致尊敬的顾客

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瑞萨电子公司网址：http://www.renesas.com

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瑞萨电子公司

【发行】瑞萨电子公司（http://www.renesas.com）

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晶闸管/双向晶闸管

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中小功率MOSFET、 IGBT、双向晶闸管和晶闸管根据使用条件 （电/机器的应力和操作等），可能会发生器件受损的情况。

为了能够安全地使用本公司的中小功率MOSFET、 IGBT、双向晶闸管和晶闸管，请遵守以下注意事项，并正确使用。

⚠注意	
包　　装	由本公司出货的器件包装，虽然能够承受一定的环境条件，但是，因为存在包装箱破损或者内部包装损坏而导致器件外露等情况，所以请注意避免暴露以防来自外部的冲击、雨水及污染等。
运输/搬运方法	(1) 运输中请将包装箱置于正确的朝向。因颠倒或者竖立放置造成的不正常压力，会导致器件受损。 (2) 投掷或者掉落，会导致器件受损。 (3) 被水淋湿，会导致器件在使用时发生故障。请注意在降雨及降雪时的搬运，避免被淋湿。
保管方法	保管器件场所的温度及湿度最好在5～35°C，45～75%的常温常湿范围内，如果保管在与此温度及湿度相差甚远的环境下，就可能会导致器件的性能和可靠性下降。
长期保管	(1) 长期（1年以上）保管器件的情况下，请采取干燥措施。此外，经过长期保管后使用时，请确认器件外观上不存在刮伤、污垢及锈渍等。 (2) 放置在非常恶劣的环境或者在通常的保管条件 （上述的保管条件）下保管至少 3 年时，请确认外观上不存在刮伤、污垢和锈渍等以及进行焊接性与电特性的检查。
使用环境	为了防止可能发生的重大事故，请避免在直接附着水和有机溶剂、产生腐蚀性气体以及存在爆炸性气体和粉尘等场所使用。
难燃性	虽然模制树脂使用的是UL规格的94-V0认定产品，但也具有可燃性。
静电措施	在中小功率半导体器件中，为了防止因静电对具有MOS栅极结构的功率MOSFET及IGBT等器件造成的损坏和老化，请遵守以下事项。 (1) 关于静电损坏的注意事项 如果人体和包装材料所带的静电或在栅极/源极（发射极）之间外加过大的电压（不低于栅极/源极 （发射极）之间最大额定电压），可能会导致器件受损和老化。静电措施的基本是尽可能控制静电的产生以及尽快释放带电的电荷。 ① 搬运，保存时请不要使用容易带静电的容器。 ② 在使用器件之前，请不要把器件从导电袋及导电管中取出。 此外，请绝对不要光手接触引脚之间。 ③ 组装时，请在使用设备和人体接地的状态下进行操作。建议在工作台表面以及工作台周围的地板上铺设导电性垫子并接地。此外，最好将作业环境的静电等级控制在不超过100V。 ④ 在安装器件的电路板上，栅极/源极 （发射极）之间为开路状态时，请注意因电路板所带静电可能导致器件受损及老化。 ⑤ 在使用烙铁的情况下，请将烙铁的前端接地。

⚠注意

静电措施

(2) 栅极/源极 （发射极）之间为开路时的注意事项
① 当栅极/源极 （发射极）之间处于开路状态时，请不要在漏极 （集电极） /源极 （发射极）之间外加电压。
② 拆卸器件时，请在栅极/源极 （发射极）之间短路之后进行拆卸。

安装方法

＜电极引脚的成形/切断＞
为防止因电极引脚的成形/切断而导致的器件受损及老化，请遵守以下的注意事项。
(1) 为了避免向电极引脚施加应力，请使用专用夹具。
此外，在没有专用夹具的情况下，比起使用扁嘴钳等夹住实施部分，夹住靠近本体侧的电极引脚部分，能避免向器件施加压力。
(2) 请在距离器件本体至少2mm的位置进行操作。
(3) 横向弯折的情况下，请在不超过30°下进行操作。（纵向在90°以内）
此外，请尽量使用瑞萨科技公司的标准成形产品。

