Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

600 V SMPS IGBT

The HGTG30N60A4 combines the best features of high input impedance of a MOSFET and the low on-state conduction loss of a bipolar transistor. This IGBT is ideal for many high voltage switching applications operating at high frequencies where low conduction losses are essential. This device has been optimized for fast switching applications.

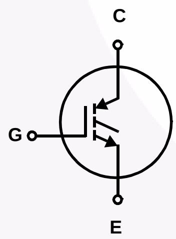
Formerly Developmental Type TA49343.

Ordering Information

PART NUMBER	PACKAGE	BRAND
HGTG30N60A4	TO-247	G30N60A4

NOTE: When ordering, use the entire part number.

Symbol



Features

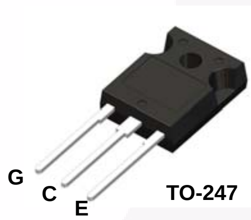
- 60 A, 600 V @ T_C = 110°C
- Low Saturation Voltage : $V_{CE(sat)}$ = 1.8 V @ I_C = 30 A
- Typical Fall Time. . . . . 58ns at T_J = 125°C
- Low Conduction Loss

Applications

- UPS, Welder

Packaging

JEDEC STYLE TO-247



FAIRCHILD CORPORATION IGBT PRODUCT IS COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS

4,364,073	4,417,385	4,430,792	4,443,931	4,466,176	4,516,143	4,532,534	4,587,713
4,598,461	4,605,948	4,620,211	4,631,564	4,639,754	4,639,762	4,641,162	4,644,637
4,682,195	4,684,413	4,694,313	4,717,679	4,743,952	4,783,690	4,794,432	4,801,986
4,803,533	4,809,045	4,809,047	4,810,665	4,823,176	4,837,606	4,860,080	4,883,767
4,888,627	4,890,143	4,901,127	4,904,609	4,933,740	4,963,951	4,969,027	

Absolute Maximum Ratings $T_C = 25^oC$, Unless Otherwise Specified

	Ratings	UNIT
Collector to Emitter Voltage . . . . BV_{CES}	600	V
Collector Current Continuous		
At $T_C = 25^oC$ . . . . I_{C25}	75	A
At $T_C = 110^oC$ . . . . I_{C110}	60	A
Collector Current Pulsed (Note 1) . . . . I_{CM}	240	A
Gate to Emitter Voltage Continuous. . . . . V_{GES}	±20	V
Gate to Emitter Voltage Pulsed . . . . V_{GEM}	±30	V
Switching Safe Operating Area at $T_J = 150^oC$, Figure 2 . . . . . SSOA	150 A at 600 V	
Power Dissipation Total at $T_C = 25^oC$ . . . . P_D	463	W
Power Dissipation Derating $T_C > 25^oC$	3.7	$W/^oC$
Operating and Storage Junction Temperature Range . . . . T_J, T_{STG}	-55 to 150	^oC
Maximum Lead Temperature for Soldering		
Leads at 0.063in (1.6mm) from Case for 10s. . . . . T_L	300	^oC
Package Body for 10s, See Techbrief 334 . . . . T_{PKG}	260	^oC

CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. Pulse width limited by maximum junction temperature.

Electrical Specifications $T_J = 25^oC$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Collector to Emitter Breakdown Voltage	BV_{CES}	$I_C = 250\ \mu A$, $V_{GE} = 0\ V$		600	-	-	V
Emitter to Collector Breakdown Voltage	BV_{ECS}	$I_C = -10\ mA$, $V_{GE} = 0\ V$		20	-	-	V
Collector to Emitter Leakage Current	I_{CES}	$V_{CE} = 600\ V$	$T_J = 25^oC$	-	-	250	µA
			$T_J = 125^oC$	-	-	4.0	mA
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 30\ A$, $V_{GE} = 15\ V$	$T_J = 25^oC$	-	1.8	2.6	V
			$T_J = 125^oC$	-	1.6	2.0	V
Gate to Emitter Threshold Voltage	$V_{GE(TH)}$	$I_C = 250\ \mu A$, $V_{CE} = 600\ V$		4.5	5.2	7.0	V
Gate to Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 20\ V$		-	-	±250	nA
Switching SOA	SSOA	$T_J = 150^oC$, $R_G = 3\ \Omega$, $V_{GE} = 15\ V$ $L = 100\ \mu H$, $V_{CE} = 600\ V$		150	-	-	A
Gate to Emitter Plateau Voltage	V_{GEP}	$I_C = 30\ A$, $V_{CE} = 300\ V$		-	8.5	-	V
On-State Gate Charge	$Q_{g(ON)}$	$I_C = 30\ A$, $V_{CE} = 300\ V$	$V_{GE} = 15\ V$	-	225	270	nC
			$V_{GE} = 20\ V$	-	300	360	nC
Current Turn-On Delay Time	$t_{d(ON)I}$	IGBT and Diode at $T_J = 25^oC$, $I_{CE} = 30\ A$, $V_{CE} = 390\ V$, $V_{GE} = 15\ V$, $R_G = 3\ \Omega$, $L = 200\ \mu H$, Test Circuit - (Figure 20)		-	25	-	ns
Current Rise Time	t_{rI}			-	12	-	ns
Current Turn-Off Delay Time	$t_{d(OFF)I}$			-	150	-	ns
Current Fall Time	t_{fI}			-	38	-	ns
Turn-On Energy (Note 2)	E_{ON1}			-	280	-	µJ
Turn-On Energy (Note 2)	E_{ON2}			-	600	-	µJ
Turn-Off Energy (Note 3)	E_{OFF}			-	240	350	µJ

