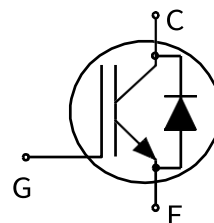


## 第五代高速开关系列

采用 TRENCHSTOP™ 5 技术的高速快开关IGBT，  
与 RAPID 1 快速软恢复反并联二极管共封装

### 特征和优点：

- 高速 F5 技术提供：
- 硬开关和谐振拓扑中的行业领先效率
  - 即插即用，替代上一代 IGBT
  - 650 V 击穿电压
  - 低栅极电荷  $Q_G$
  - IGBT 与 RAPID 1 快速软恢复反并联二极管共封装
  - 最高结温 175°C
  - 经过动态压力测试
  - 符合 AEC-Q101 标准
  - 绿色封装（符合 RoHS 要求）
  - 完整的产品范围和 PSpice 模型：  
<http://www.infineon.com/igbt/>



### 应用：

- 车载充电器
- 车载充电器
- 直流/直流转换器
- 功率因数校正



### 封装引脚定义：

- 引脚 1 - 栅极
- 引脚 2 & 背面 - 集电极
- 引脚 3 - 发射极



### 关键性能和封装参数

| Type         | $V_{CE}$ | $I_C$ | $V_{CEsat}, T_{vj}=25^{\circ}C$ | $T_{vjmax}$ | Marking  | Package    |
|--------------|----------|-------|---------------------------------|-------------|----------|------------|
| AIKW40N65DH5 | 650V     | 40A   | 1.66V                           | 175°C       | AK40EDH5 | PG-TO247-3 |

本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。为确认准确性，请务必访问 [infineon.com](http://infineon.com) 参考最新的英文版本（控制文档）。



第五代高速开关系列

目录

描述..... 1

目录..... 2

最大额定值..... 3

热阻抗..... 3

电气特性..... 4

电气特性图 ..... 7

封装图编号..... 13

测试条件..... 14

修订记录..... 15

免责声明..... 16

## 第五代高速开关系列

## 最大额定值

| Parameter                                                                                                                          | Symbol      | Value                | Unit               |
|------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------|--------------------|
| Collector-emitter voltage, $T_{vj} \geq 25^{\circ}\text{C}$                                                                        | $V_{CE}$    | 650                  | V                  |
| DC collector current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$<br>$T_C = 100^{\circ}\text{C}$                             | $I_C$       | 74.0<br>46.0         | A                  |
| Pulsed collector current, $t_p$ limited by $T_{vjmax}$ <sup>1)</sup>                                                               | $I_{Cpuls}$ | 120.0                | A                  |
| Turn off safe operating area<br>$V_{CE} \leq 650\text{V}$ , $T_{vj} \leq 175^{\circ}\text{C}$ , $t_p = 1\mu\text{s}$ <sup>1)</sup> | -           | 120.0                | A                  |
| Diode forward current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$<br>$T_C = 100^{\circ}\text{C}$                            | $I_F$       | 36.0<br>21.0         | A                  |
| Diode pulsed current, $t_p$ limited by $T_{vjmax}$ <sup>1)</sup>                                                                   | $I_{Fpuls}$ | 120.0                | A                  |
| Gate-emitter voltage<br>Transient Gate-emitter voltage ( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )                                  | $V_{GE}$    | $\pm 20$<br>$\pm 30$ | V                  |
| Power dissipation $T_C = 25^{\circ}\text{C}$ Power<br>dissipation $T_C = 100^{\circ}\text{C}$                                      | $P_{tot}$   | 250.0<br>125.0       | W                  |
| Operating junction temperature                                                                                                     | $T_{vj}$    | $-40 \dots +175$     | $^{\circ}\text{C}$ |
| Storage temperature                                                                                                                | $T_{stg}$   | $-55 \dots +150$     | $^{\circ}\text{C}$ |
| Soldering temperature, <sup>2)</sup><br>wave soldering 1.6mm (0.063in.) from case for 10s                                          |             | 260                  | $^{\circ}\text{C}$ |
| Mounting torque, M3 screw Maximum<br>of mounting processes: 3                                                                      | $M$         | 0.6                  | Nm                 |

## 热阻抗

| Parameter | Symbol | Conditions | Value |      |      | Unit |
|-----------|--------|------------|-------|------|------|------|
|           |        |            | min.  | typ. | max. |      |

 $R_{th}$  特性

|                                              |               |  |   |   |      |     |
|----------------------------------------------|---------------|--|---|---|------|-----|
| IGBT thermal resistance, junction<br>- case  | $R_{th(j-c)}$ |  | - | - | 0.60 | K/W |
| Diode thermal resistance,<br>junction - case | $R_{th(j-c)}$ |  | - | - | 1.80 | K/W |
| Thermal resistance<br>junction - ambient     | $R_{th(j-a)}$ |  | - | - | 40   | K/W |

<sup>1)</sup>由设计标定，不受限于生产测试。<sup>2)</sup>封装不推荐用于表面贴装应用

## 第五代高速开关系列

除非另有规定，电气特性均为  $T_{vj} = 25^{\circ}\text{C}$ 

| Parameter                            | Symbol        | Conditions                                                                                                        | Value       |                      |                | Unit    |
|--------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------|-------------|----------------------|----------------|---------|
|                                      |               |                                                                                                                   | min.        | typ.                 | max.           |         |
| 静态特性                                 |               |                                                                                                                   |             |                      |                |         |
| Collector-emitter breakdown voltage  | $V_{(BR)CES}$ | $V_{GE} = 0V, I_C = 0.20mA$                                                                                       | 650         | -                    | -              | V       |
| Collector-emitter saturation voltage | $V_{CESat}$   | $V_{GE} = 15.0V, I_C = 40.0A$<br>$T_{vj} = 25^{\circ}C$ $T_{vj}$<br>$= 125^{\circ}C$ $T_{vj} =$<br>$175^{\circ}C$ | -<br>-<br>- | 1.66<br>1.85<br>2.05 | 2.10<br>-<br>- | V       |
| Diode forward voltage                | $V_F$         | $V_{GE} = 0V, I_F = 20.0A$<br>$T_{vj} = 25^{\circ}C$ $T_{vj}$<br>$= 125^{\circ}C$ $T_{vj} =$<br>$175^{\circ}C$    | -<br>-<br>- | 1.55<br>1.53<br>1.49 | 1.80<br>-<br>- | V       |
| Gate-emitter threshold voltage       | $V_{GE(th)}$  | $I_C = 0.40mA, V_{CE} = V_{GE}$                                                                                   | 3.2         | 4.0                  | 4.8            | V       |
| Zero gate voltage collector current  | $I_{CES}$     | $V_{CE} = 650V, V_{GE} = 0V$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$                                 | -<br>-      | -<br>800             | 40<br>-        | $\mu A$ |
| Gate-emitter leakage current         | $I_{GES}$     | $V_{CE} = 0V, V_{GE} = 20V$                                                                                       | -           | -                    | 100            | nA      |
| Transconductance                     | $g_{fs}$      | $V_{CE} = 20V, I_C = 40.0A$                                                                                       | -           | 50.0                 | -              | S       |

电气特性,  $T_{vj} = 25^{\circ}\text{C}$ , 除非另有说明

| Parameter                                                            | Symbol    | Conditions                                      | Value |      |      | Unit |
|----------------------------------------------------------------------|-----------|-------------------------------------------------|-------|------|------|------|
|                                                                      |           |                                                 | min.  | typ. | max. |      |
| 动态特性                                                                 |           |                                                 |       |      |      |      |
| Input capacitance                                                    | $C_{ies}$ | $V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$           | -     | 2300 | -    | pF   |
| Output capacitance                                                   | $C_{oes}$ |                                                 | -     | 43   | -    |      |
| Reverse transfer capacitance                                         | $C_{res}$ |                                                 | -     | 9    | -    |      |
| Gate charge                                                          | $Q_G$     | $V_{CC} = 520V, I_C = 40.0A,$<br>$V_{GE} = 15V$ | -     | 92.0 | -    | nC   |
| Internal emitter inductance<br>measured 5mm (0.197 in.) from<br>case | $L_E$     |                                                 | -     | 13.0 | -    | nH   |