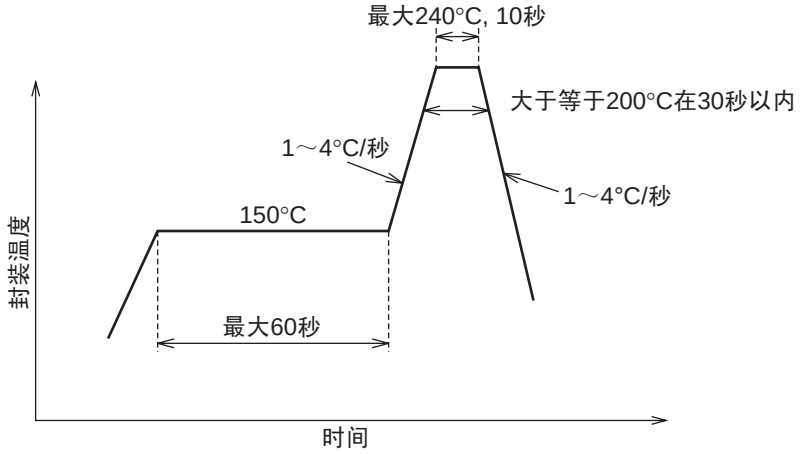
＜散热板的安装＞
(1) 为了最大限度地获得散热效果，必须尽可能增大接触面积并将接触热阻减少至最小。请使用安装器件表面的表面平坦度不超过6S、弯曲度在100μS以内的散热板。请将器件的安装孔设定为不超过螺栓直径+0.5mm，孔的倒棱设定为不超过直径的1%。
(2) 在紧固方面，请使用转矩扳手紧固到规定的转矩。如果 （参照下表1）紧固转矩过大，就可能导致封装破损、器件损坏及老化等危险。
(3) 请将硅脂膏薄而均匀地涂满整个安装表面。考虑到安装表面及散热板的精度，涂抹厚度为100～200μm最恰当。此外，如果在散热板的接触面涂上硅脂膏，也可以起到防止接触部分被腐蚀的作用。但是，关于所涂硅脂膏，必须是在使用工作温度范围内不会发生变质，并且常年都不会发生变化的硅脂膏。

表1 紧固转矩的一览表

外形	螺栓直径	紧固转矩			
		推荐值		最大值	
		N•m	(kg•cm)	N•m	(kg•cm)
TO-220	M3	0.49	(5)	0.98	(10)
TO-220F	M3	0.49	(5)	0.98	(10)
TO-220FN	M3	0.49	(5)	0.98	(10)
TO-3P	M3	0.59	(6)	0.98	(10)

＜极性＞
为了防止由于错误插入而导致的器件受损及老化，请按照外形图中所记载的引脚排列插入到电路板。

＜焊接＞
为了防止由于机械应力和温度应力而导致的器件受损、老化及质量下降，请遵守以下事项。
(1) 请在散热板安装之后，进行焊接。
(2) 请在温度条件为260°C时不超过10秒或者350°C时不超过3秒的温度/时间内进行操作。

⚠注意	
安　装　方　法	(3)　表面贴装产品的推荐安装方法是回流。 回流时的推荐温度分布图，如下图1所示。 使用回流以外的方法安装时，请另外向本公司进行咨询。  图1　回流时的推荐温度分布图 ＜电路板清洗＞ 关于焊接之后的电路板清洗，为了防止由于机械应力而导致器件受损，老化及质量下降，请遵守以下事项。 (1)　请不要在清洗的过程中或者附着清洗液的状态下用刷子或手摩擦器件的标识。 (2)　进行超声波清洗时，请在以下的条件下进行。 频率　　：小于等于28kHz 超声波输出：小于等于20W/升 清洗时间　：30s以内 此外请避免超声波振荡器与电路板或器件直接接触。还要避免器件与频率共振。
最　大　额　定　值	请在器件的最大额定值以内使用，以防止器件受损、老化以及可靠性下降。 器件的最大额定值是指，关于温度、电流、电压和损耗等的绝对最大额定值，一瞬间都不能超过该值。

修订记录

Rev.	发行日	修订内容	
		页	修订处
1.00	2008.01.30	—	初版发行

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