Electrical Specifications $T_J = 25^oC$, Unless Otherwise Specified **(Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Current Turn-On Delay Time	$t_{d(ON)I}$	IGBT and Diode at $T_J = 125^oC$ $I_{CE} = 30$ A $V_{CE} = 390$ V $V_{GE} = 15$ V $R_G = 3\ \Omega$ L = 200 μH Test Circuit - (Figure 20)	-	24	-	ns
Current Rise Time	t_{rI}		-	11	-	ns
Current Turn-Off Delay Time	$t_{d(OFF)I}$		-	180	200	ns
Current Fall Time	t_{fI}		-	58	70	ns
Turn-On Energy (Note 2)	E_{ON1}		-	280	-	μJ
Turn-On Energy (Note 2)	E_{ON2}		-	1000	1160	μJ
Turn-Off Energy (Note 3)	E_{OFF}		-	450	750	μJ
Thermal Resistance Junction To Case	$R_{\theta JC}$		-	-	0.27	$^oC/W$

NOTES:

2. Values for two Turn-On loss conditions are shown for the convenience of the circuit designer. E_{ON1} is the turn-on loss of the IGBT only. E_{ON2} is the turn-on loss when a typical diode is used in the test circuit and the diode is at the same T_J as the IGBT. The diode type is specified in Figure 20.
3. Turn-Off Energy Loss (E_{OFF}) is defined as the integral of the instantaneous power loss starting at the trailing edge of the input pulse and ending at the point where the collector current equals zero ($I_{CE} = 0$ A). All devices were tested per JEDEC Standard No. 24-1 Method for Measurement of Power Device Turn-Off Switching Loss. This test method produces the true total Turn-Off Energy Loss.