## 开关特性、感性负载

| Parameter                              | Symbol              | Conditions                                                                                                                                                                                                                                                                                                                           | Value |      |      | Unit |
|----------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
|                                        |                     |                                                                                                                                                                                                                                                                                                                                      | min.  | typ. | max. |      |
| IGBT 特性, $T_{vj} = 25^{\circ}\text{C}$ |                     |                                                                                                                                                                                                                                                                                                                                      |       |      |      |      |
| Turn-on delay time                     | $t_{d(\text{on})}$  | $T_{vj} = 25^{\circ}\text{C},$<br>$V_{CC} = 400\text{V}, I_C = 20.0\text{A},$<br>$V_{GE} = 0.0/15.0\text{V},$<br>$R_{G(\text{on})} = 15.0\Omega, R_{G(\text{off})} = 15.0\Omega,$<br>$L\sigma = 30\text{nH}, C\sigma = 30\text{pF}$<br>$L\sigma, C\sigma$ from Fig. E<br>Energy losses include “tail” and<br>diode reverse recovery. | -     | 20   | -    | ns   |
| Rise time                              | $t_r$               |                                                                                                                                                                                                                                                                                                                                      | -     | 11   | -    | ns   |
| Turn-off delay time                    | $t_{d(\text{off})}$ |                                                                                                                                                                                                                                                                                                                                      | -     | 153  | -    | ns   |
| Fall time                              | $t_f$               |                                                                                                                                                                                                                                                                                                                                      | -     | 11   | -    | ns   |
| Turn-on energy                         | $E_{\text{on}}$     |                                                                                                                                                                                                                                                                                                                                      | -     | 0.38 | -    | mJ   |
| Turn-off energy                        | $E_{\text{off}}$    |                                                                                                                                                                                                                                                                                                                                      | -     | 0.12 | -    | mJ   |
| Total switching energy                 | $E_{\text{ts}}$     |                                                                                                                                                                                                                                                                                                                                      | -     | 0.50 | -    | mJ   |

## 第五代高速开关系列

|                        |              |                                                                                                                                                                                                                                                                                                                                       |   |      |   |    |
|------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------|---|----|
| Turn-on delay time     | $t_{d(on)}$  | $T_{vj} = 25^{\circ}\text{C}$ ,<br>$V_{CC} = 400\text{V}$ , $I_C = 5.0\text{A}$ ,<br>$V_{GE} = 0.0/15.0\text{V}$ ,<br>$R_{G(on)} = 15.0\Omega$ , $R_{G(off)} = 15.0\Omega$ ,<br>$L\sigma = 30\text{nH}$ , $C\sigma = 30\text{pF}$<br>$L\sigma$ , $C\sigma$ from Fig. E<br>Energy losses include "tail" and<br>diode reverse recovery. | - | 18   | - | ns |
| Rise time              | $t_r$        |                                                                                                                                                                                                                                                                                                                                       | - | 4    | - | ns |
| Turn-off delay time    | $t_{d(off)}$ |                                                                                                                                                                                                                                                                                                                                       | - | 161  | - | ns |
| Fall time              | $t_f$        |                                                                                                                                                                                                                                                                                                                                       | - | 24   | - | ns |
| Turn-on energy         | $E_{on}$     |                                                                                                                                                                                                                                                                                                                                       | - | 0.08 | - | mJ |
| Turn-off energy        | $E_{off}$    |                                                                                                                                                                                                                                                                                                                                       | - | 0.04 | - | mJ |
| Total switching energy | $E_{ts}$     |                                                                                                                                                                                                                                                                                                                                       | - | 0.12 | - | mJ |

二极管特性,  $T_{vj} = 25^{\circ}\text{C}$ 

|                                                                  |              |                                                                                                                              |   |      |   |                  |
|------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ , $I_F$<br>$= 20.0\text{A}$ ,<br>$di_F/dt = 1000\text{A}/\mu\text{s}$ | - | 75   | - | ns               |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                              | - | 0.52 | - | $\mu\text{C}$    |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                              | - | 13.1 | - | A                |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                              | - | -217 | - | A/ $\mu\text{s}$ |
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ , $I_F$<br>$= 5.0\text{A}$ ,<br>$di_F/dt = 1000\text{A}/\mu\text{s}$  | - | 37   | - | ns               |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                              | - | 0.23 | - | $\mu\text{C}$    |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                              | - | 10.2 | - | A                |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                              | - | -550 | - | A/ $\mu\text{s}$ |

## 开关特性、感性负载

| Parameter                               | Symbol              | Conditions                                                                                                                                                                                                                                                                                                                                            | Value |      |      | Unit |
|-----------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
|                                         |                     |                                                                                                                                                                                                                                                                                                                                                       | min.  | typ. | max. |      |
| IGBT 特性, $T_{vj} = 150^{\circ}\text{C}$ |                     |                                                                                                                                                                                                                                                                                                                                                       |       |      |      |      |
| Turn-on delay time                      | $t_{d(\text{on})}$  | $T_{vj} = 150^{\circ}\text{C}$ ,<br>$V_{CC} = 400\text{V}$ , $I_C = 20.0\text{A}$ ,<br>$V_{GE} = 0.0/15.0\text{V}$ ,<br>$R_{G(\text{on})} = 15.0\Omega$ , $R_{G(\text{off})} = 15.0\Omega$ ,<br>$L\sigma = 30\text{nH}$ , $C\sigma = 30\text{pF}$<br>$L\sigma$ , $C\sigma$ from Fig. E<br>Energy losses include “tail” and<br>diode reverse recovery. | -     | 20   | -    | ns   |
| Rise time                               | $t_r$               |                                                                                                                                                                                                                                                                                                                                                       | -     | 12   | -    | ns   |
| Turn-off delay time                     | $t_{d(\text{off})}$ |                                                                                                                                                                                                                                                                                                                                                       | -     | 190  | -    | ns   |
| Fall time                               | $t_f$               |                                                                                                                                                                                                                                                                                                                                                       | -     | 14   | -    | ns   |
| Turn-on energy                          | $E_{\text{on}}$     |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.57 | -    | mJ   |
| Turn-off energy                         | $E_{\text{off}}$    |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.22 | -    | mJ   |
| Total switching energy                  | $E_{\text{ts}}$     |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.79 | -    | mJ   |
|                                         |                     |                                                                                                                                                                                                                                                                                                                                                       |       |      |      |      |
| Turn-on delay time                      | $t_{d(\text{on})}$  | $T_{vj} = 150^{\circ}\text{C}$ ,<br>$V_{CC} = 400\text{V}$ , $I_C = 5.0\text{A}$ ,<br>$V_{GE} = 0.0/15.0\text{V}$ ,<br>$R_{G(\text{on})} = 15.0\Omega$ , $R_{G(\text{off})} = 15.0\Omega$ ,<br>$L\sigma = 30\text{nH}$ , $C\sigma = 30\text{pF}$<br>$L\sigma$ , $C\sigma$ from Fig. E<br>Energy losses include “tail” and<br>diode reverse recovery.  | -     | 17   | -    | ns   |
| Rise time                               | $t_r$               |                                                                                                                                                                                                                                                                                                                                                       | -     | 4    | -    | ns   |
| Turn-off delay time                     | $t_{d(\text{off})}$ |                                                                                                                                                                                                                                                                                                                                                       | -     | 223  | -    | ns   |
| Fall time                               | $t_f$               |                                                                                                                                                                                                                                                                                                                                                       | -     | 25   | -    | ns   |
| Turn-on energy                          | $E_{\text{on}}$     |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.16 | -    | mJ   |
| Turn-off energy                         | $E_{\text{off}}$    |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.06 | -    | mJ   |
| Total switching energy                  | $E_{\text{ts}}$     |                                                                                                                                                                                                                                                                                                                                                       | -     | 0.22 | -    | mJ   |

## 第五代高速开关系列

### 二极管特性, $T_{vj} = 150^{\circ}\text{C}$

|                                                                  |              |                                                                                                           |   |      |   |                        |
|------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------|---|------|---|------------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 150^{\circ}\text{C}, V_R = 400\text{V}, I_F = 20.0\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}$ | - | 128  | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                           | - | 1.22 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                           | - | 18.6 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                           | - | -170 | - | $\text{A}/\mu\text{s}$ |
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 150^{\circ}\text{C}, V_R = 400\text{V}, I_F = 5.0\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}$  | - | 68   | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                           | - | 0.58 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                           | - | 15.5 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                           | - | -320 | - | $\text{A}/\mu\text{s}$ |

