

## FGL60N100BNTD

### NPT-Trench IGBT

#### General Description

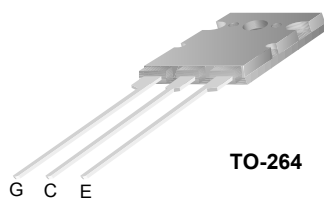
Trench insulated gate bipolar transistors (IGBTs) with NPT technology show outstanding performance in conduction and switching characteristics as well as enhanced avalanche ruggedness. These devices are well suited for Induction Heating ( I-H ) applications

#### Features

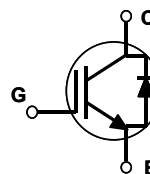
- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 2.5\text{ V @ } I_C = 60\text{ A}$
- High Input Impedance
- Built-in Fast Recovery Diode

#### Application

Micro- Wave Oven, I-H Cooker, I-H Jar, Induction Heater, Home Appliance



TO-264



#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	FGL60N100BNTD	Units
$V_{CES}$	Collector-Emitter Voltage	1000	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	60	A
	Collector Current @ $T_C = 100^\circ\text{C}$	42	A
$I_{CM(1)}$	Pulsed Collector Current	120	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	15	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	180	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	72	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

**Notes :**

(1) Repetitive rating : Pulse width limited by max. junction temperature

#### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction-to-Case	--	0.69	$^\circ\text{C/W}$
$R_{\theta JC}$ (DIODE)	Thermal Resistance, Junction-to-Case	--	2.08	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	$^\circ\text{C/W}$

**Electrical Characteristics of IGBT**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{CES}$	Collector Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	1000	--	--	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = 1000V, V_{GE} = 0V$	--	--	1.0	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = \pm 25, V_{CE} = 0V$	--	--	$\pm 500$	nA

**On Characteristics**

$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 60mA, V_{CE} = V_{GE}$	4.0	5.0	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 10A, V_{GE} = 15V$	--	1.5	1.8	V
		$I_C = 60A, V_{GE} = 15V$	--	2.5	2.9	V

**Dynamic Characteristics**

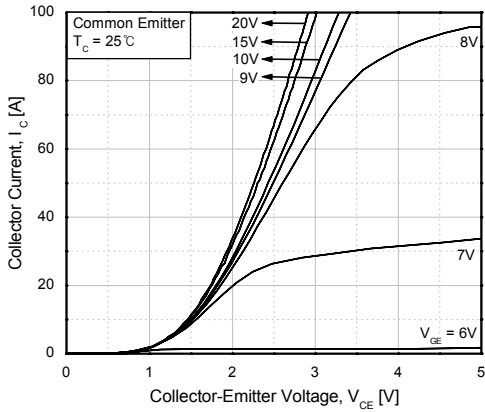
$C_{ies}$	Input Capacitance	$V_{CE}=10V, V_{GE} = 0V, f = 1MHz$	--	6000	--	pF
$C_{oes}$	Output Capacitance		--	260	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	200	--	pF

**Switching Characteristics**

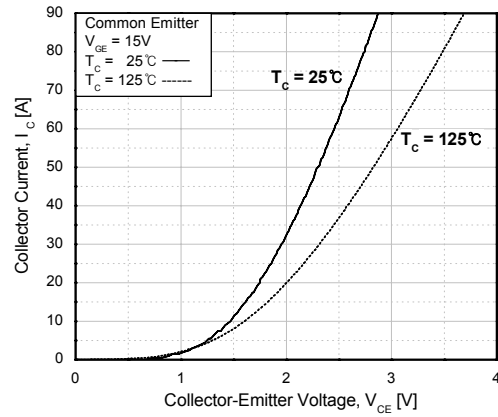
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600V, I_C = 60A, R_G = 51\Omega, V_{GE}=15V, \text{Resistive Load}, T_C = 25^\circ\text{C}$	--	140	--	ns
$t_r$	Rise Time		--	320	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	630	--	ns
$t_f$	Fall Time		--	130	250	ns
$Q_g$	Total Gate Charge	$V_{CE} = 600V, I_C = 60A, V_{GE} = 15V, T_C = 25^\circ\text{C}$	--	275	350	nC
$Q_{ge}$	Gate-Emitter Charge		--	45	--	nC
$Q_{gc}$	Gate-Collector Charge		--	95	--	nC