Typical Performance Curves Unless Otherwise Specified

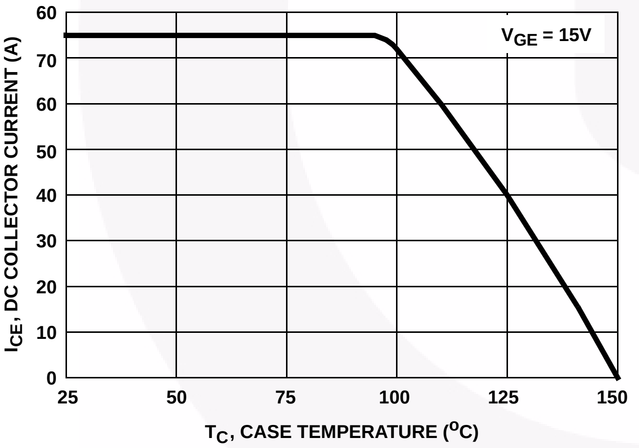


FIGURE 1. DC COLLECTOR CURRENT vs CASE TEMPERATURE

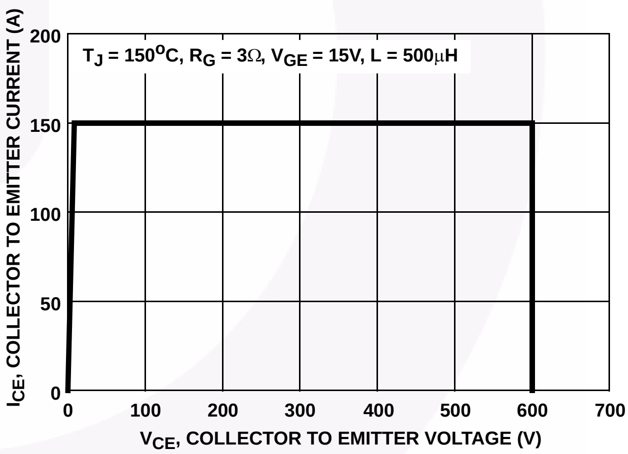


FIGURE 2. MINIMUM SWITCHING SAFE OPERATING AREA

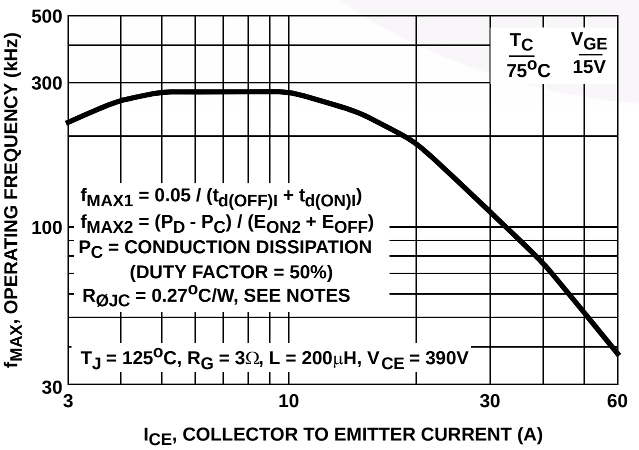


FIGURE 3. OPERATING FREQUENCY vs COLLECTOR TO EMITTER CURRENT

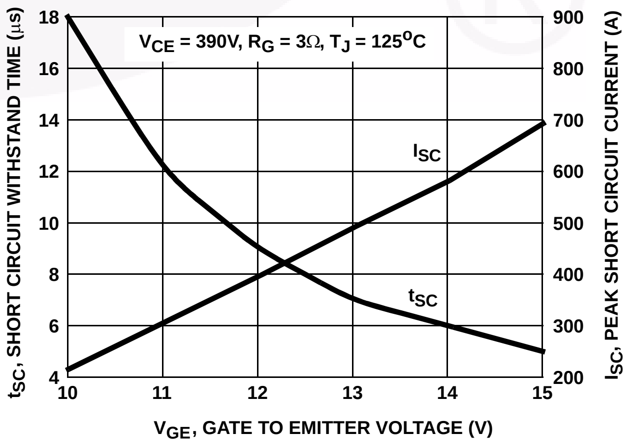


FIGURE 4. SHORT CIRCUIT WITHSTAND TIME

Typical Performance Curves Unless Otherwise Specified **(Continued)**

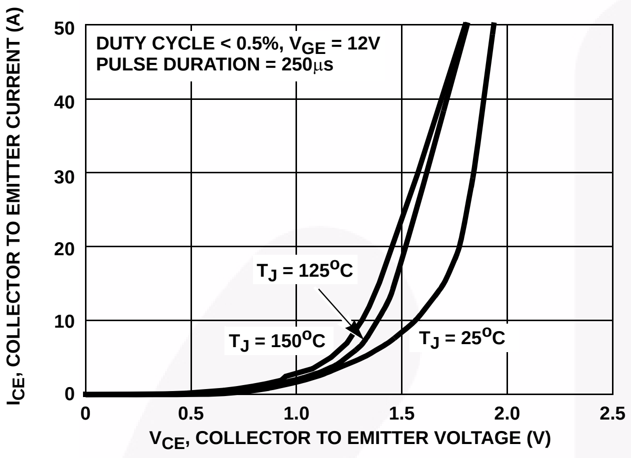


FIGURE 5. COLLECTOR TO EMITTER ON-STATE VOLTAGE

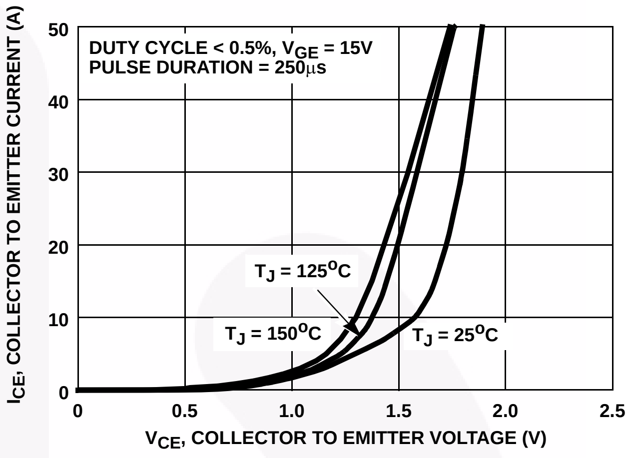


FIGURE 6. COLLECTOR TO EMITTER ON-STATE VOLTAGE

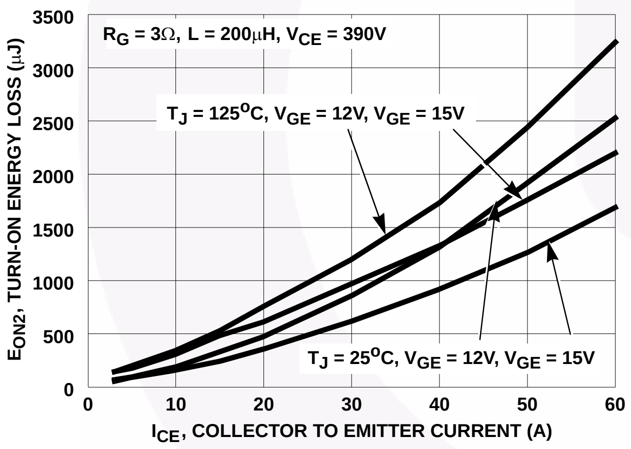


FIGURE 7. TURN-ON ENERGY LOSS vs COLLECTOR TO EMITTER CURRENT

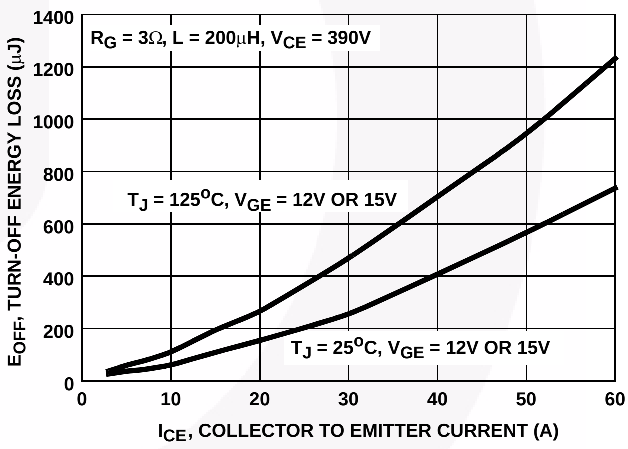


FIGURE 8. TURN-OFF ENERGY LOSS vs COLLECTOR TO EMITTER CURRENT

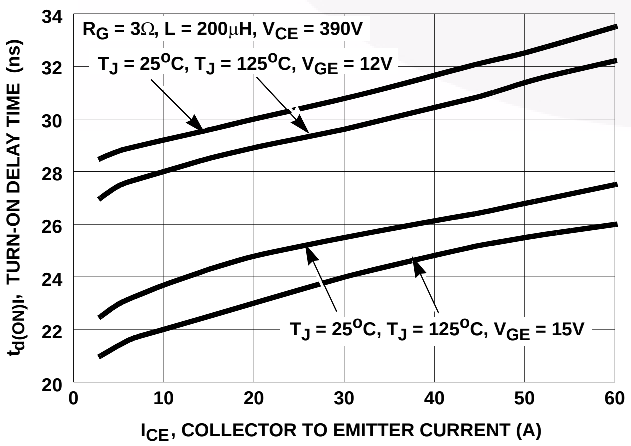


FIGURE 9. TURN-ON DELAY TIME vs COLLECTOR TO EMITTER CURRENT

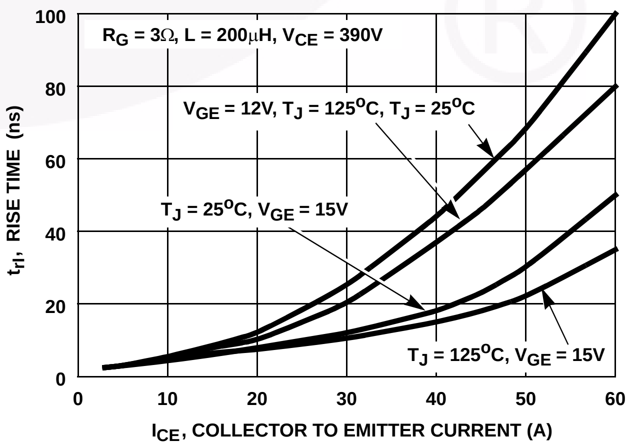


FIGURE 10. TURN-ON RISE TIME vs COLLECTOR TO EMITTER CURRENT