第五代高速开关系列

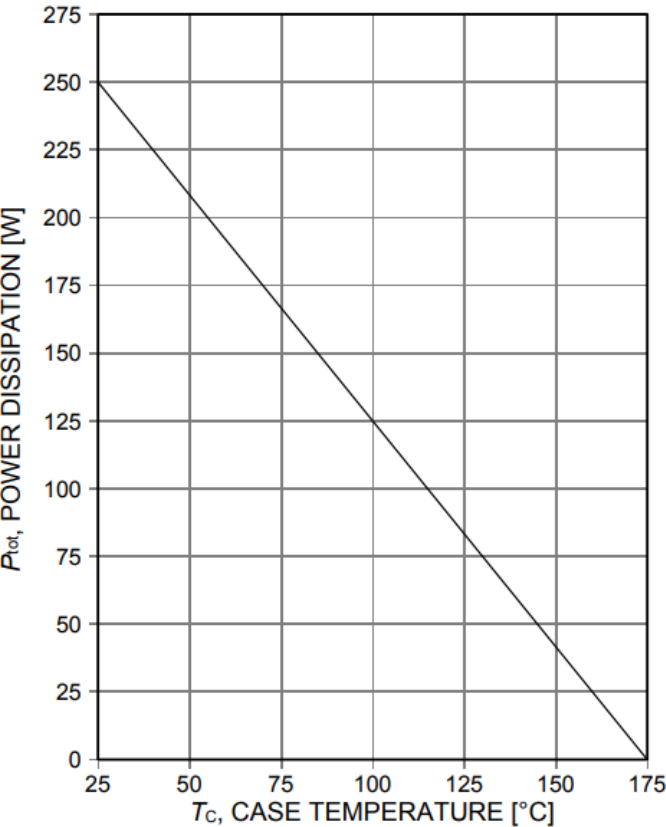


Figure 1. **Power dissipation as a function of case temperature**  
( $T_{vj} \leq 175^\circ\text{C}$ )

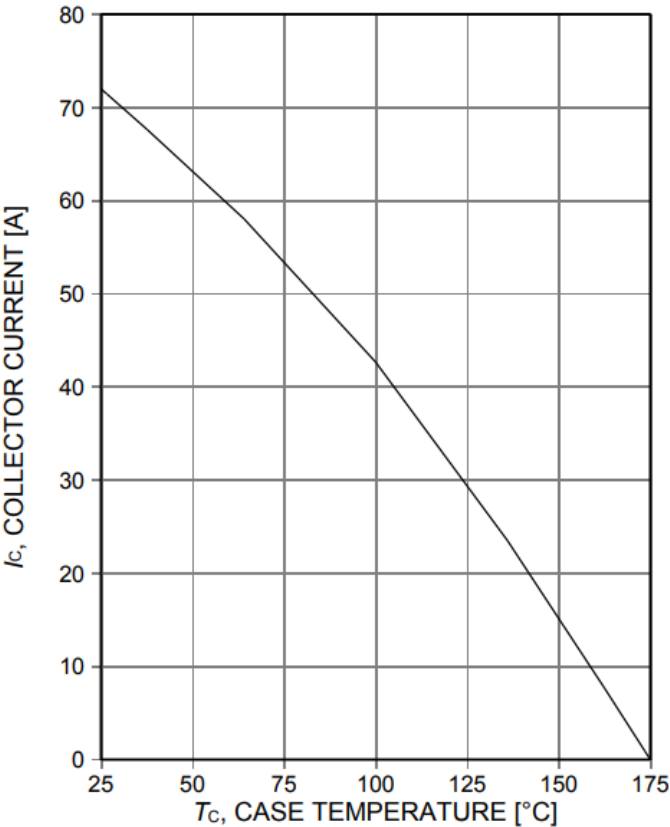


Figure 2. **Collector current as a function of case temperature**  
( $V_{GE} \geq 15\text{V}$ ,  $T_{vj} \leq 175^\circ\text{C}$ )

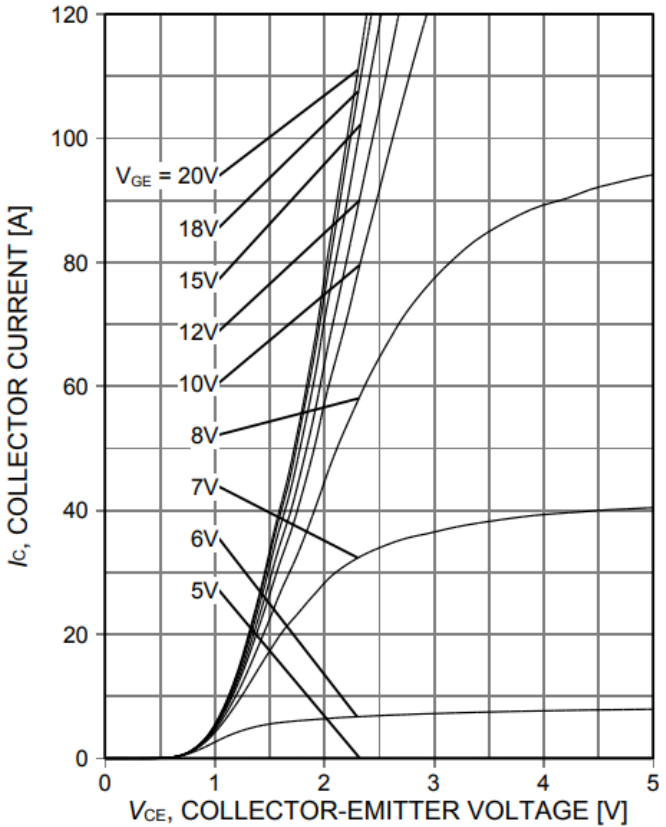


Figure 3. **Typical output characteristic**  
( $T_{vj} = 25^\circ\text{C}$ )

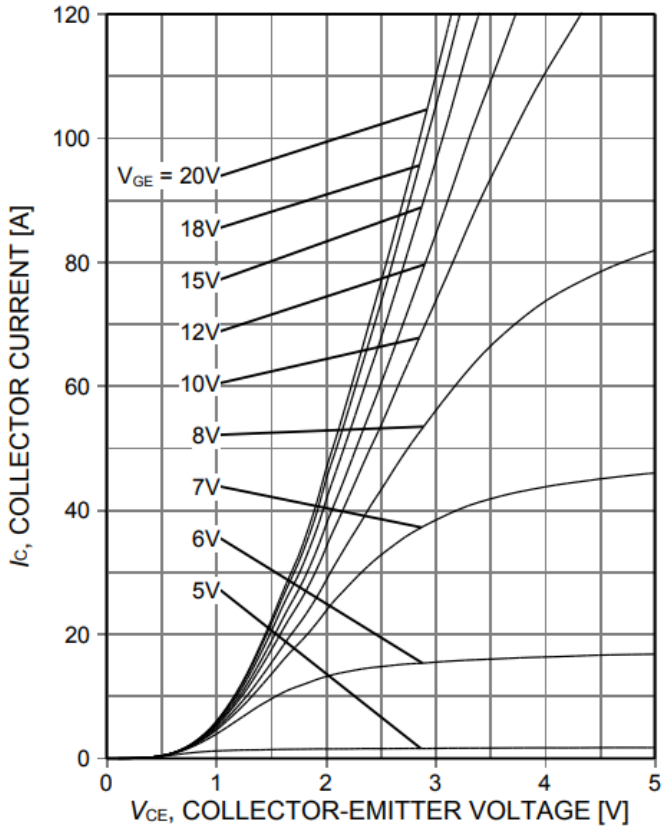


Figure 4. **Typical output characteristic**  
( $T_{vj} = 150^\circ\text{C}$ )

## 第五代高速开关系列

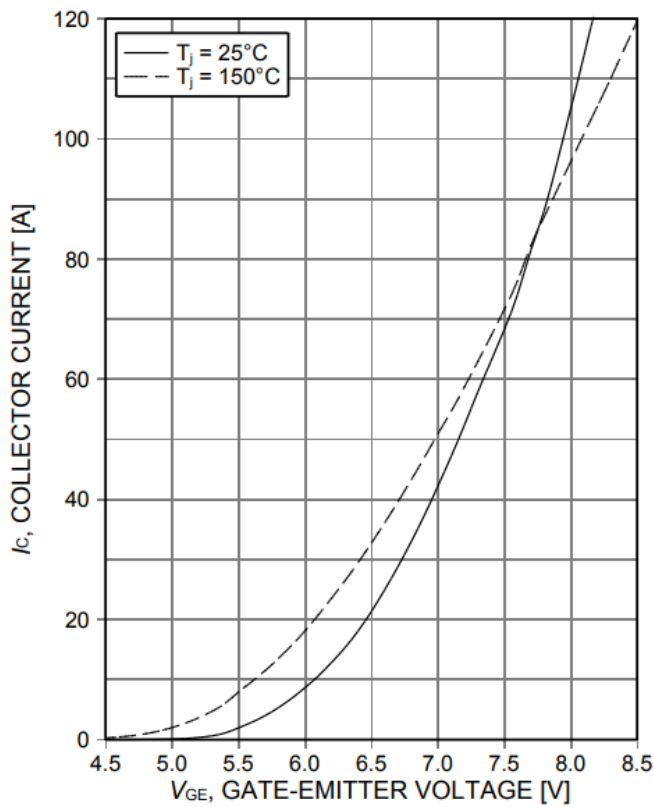


Figure 5. **Typical transfer characteristic**  
( $V_{CE}=20V$ )