**Electrical Characteristics of DIODE**  $T_C = 25^\circ\text{C}$  unless otherwise noted

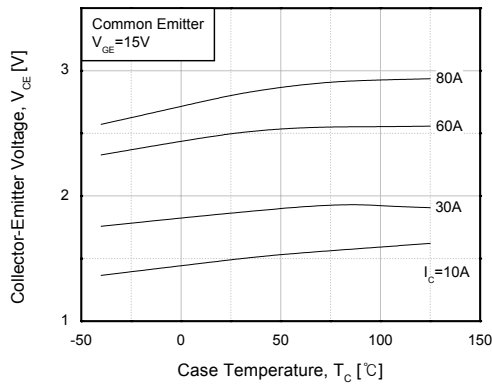
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{FM}$	Diode Forward Voltage	$I_F = 15A$	--	1.2	1.7	V
		$I_F = 60A$	--	1.8	2.1	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 60A, di/dt = 20 A/us$	--	1.2	1.5	us
$I_R$	Instantaneous Reverse Current	$V_{RRM} = 1000V$	--	0.05	2	uA



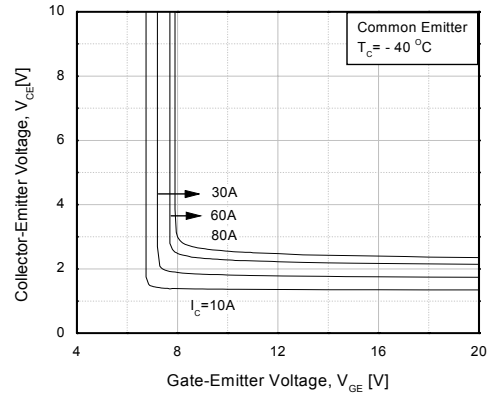
**Fig 1. Typical Output Characteristics**



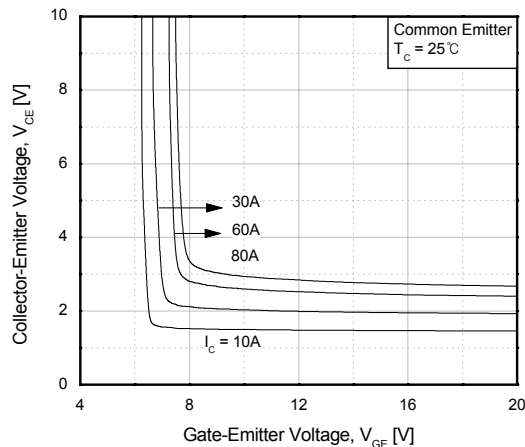
**Fig 2. Typical Saturation Voltage Characteristics**



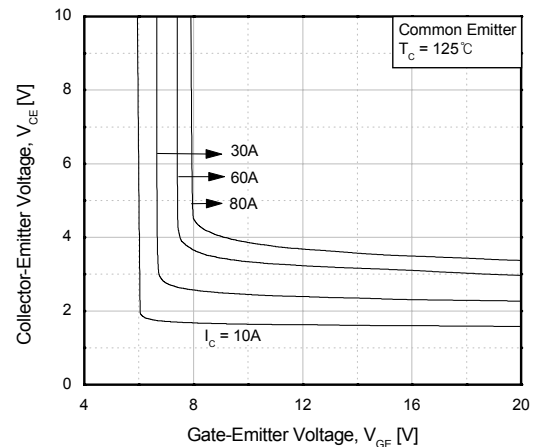
**Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level**



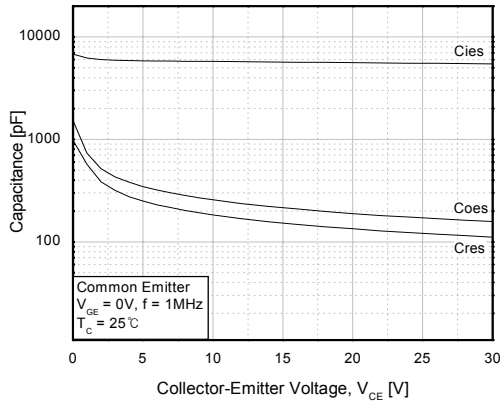
**Fig 4. Saturation Voltage vs. V<sub>GE</sub>**