Typical Performance Curves Unless Otherwise Specified **(Continued)**

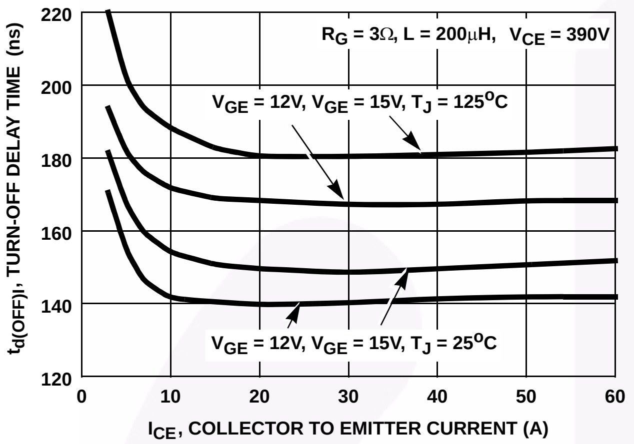


FIGURE 11. TURN-OFF DELAY TIME vs COLLECTOR TO EMITTER CURRENT

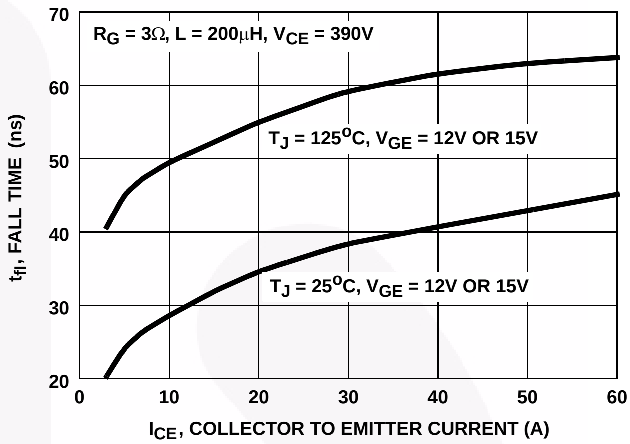


FIGURE 12. FALL TIME vs COLLECTOR TO EMITTER CURRENT

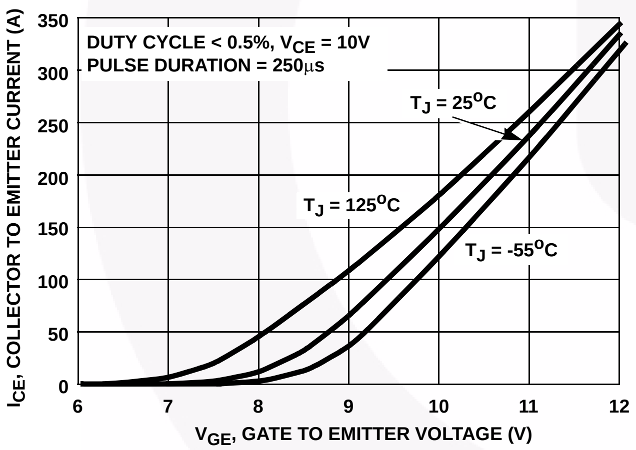


FIGURE 13. TRANSFER CHARACTERISTIC

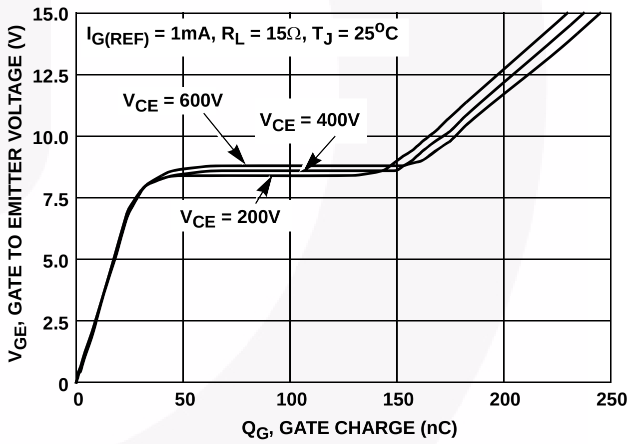


FIGURE 14. GATE CHARGE WAVEFORMS

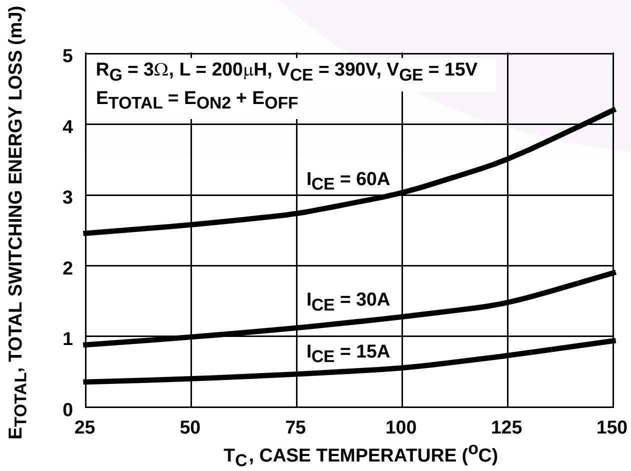


FIGURE 15. TOTAL SWITCHING LOSS vs CASE TEMPERATURE

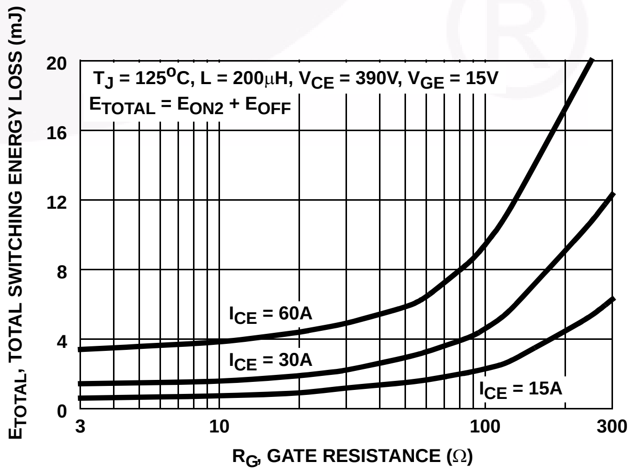


FIGURE 16. TOTAL SWITCHING LOSS vs GATE RESISTANCE

Typical Performance Curves Unless Otherwise Specified **(Continued)**

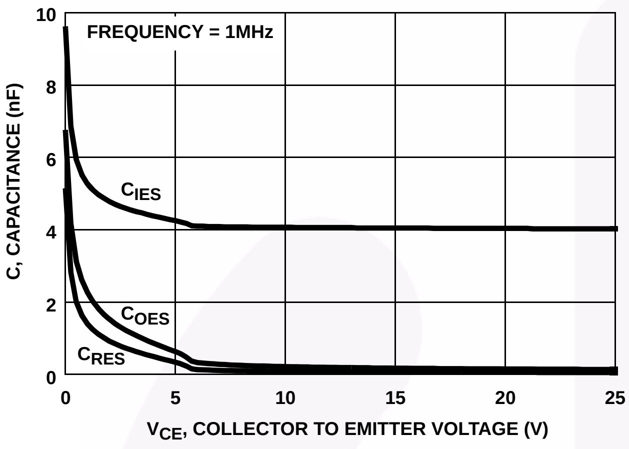


FIGURE 17. CAPACITANCE vs COLLECTOR TO EMITTER VOLTAGE

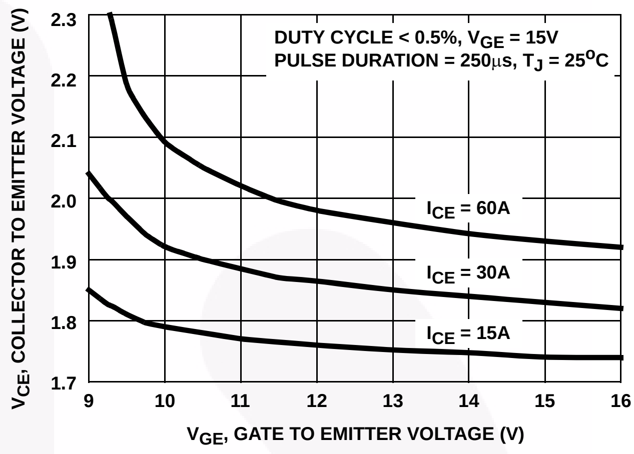


FIGURE 18. COLLECTOR TO EMITTER ON-STATE VOLTAGE vs GATE TO EMITTER VOLTAGE

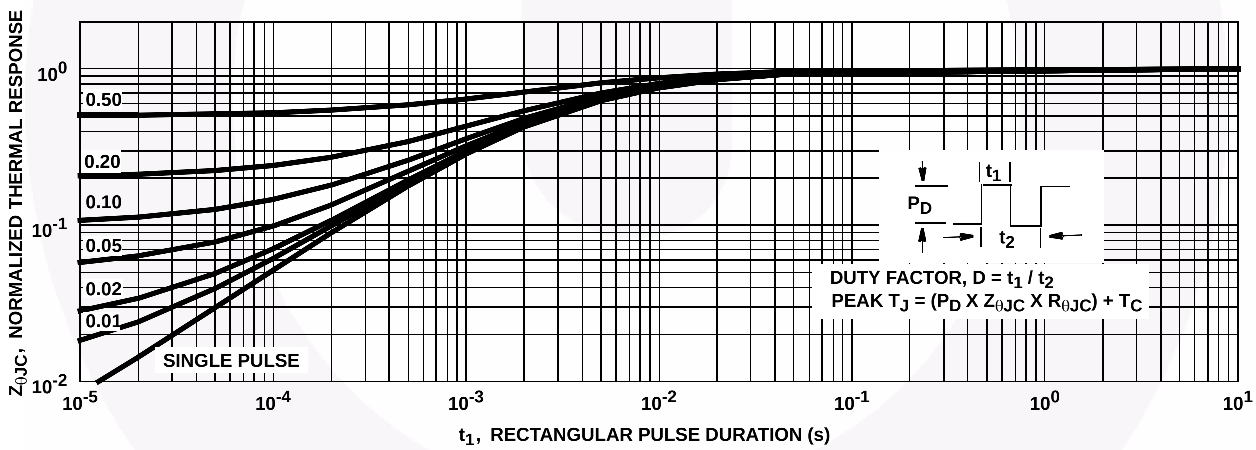


FIGURE 19. IGBT NORMALIZED TRANSIENT THERMAL RESPONSE, JUNCTION TO CASE

Test Circuit and Waveforms

