, See Test Circuit A of Figure 1	5	10		5	10		5	10	μs	
t_f	Fall Time		5	10		5	10		5	10		
t_r	Rise Time	Photodiode Operation $V_{CC} = 10 V, R_L = 1 k\Omega, I_{C(on)} = 20 \mu A$, See Test Circuit B of Figure 1	1			1			1		μs	
t_f	Fall Time		1			1			1			

PARAMETER MEASUREMENT INFORMATION

Adjust amplitude of input pulse for:
 $I_{C(on)} = 2 \text{ mA}$ (Test Circuit A) or
 $I_{C(on)} = 20 \mu\text{A}$ (Test Circuit B)



NOTES a. The input waveform is supplied by a generator with the following characteristics: $Z_{out} = 50 \Omega$, $t_r = 15 \text{ ns}$, duty cycle $\approx 1\%$, $t_w = 100 \mu\text{s}$
 b. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r = 12 \text{ ns}$, $R_{in} = 1 \text{ M}\Omega$, $C_{in} = 20 \text{ pF}$.

FIGURE 1—SWITCHING TIMES

TYPICAL CHARACTERISTICS

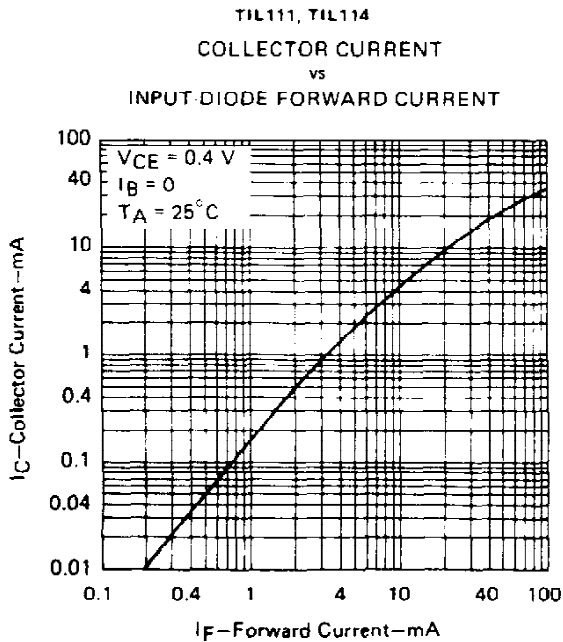


FIGURE 2

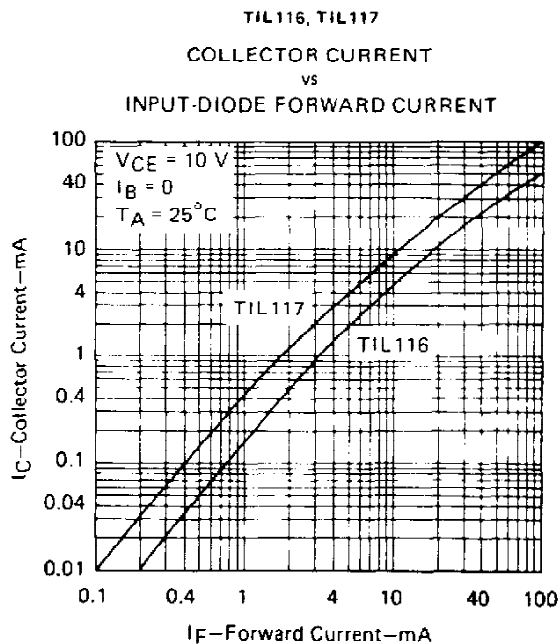


FIGURE 3

**TIL111, TIL114, TIL116, TIL117
OPTOCOUPERS**

TYPICAL CHARACTERISTICS

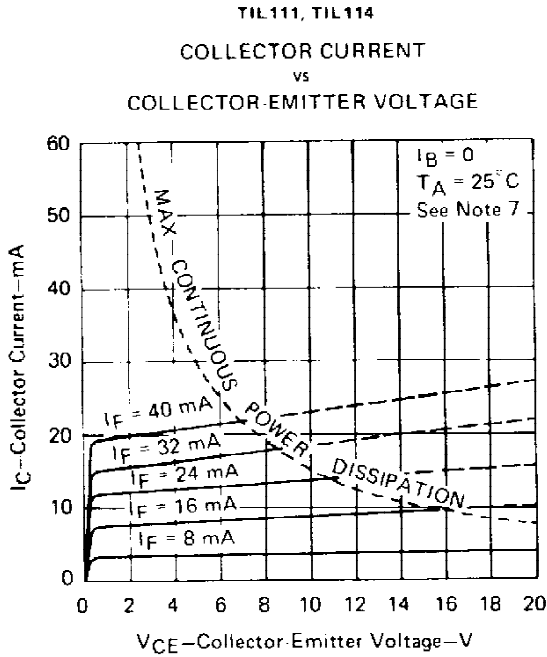


FIGURE 4

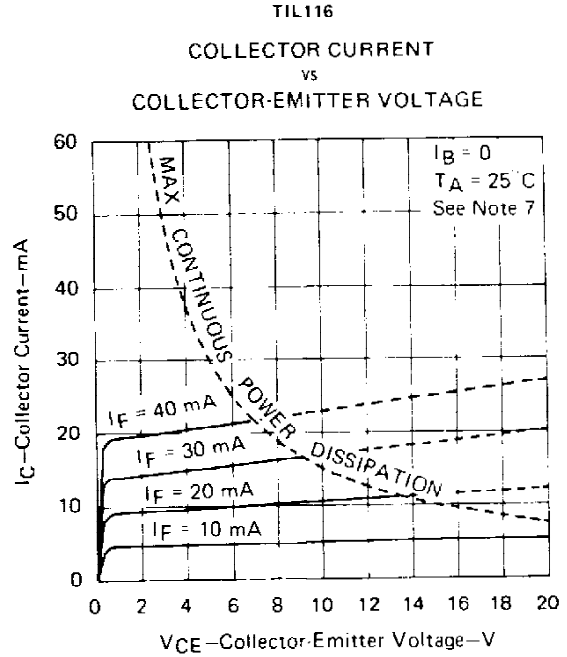


FIGURE 5

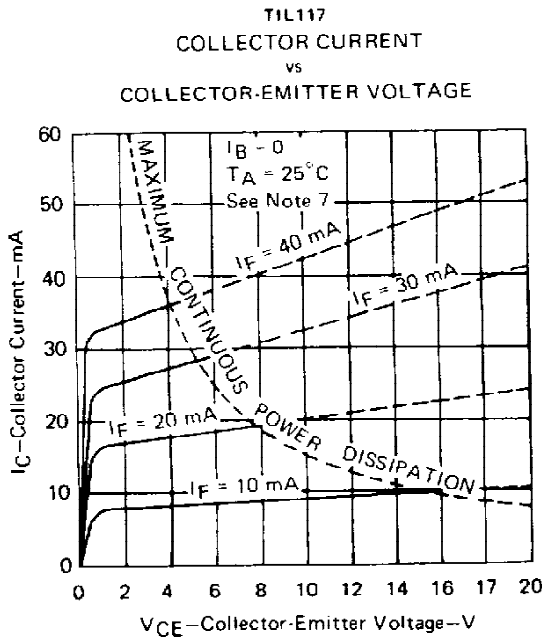


FIGURE 6

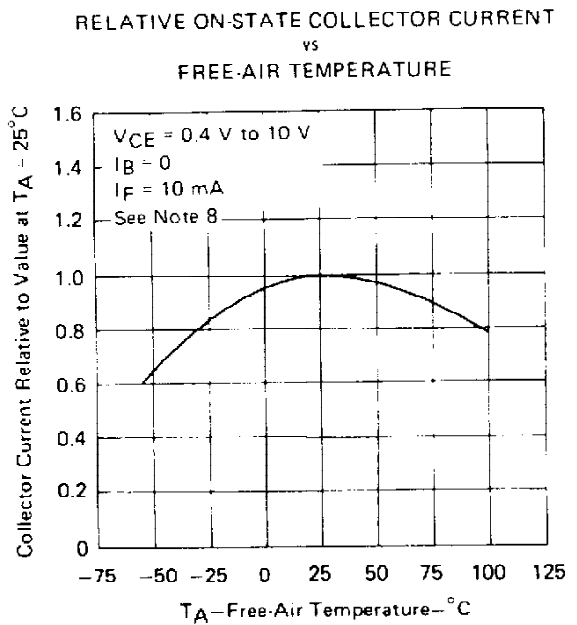


FIGURE 7

NOTES: 7. Pulse operation of input diode is required for operation beyond limits shown by dotted lines.
8. These parameters were measured using pulse techniques: $t_w = 1$ ms, duty cycle $\leq 2\%$