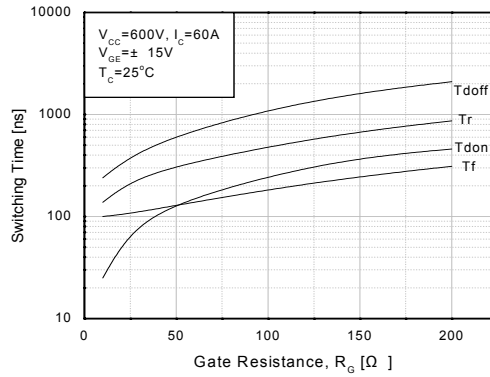
**Fig 5. Saturation Voltage vs. V<sub>GE</sub>**



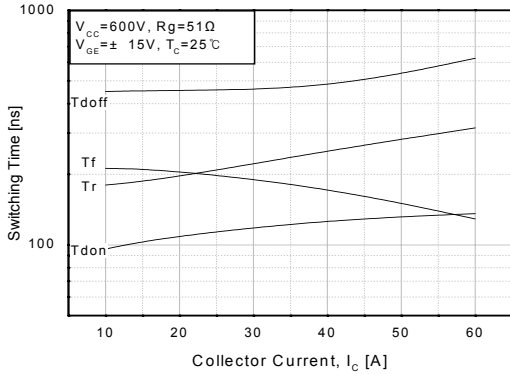
**Fig 6. Saturation Voltage vs. V<sub>GE</sub>**



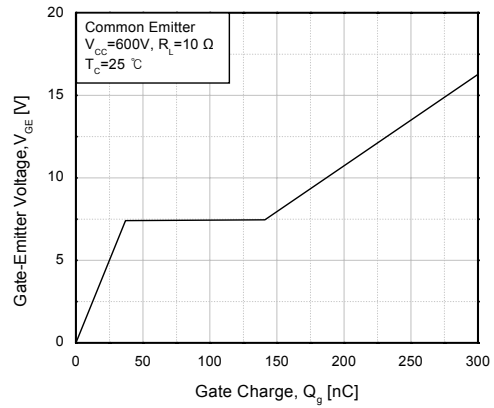
**Fig 7. Capacitance Characteristics**



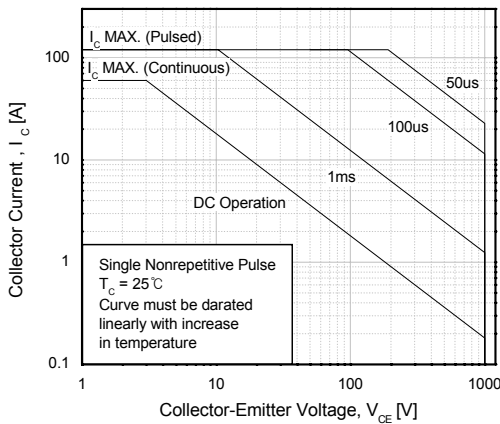
**Fig 8. Switching Characteristics vs. Gate Resistance**



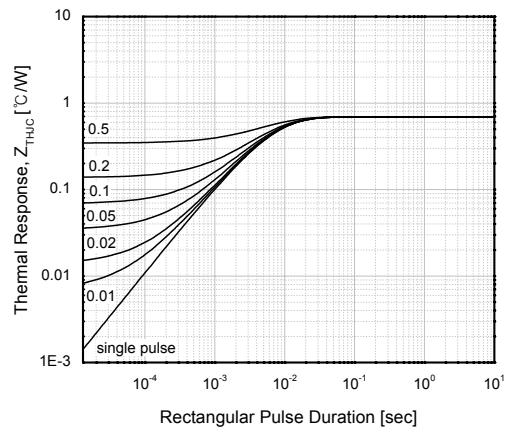
**Fig 9. Switching Characteristics vs. Collector Current**