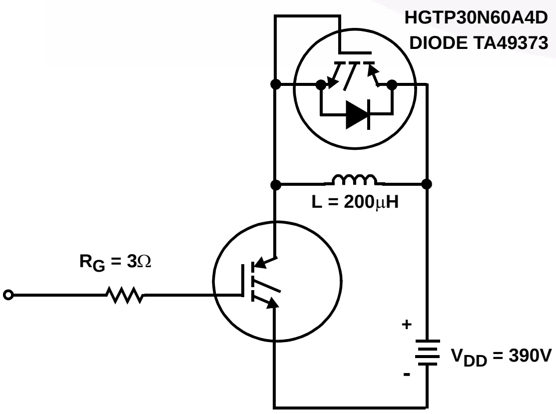


FIGURE 20. INDUCTIVE SWITCHING TEST CIRCUIT

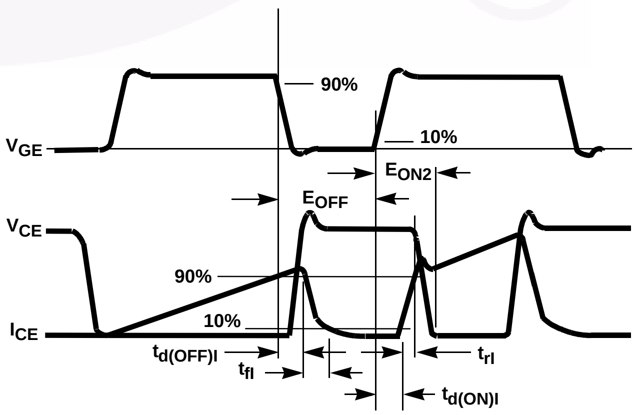


FIGURE 21. SWITCHING TEST WAVEFORMS

Handling Precautions for IGBTs

Insulated Gate Bipolar Transistors are susceptible to gate-insulation damage by the electrostatic discharge of energy through the devices. When handling these devices, care should be exercised to assure that the static charge built in the handler's body capacitance is not discharged through the device. With proper handling and application procedures, however, IGBTs are currently being extensively used in production by numerous equipment manufacturers in military, industrial and consumer applications, with virtually no damage problems due to electrostatic discharge. IGBTs can be handled safely if the following basic precautions are taken:

1. Prior to assembly into a circuit, all leads should be kept shorted together either by the use of metal shorting springs or by the insertion into conductive material such as "ECCOSORBD™ LD26" or equivalent.