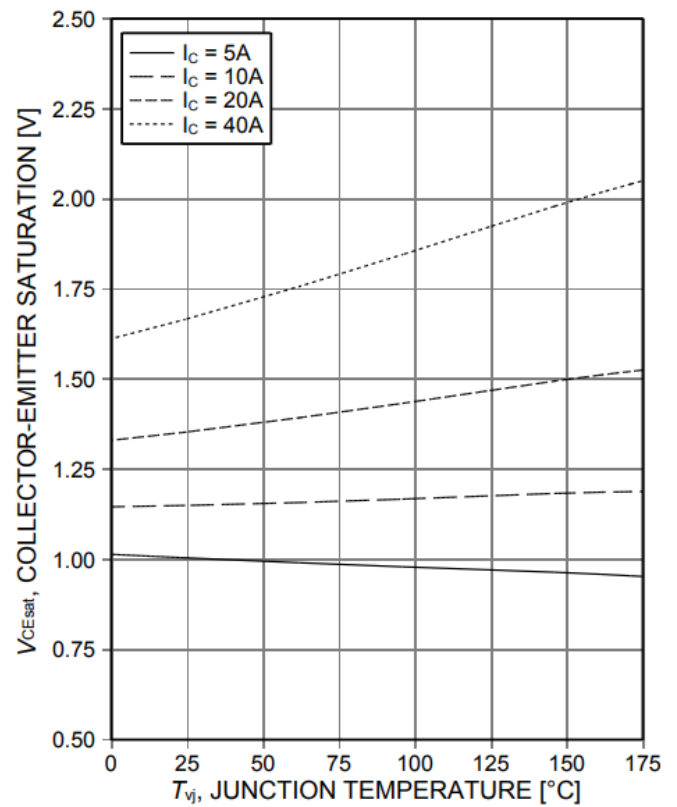


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature**  
( $V_{GE}=15V$ )

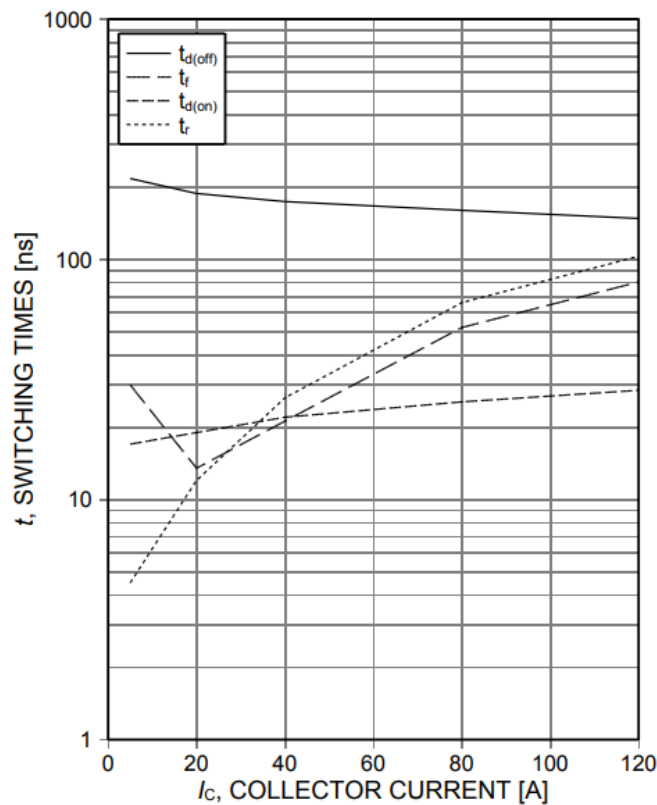


Figure 7. **Typical switching times as a function of collector current**  
(inductive load,  $T_{vj}=150^{\circ}C$ ,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $r_G=15\Omega$ , Dynamic test circuit in Figure E)

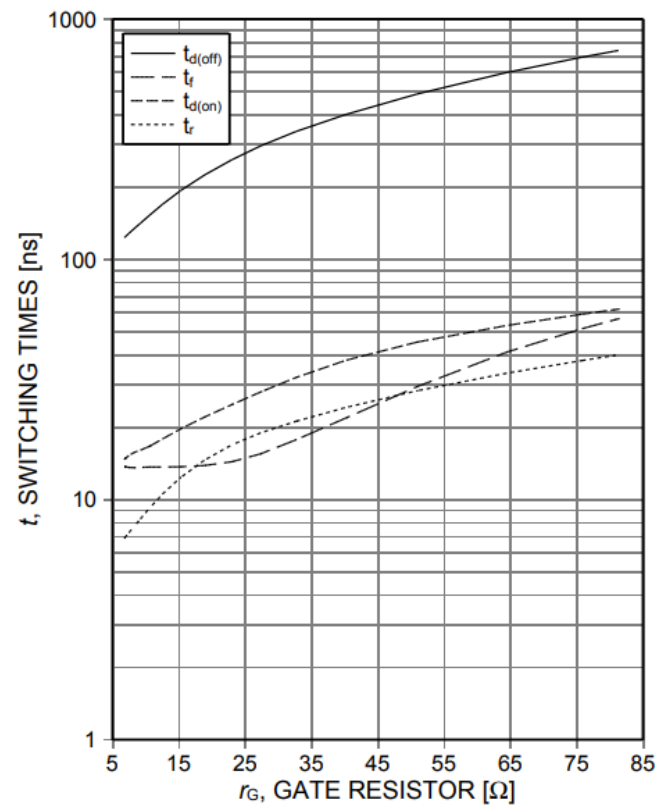


Figure 8. **Typical switching times as a function of gate resistor**  
(inductive load,  $T_{vj}=150^{\circ}C$ ,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $I_C=20A$ , Dynamic test circuit in Figure E)

## 第五代高速开关系列

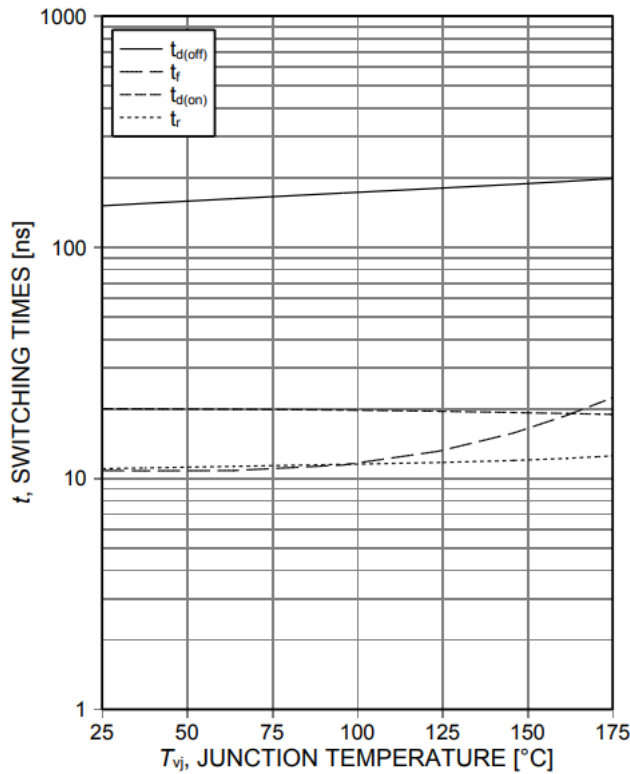


Figure 9. **Typical switching times as a function of junction temperature**  
(inductive load,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $I_C=20A$ ,  $r_G=15\Omega$ , Dynamic test circuit in Figure E)