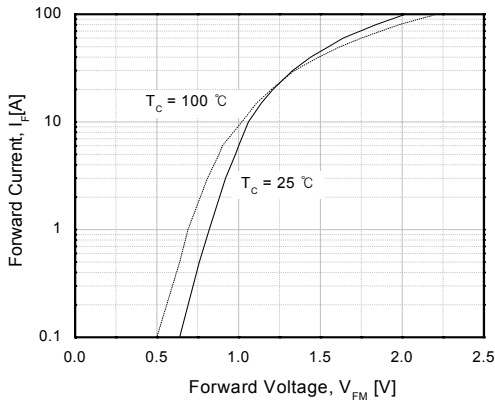
**Fig 10. Gate Charge Characteristics**



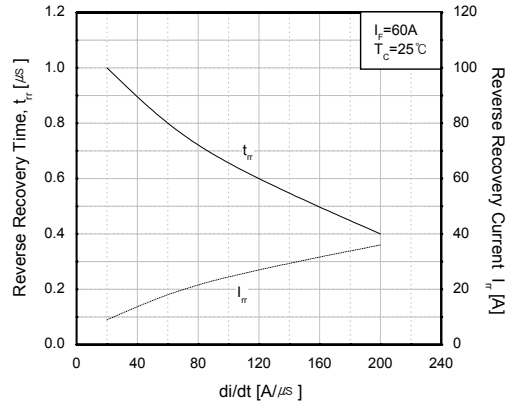
**Fig 11. SOA Characteristics**



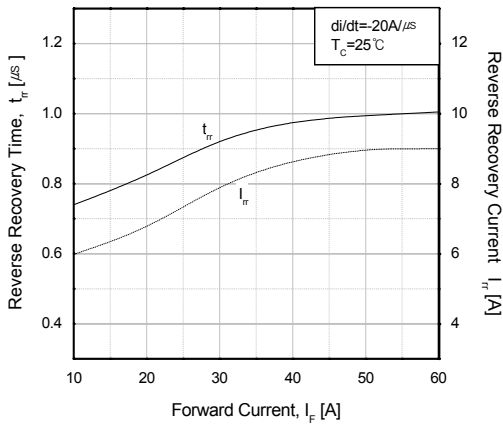
**Fig 12. Transient Thermal Impedance of IGBT**



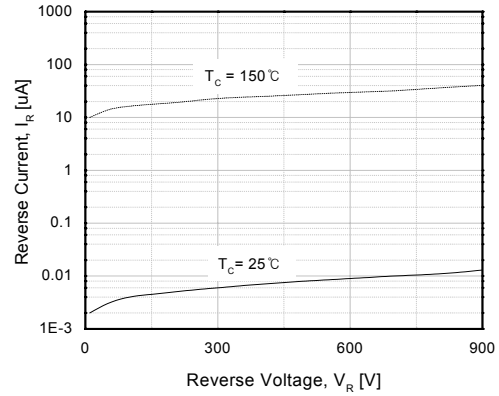
**Fig 13. Forward Characteristics**



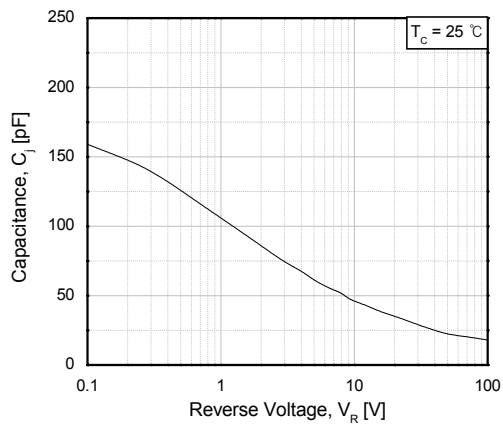
**Fig 14. Reverse Recovery Characteristics vs. di/dt**