TIL111, TIL114, TIL116, TIL117
OPTOCOUPERS

TYPICAL CHARACTERISTICS

OFF-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

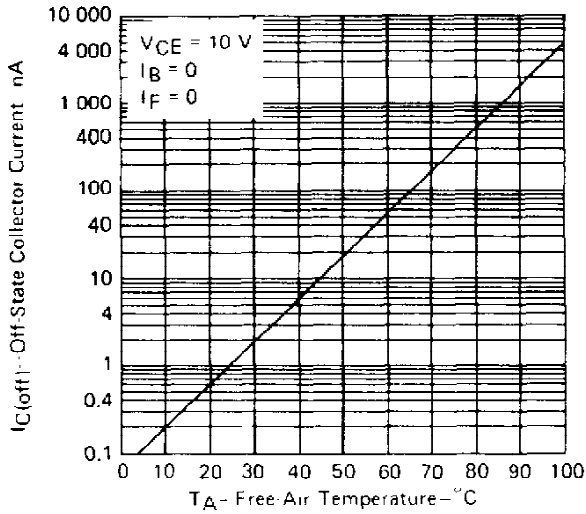


FIGURE 8

NORMALIZED TRANSISTOR STATIC FORWARD
CURRENT TRANSFER RATIO
vs
ON-STATE COLLECTOR CURRENT

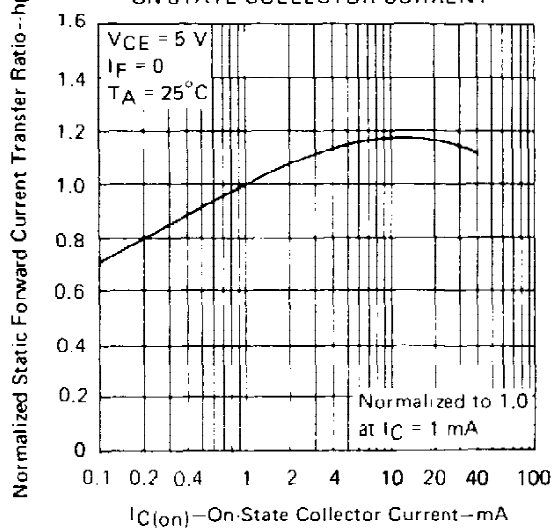


FIGURE 9

INPUT DIODE FORWARD
CONDUCTION CHARACTERISTICS

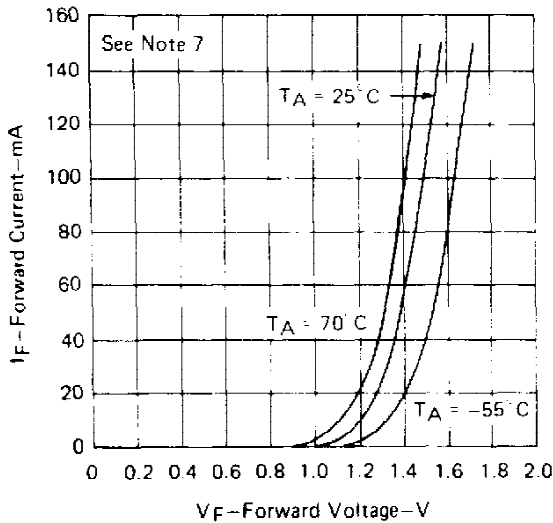


FIGURE 10

COLLECTOR CURRENT
vs
MODULATION FREQUENCY

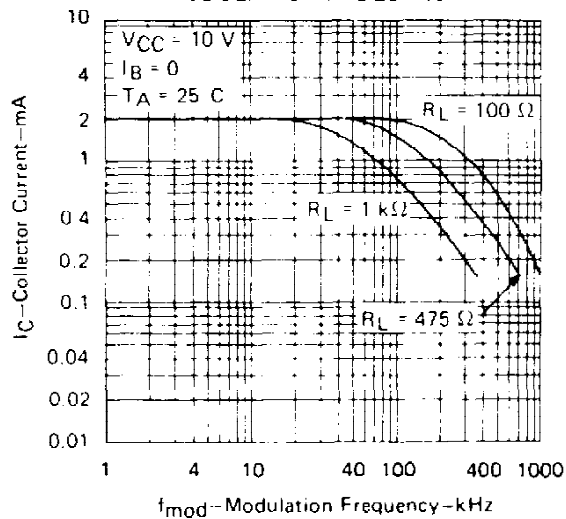


FIGURE 11

NOTE 7: These parameters were measured using pulse techniques. $t_w = 1$ ms, duty cycle $\leq 2\%$

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

Copyright © Each Manufacturing Company.

All Datasheets cannot be modified without permission.

This datasheet has been download from :

www.AllDataSheet.com

100% Free DataSheet Search Site.

Free Download.

No Register.

Fast Search System.

www.AllDataSheet.com