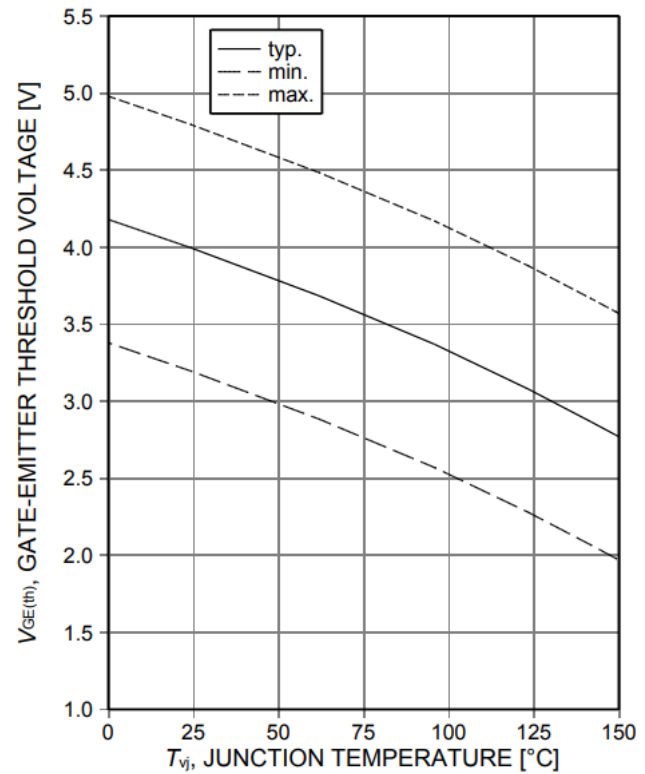


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**  
( $I_C=0.4mA$ )

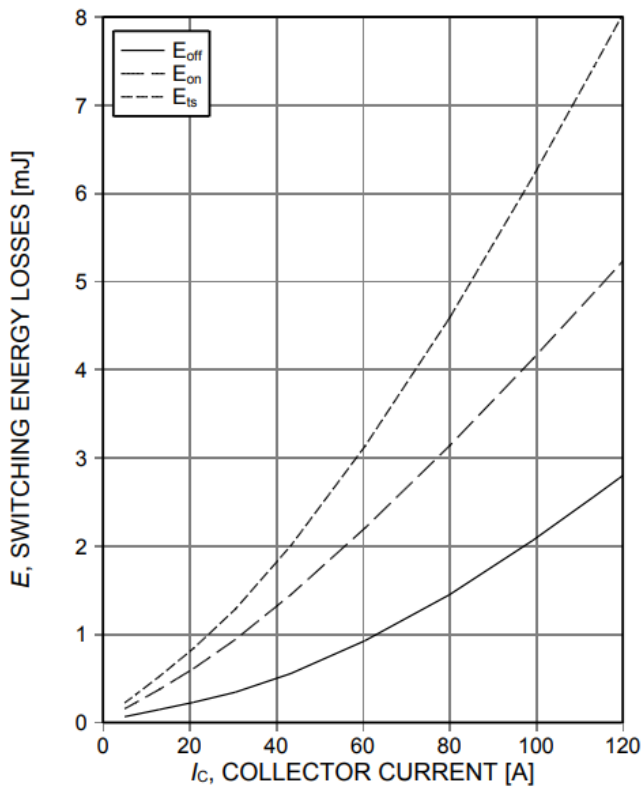


Figure 11. **Typical switching energy losses as a function of collector current**  
(inductive load,  $T_{vj}=150^\circ C$ ,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $r_G=15\Omega$ , Dynamic test circuit in Figure E)

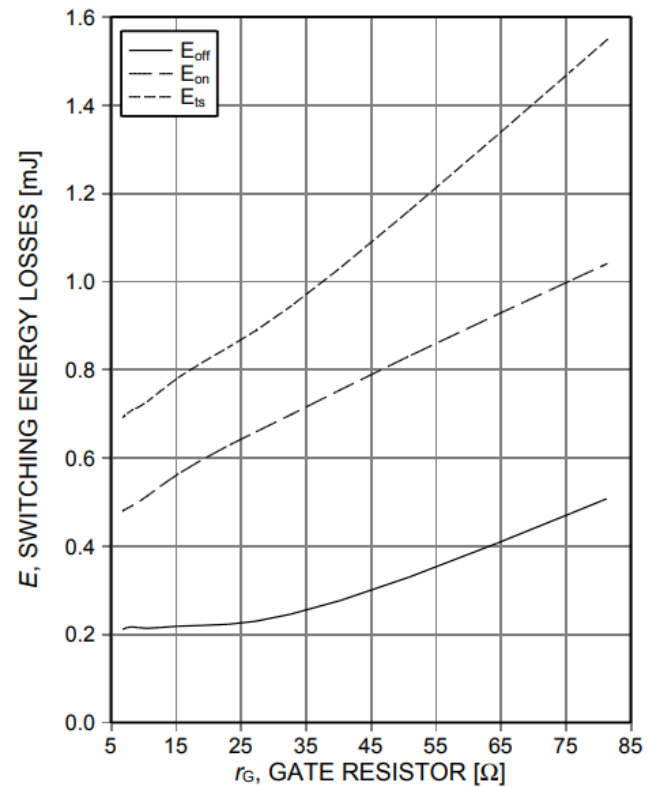


Figure 12. **Typical switching energy losses as a function of gate resistor**  
(inductive load,  $T_{vj}=150^\circ C$ ,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $I_C=20A$ , Dynamic test circuit in Figure E)

第五代高速开关系列

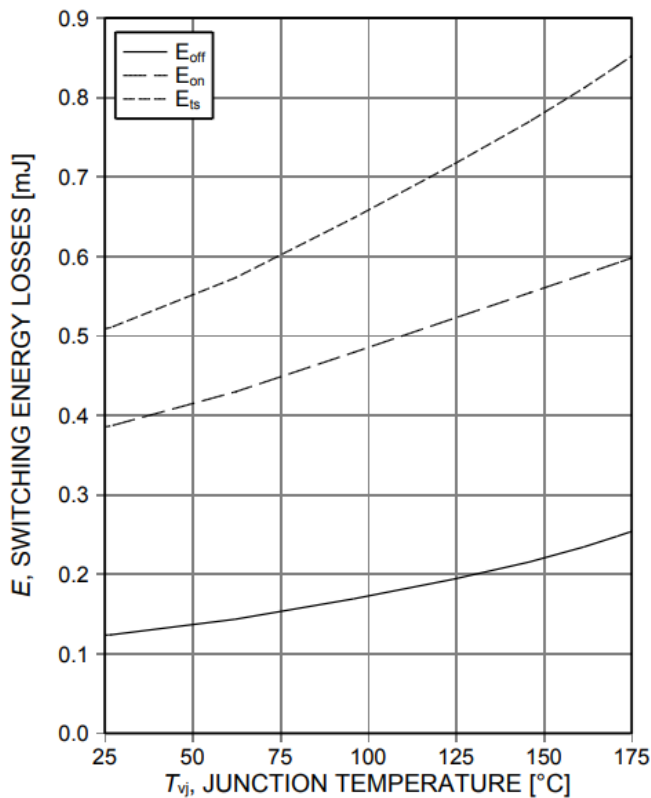


Figure 13. **Typical switching energy losses as a function of junction temperature**  
(inductive load,  $V_{CE}=400V$ ,  $V_{GE}=15/0V$ ,  $I_C=20A$ ,  $r_G=15\Omega$ , Dynamic test circuit in Figure E)

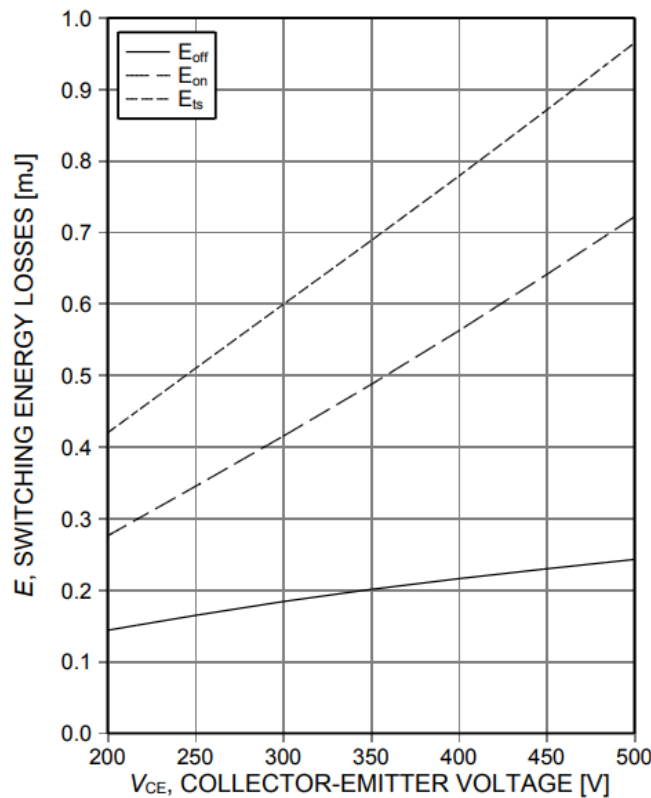


Figure 14. **Typical switching energy losses as a function of collector emitter voltage**  
(inductive load,  $T_{vj}=150^{\circ}C$ ,  $V_{GE}=15/0V$ ,  $I_C=20A$ ,  $r_G=15\Omega$ , Dynamic test circuit in Figure E)

