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FAIRCHILD SEMICONDUCTOR®

HGTG12N60A4D, HGTP12N60A4D, HGT1S12N60A4DS

Data Sheet **December 2001**

600V, SMPS Series N-Channel IGBT with Anti-Parallel Hyperfast Diode

The HGTG12N60A4D, HGTP12N60A4D and HGT1S12N60A4DS are MOS gated high voltage switching devices combining the best features of MOSFETs and bipolar transistors. These devices have the high input impedance of a MOSFET and the low on-state conduction loss of a bipolar transistor. The much lower on-state voltage drop varies only moderately between 25^{O}C and 150^{O}C. The IGBT used is the development type TA49335. The diode used in anti-parallel is the development type TA49371.

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 high frequency switch mode power supplies.

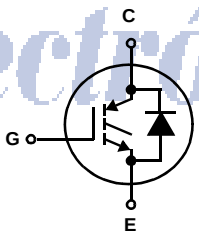
Formerly Developmental Type TA49337.

Ordering Information

PART NUMBER	PACKAGE	BRAND
HGTG12N60A4D	TO-247	12N60A4D
HGTP12N60A4D	TO-220AB	12N60A4D
HGT1S12N60A4DS	TO-263AB	12N60A4D

NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-263AB variant in tape and reel, e.g. HGT1S12N60A4DS9A.

Symbol

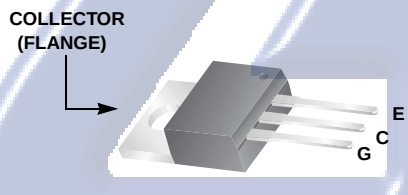


Features

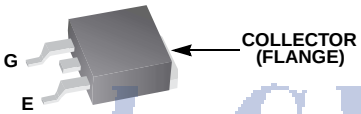
- >100kHz Operation 390V, 12A
- 200kHz Operation 390V, 9A
- 600V Switching SOA Capability
- Typical Fall Time. . . . . 70ns at T_J = 125^{O}C
- Low Conduction Loss
- *Temperature Compensating* SABER™ Model www.fairchildsermi.com
- Related Literature
  - TB334 “Guidelines for Soldering Surface Mount Components to PC Boards

Packaging

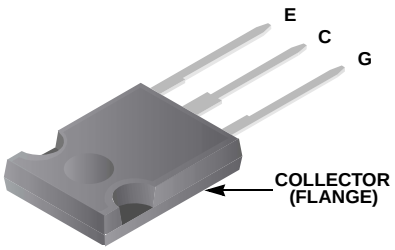
JEDEC TO-220AB ALTERNATE VERSION



JEDEC TO-263AB



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	

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

		HGTG12N60A4D, HGTP12N60A4D, HGT1S12N60A4DS	UNITS
Collector to Emitter Voltage	BV_{CES}	600	V
Collector Current Continuous			
At $T_C = 25^oC$	I_{C25}	54	A
At $T_C = 110^oC$	I_{C110}	23	A
Collector Current Pulsed (Note 1)	I_{CM}	96	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	60A at 600V	
Power Dissipation Total at $T_C = 25^oC$	P_D	167	W
Power Dissipation Derating $T_C > 25^oC$		1.33	$W/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to 150	^oC
Maximum Temperature for Soldering			
Leads at 0.063in (1.6mm) from Case for 10s	T_L	300	^oC
Package Body for 10s, see Tech Brief 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	UNITS
Collector to Emitter Breakdown Voltage	BV_{CES}	$I_C = 250\mu A$, $V_{GE} = 0V$		600	-	-	V
Collector to Emitter Leakage Current	I_{CES}	$V_{CE} = 600V$	$T_J = 25^oC$	-	-	250	µA
			$T_J = 125^oC$	-	-	2.0	mA
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 12A$, $V_{GE} = 15V$	$T_J = 25^oC$	-	2.0	2.7	V
			$T_J = 125^oC$	-	1.6	2.0	V
Gate to Emitter Threshold Voltage	$V_{GE(TH)}$	$I_C = 250\mu A$, $V_{CE} = 600V$		-	5.6	-	V
Gate to Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 20V$		-	-	±250	nA
Switching SOA	SSOA	$T_J = 150^oC$, $R_G = 10\Omega$, $V_{GE} = 15V$, $L = 100\mu H$, $V_{CE} = 600V$		60	-	-	A
Gate to Emitter Plateau Voltage	V_{GEP}	$I_C = 12A$, $V_{CE} = 300V$		-	8	-	V
On-State Gate Charge	$Q_{g(ON)}$	$I_C = 12A$, $V_{CE} = 300V$	$V_{GE} = 15V$	-	78	96	nC
			$V_{GE} = 20V$	-	97	120	nC
Current Turn-On Delay Time	$t_{d(ON)I}$	IGBT and Diode at $T_J = 25^oC$, $I_{CE} = 12A$, $V_{CE} = 390V$, $V_{GE} = 15V$, $R_G = 10\Omega$, $L = 500\mu H$, Test Circuit (Figure 24)		-	17	-	ns
Current Rise Time	t_{rI}			-	8	-	ns
Current Turn-Off Delay Time	$t_{d(OFF)I}$			-	96	-	ns
Current Fall Time	t_{fI}			-	18	-	ns
Turn-On Energy (Note 3)	E_{ON1}			-	55	-	µJ
Turn-On Energy (Note 3)	E_{ON2}			-	160	-	µJ
Turn-Off Energy (Note 2)	E_{OFF}			-	50	-	µJ
Current Turn-On Delay Time	$t_{d(ON)I}$	IGBT and Diode at $T_J = 125^oC$, $I_{CE} = 12A$, $V_{CE} = 390V$, $V_{GE} = 15V$, $R_G = 10\Omega$, $L = 500\mu H$, Test Circuit (Figure 24)		-	17	-	ns
Current Rise Time	t_{rI}			-	16	-	ns
Current Turn-Off Delay Time	$t_{d(OFF)I}$			-	110	170	ns
Current Fall Time	t_{fI}			-	70	95	ns
Turn-On Energy (Note3)	E_{ON1}			-	55	-	µJ
Turn-On Energy (Note 3)	E_{ON2}			-	250	350	µJ
Turn-Off Energy (Note 2)	E_{OFF}			-	175	285	µJ

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