2. When devices are removed by hand from their carriers, the hand being used should be grounded by any suitable means - for example, with a metallic wristband.
3. Tips of soldering irons should be grounded.
4. Devices should never be inserted into or removed from circuits with power on.
5. **Gate Voltage Rating** - Never exceed the gate-voltage rating of V_{GEM}. Exceeding the rated V_{GE} can result in permanent damage to the oxide layer in the gate region.
6. **Gate Termination** - The gates of these devices are essentially capacitors. Circuits that leave the gate open-circuited or floating should be avoided. These conditions can result in turn-on of the device due to voltage buildup on the input capacitor due to leakage currents or pickup.
7. **Gate Protection** - These devices do not have an internal monolithic Zener diode from gate to emitter. If gate protection is required an external Zener is recommended.

Operating Frequency Information

Operating frequency information for a typical device (Figure 3) is presented as a guide for estimating device performance for a specific application. Other typical frequency vs collector current (I_{CE}) plots are possible using the information shown for a typical unit in Figures 5, 6, 7, 8, 9 and 11. The operating frequency plot (Figure 3) of a typical device shows f_{MAX1} or f_{MAX2}; whichever is smaller at each point. The information is based on measurements of a typical device and is bounded by the maximum rated junction temperature.

f_{MAX1} is defined by $f_{MAX1} = 0.05/(t_{d(OFF)I} + t_{d(ON)I})$. Deadtime (the denominator) has been arbitrarily held to 10% of the on-state time for a 50% duty factor. Other definitions are possible. $t_{d(OFF)I}$ and $t_{d(ON)I}$ are defined in Figure 21. Device turn-off delay can establish an additional frequency limiting condition for an application other than T_{JM}.

f_{MAX2} is defined by $f_{MAX2} = (P_D - P_C)/(E_{OFF} + E_{ON2})$. The allowable dissipation (P_D) is defined by $P_D = (T_{JM} - T_C)/R_{\theta JC}$. The sum of device switching and conduction losses must not exceed P_D. A 50% duty factor was used (Figure 3) and the conduction losses (P_C) are approximated by $P_C = (V_{CE} \times I_{CE})/2$.