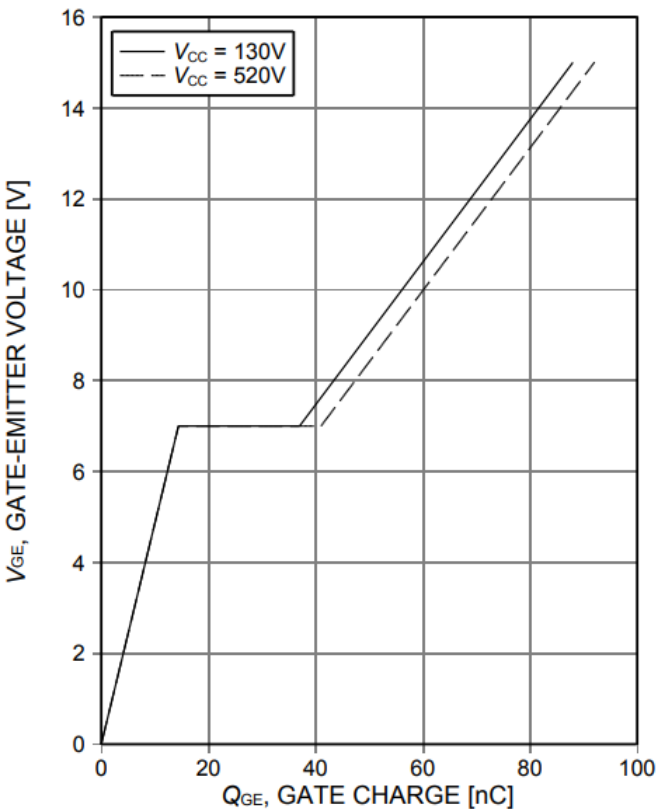


Figure 15. **Typical gate charge**  
( $I_C=40A$ )

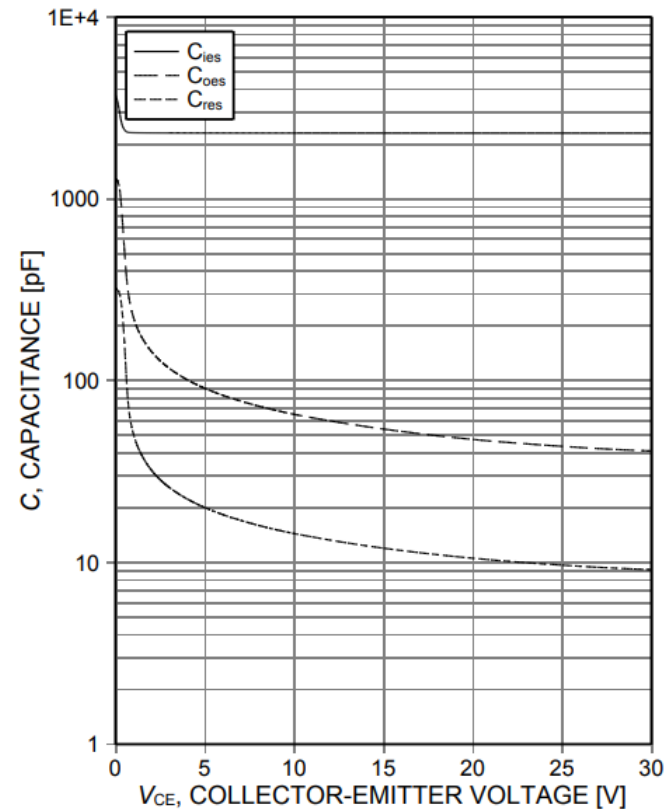
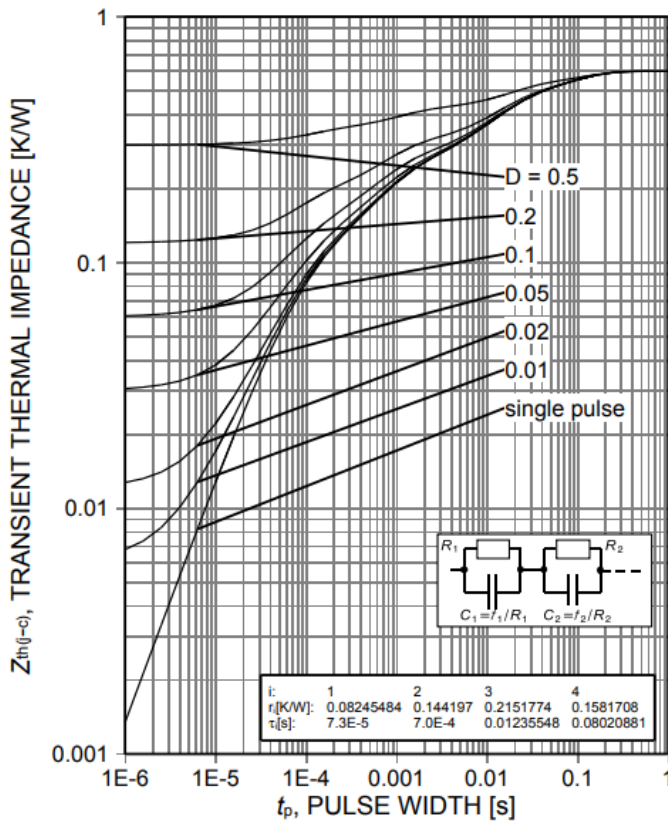
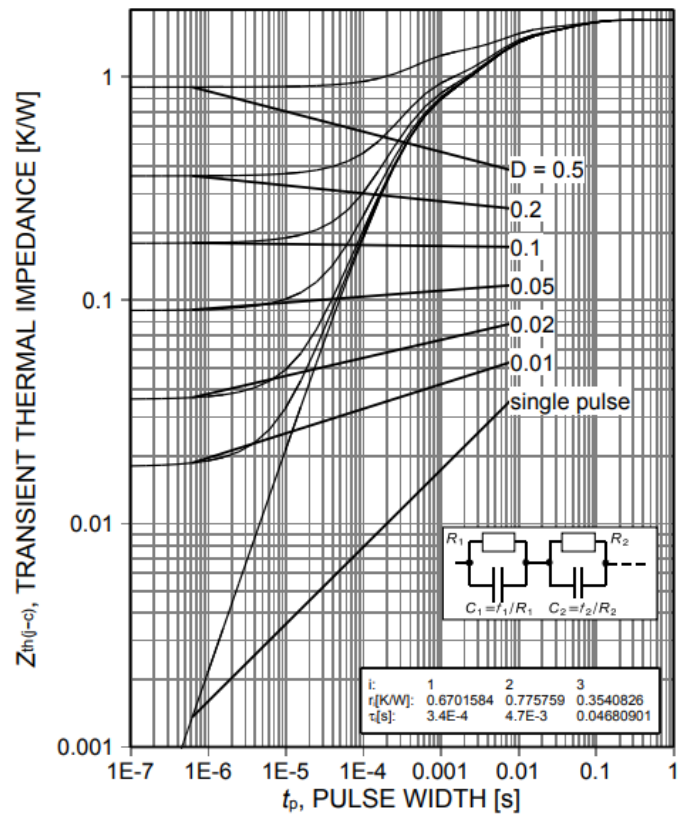
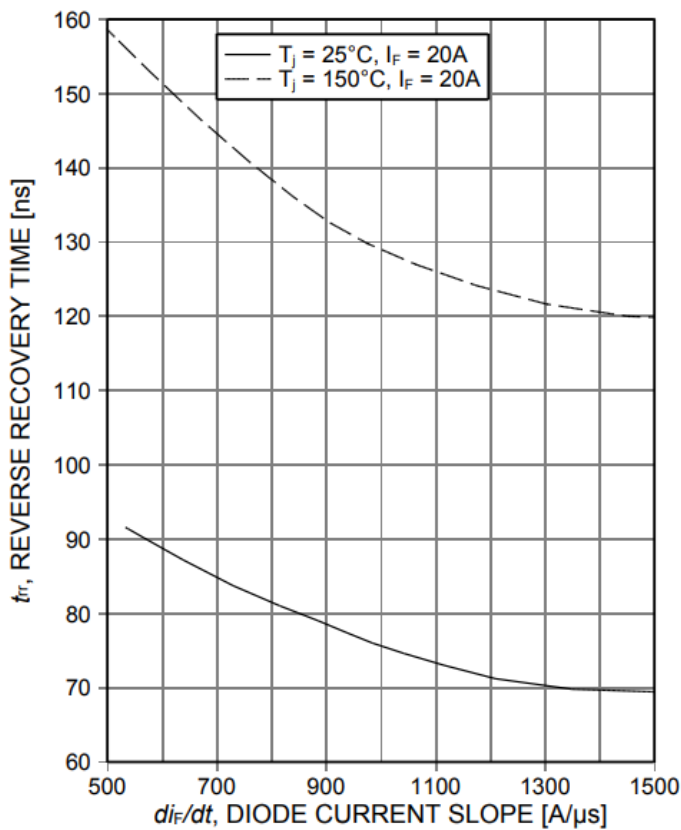
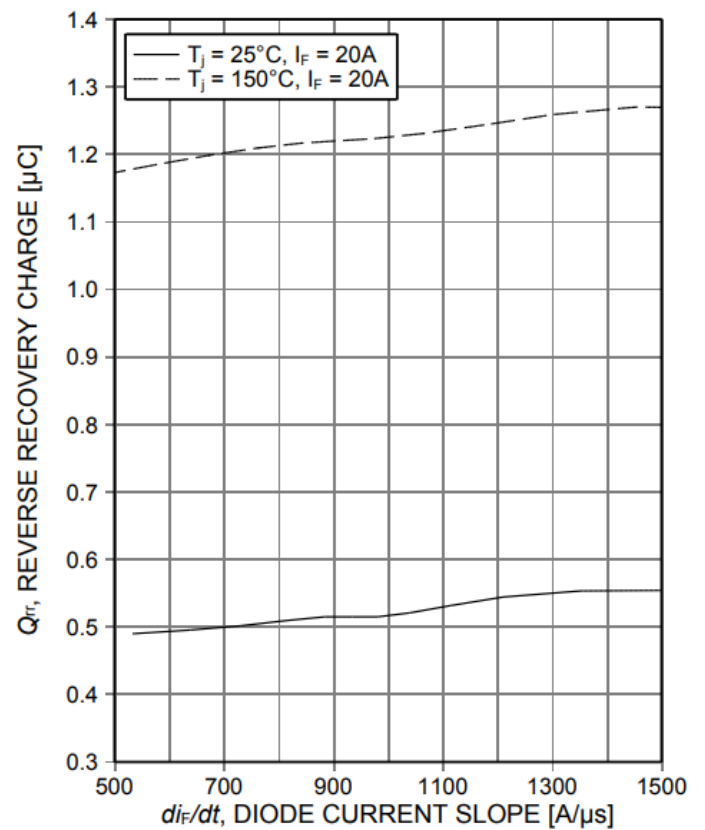