**Fig 15. Reverse Recovery Characteristics vs. Forward Current**



**Fig 16. Reverse Current vs. Reverse Voltage**

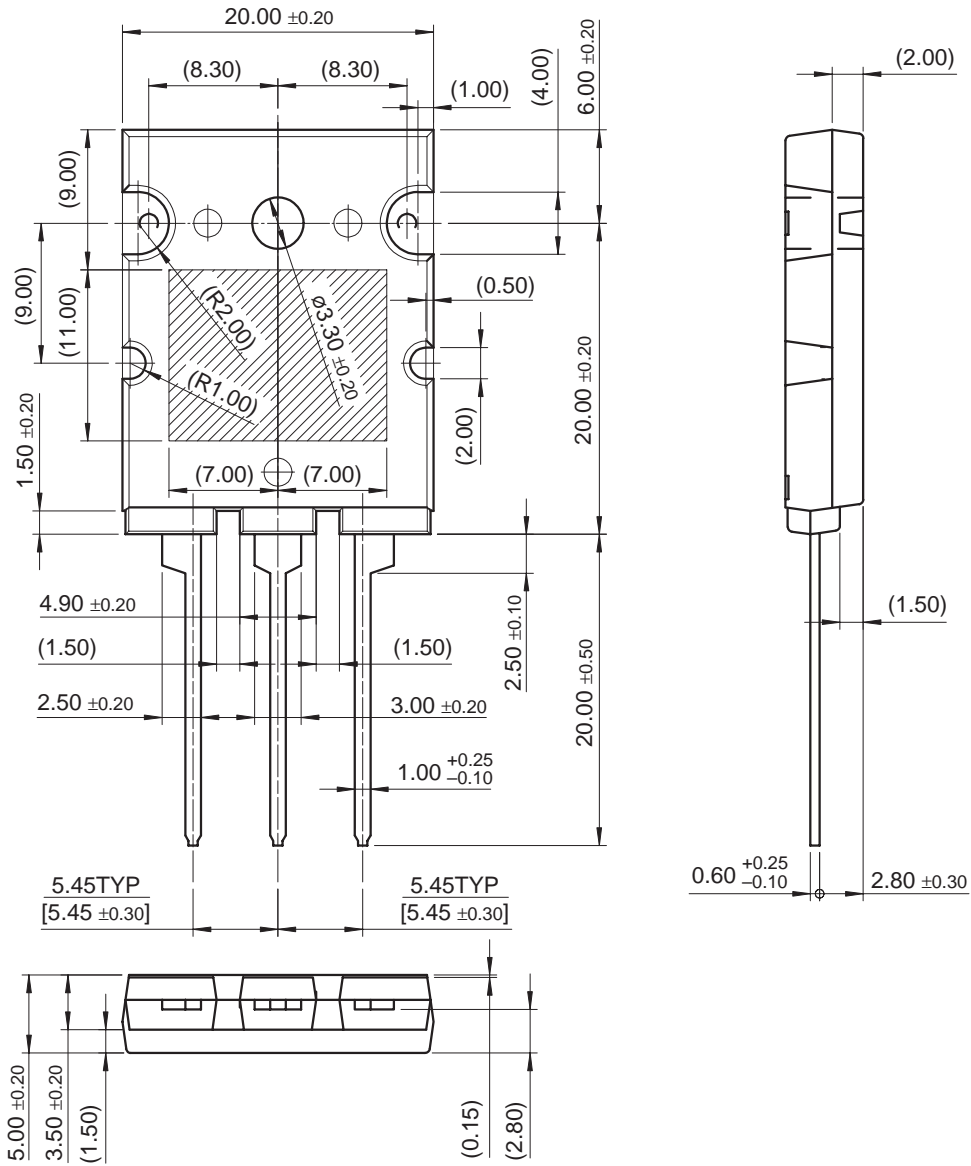


**Fig 17. Junction capacitance**

Package Dimension

TO-264

FGL60N100BNTD



Dimensions in Millimeters

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACE <sup>x</sup> ™	FACT Quiet Series™	ISOPLANAR™	POP™	Stealth™
ActiveArray™	FAST®	LittleFET™	Power247™	SuperFET™
Bottomless™	FASTr™	MICROCOUPLER™	PowerSaver™	SuperSOT™-3
CoolFET™	FPS™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET®	SuperSOT™-8
DOME™	GlobalOptoisolator™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	GTO™	MSX™	QT Optoelectronics™	TinyLogic®
E <sup>2</sup> CMOS™	HiSeC™	MSXPro™	Quiet Series™	TINYOPTO™
EnSigna™	I <sup>2</sup> C™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
Across the board. Around the world.™		OPTOLOGIC®	SILENT SWITCHER®	UltraFET®
The Power Franchise™		OPTOPLANAR™	SMART START™	VCX™
Programmable Active Droop™		PACMAN™	SPM™	

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.