E_{ON2} and E_{OFF} are defined in the switching waveforms shown in Figure 21. E_{ON2} is the integral of the instantaneous power loss ($I_{CE} \times V_{CE}$) during turn-on and E_{OFF} is the integral of the instantaneous power loss ($I_{CE} \times V_{CE}$) during turn-off. All tail losses are included in the calculation for E_{OFF}; i.e., the collector current equals zero ($I_{CE} = 0$).

Mechanical Dimensions

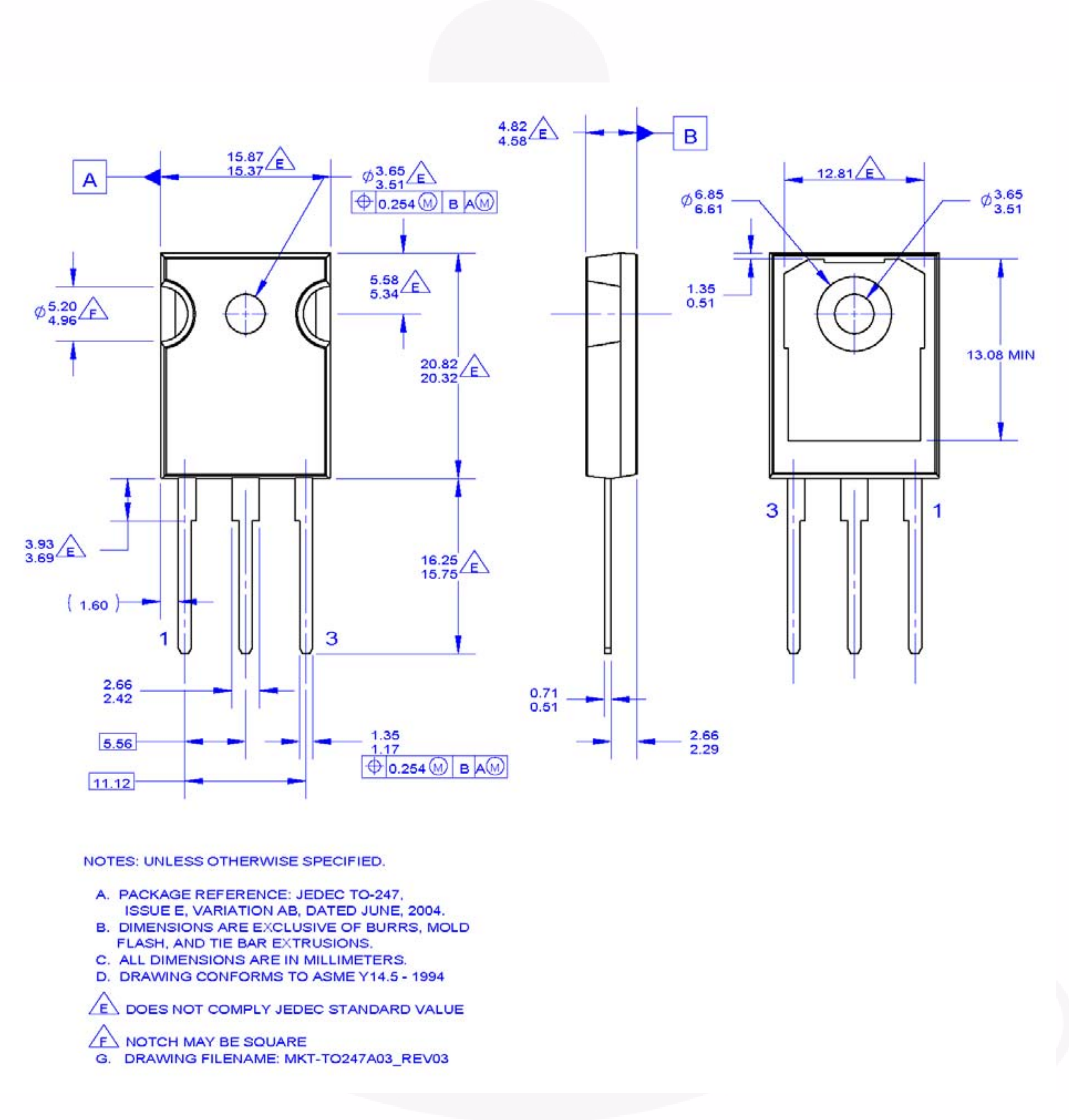


Figure 22. TO-247 3L - TO-247,MOLDED,3 LEAD,JEDEC VARIATION AB

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TO247-003

FAIRCHILD SEMICONDUCTOR®

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Marking Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
µSerDes™
µSerDes™
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

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. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

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 here in:

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, and (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 a significant injury of the user.
2. A critical component in 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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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

Rev. I66

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9