Figure 16. **Typical capacitance as a function of collector-emitter voltage**  
( $V_{GE}=0V$ ,  $f=1MHz$ )

## 第五代高速开关系列

Figure 17. IGBT transient thermal impedance ( $D=t_p/T$ )Figure 18. Diode transient thermal impedance as a function of pulse width ( $D=t_p/T$ )Figure 19. Typical reverse recovery time as a function of diode current slope ( $V_R=400V$ )Figure 20. Typical reverse recovery charge as a function of diode current slope ( $V_R=400V$ )

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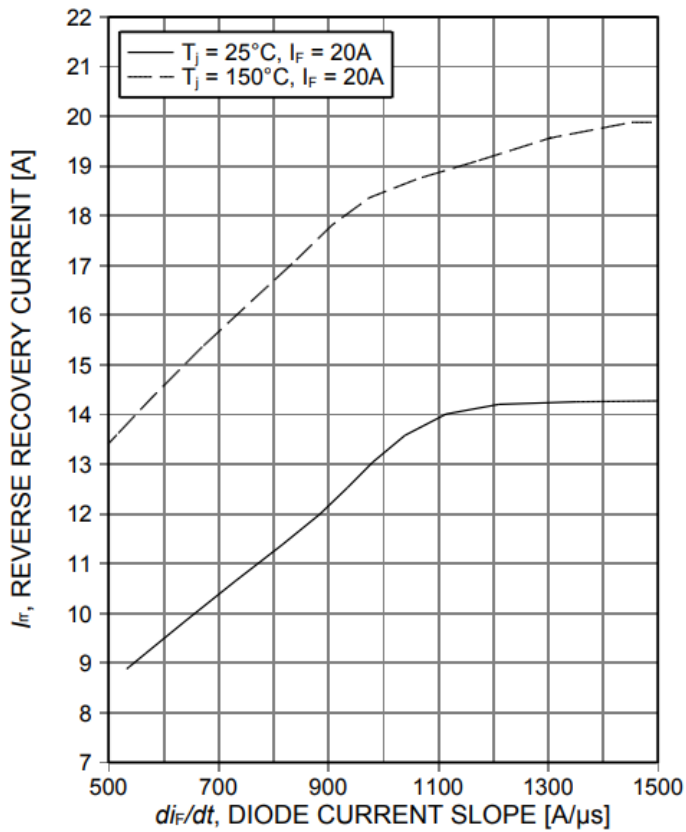


Figure 21. Typical reverse recovery current as a function of diode current slope ( $V_R=400V$ )

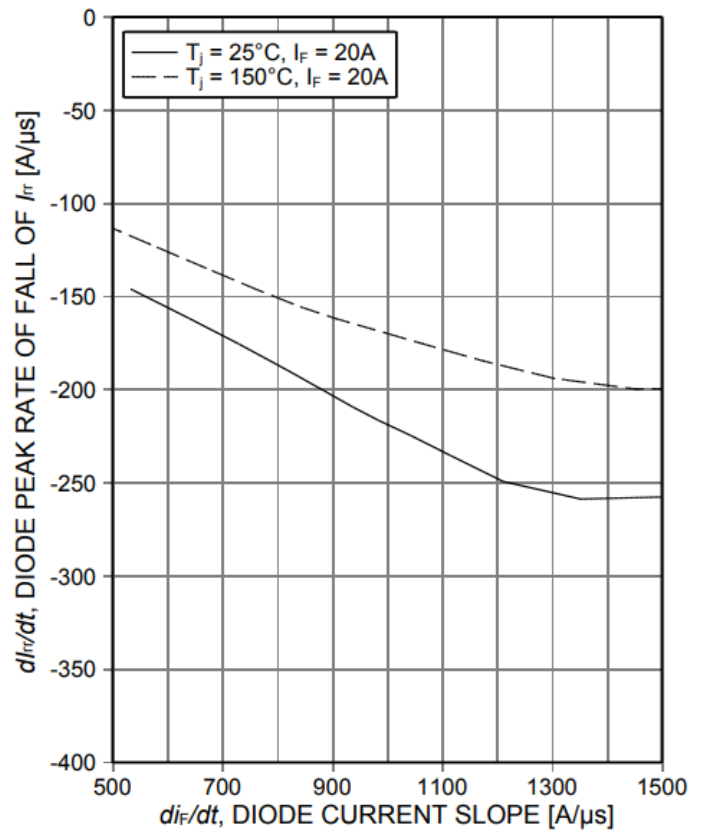


Figure 22. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope ( $V_R=400V$ )

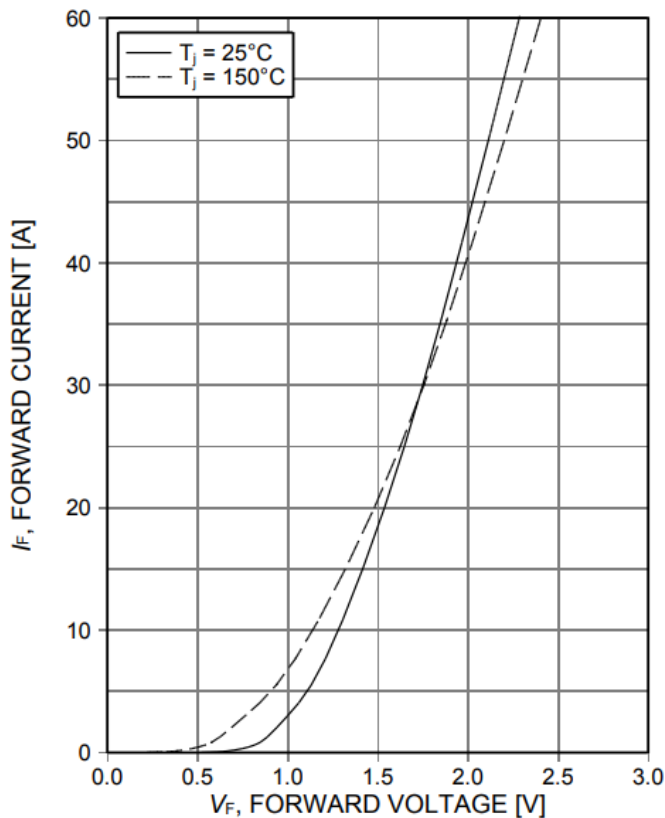


Figure 23. Typical diode forward current as a function of forward voltage

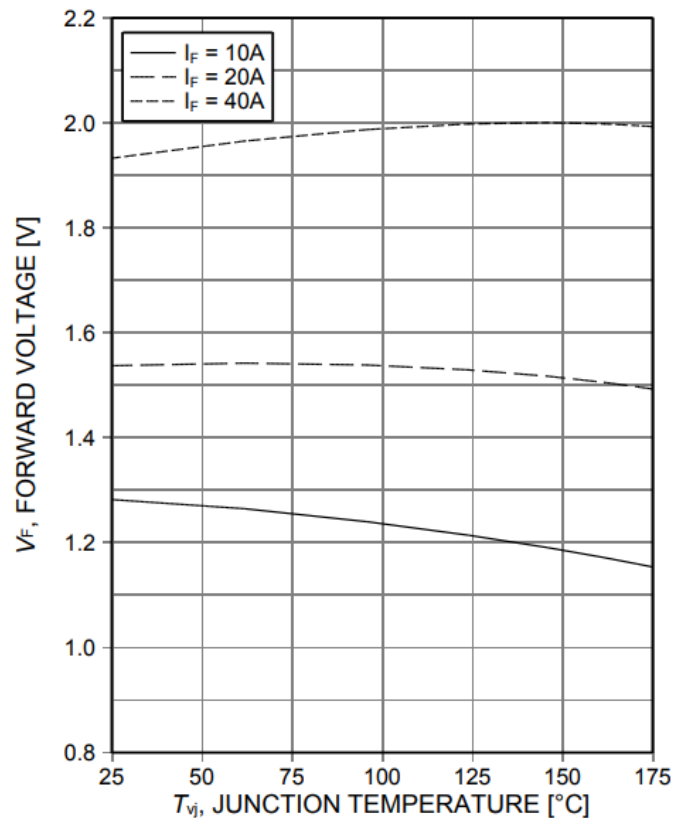


Figure 24. Typical diode forward voltage as a function of junction temperature



## 第五代高速开关系列

## 测试条件

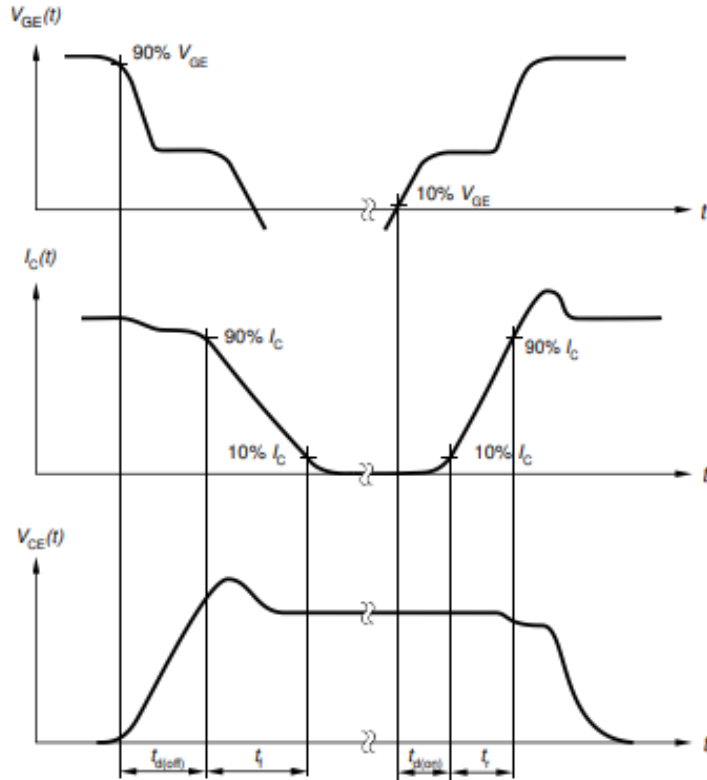


Figure A. Definition of switching times

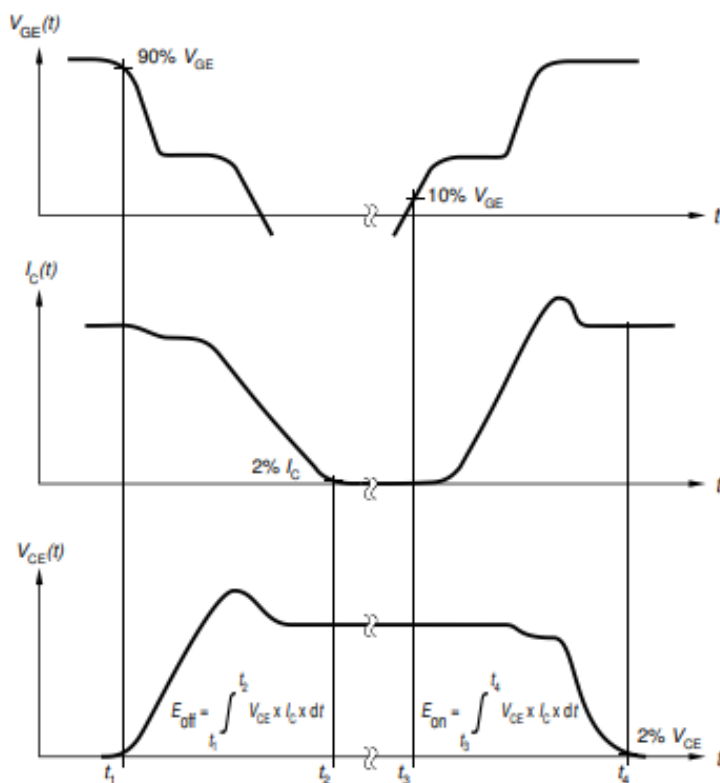


Figure B. Definition of switching losses

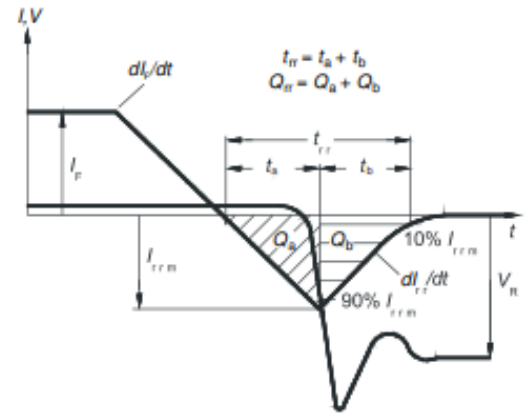


Figure C. Definition of diode switching characteristics

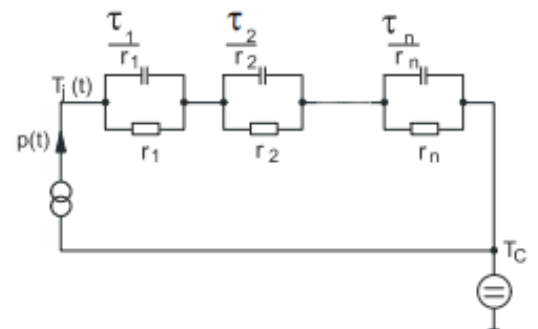


Figure D. Thermal equivalent circuit

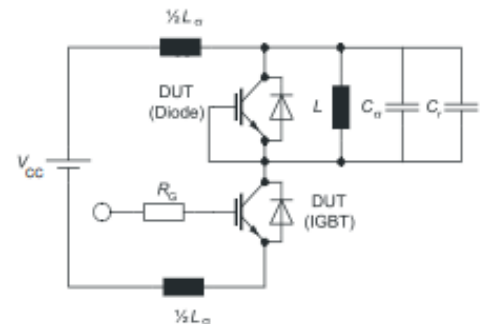


Figure E. **Dynamic test circuit**  
 Parasitic inductance  $L_{\sigma}$ ,  
 parasitic capacitor  $C_{\sigma}$ ,  
 relief capacitor  $C_r$ ,  
 (only for ZVT switching)



第五代高速开关系列

修订记录

AIKW40N65DH5

**Revision: 2017-06-30, Rev. 2.1**

历史修订版本

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.1      | 2017-06-30 | Data sheet created                           |

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