



SANYO Semiconductors

# DATA SHEET

## VEC2904

 PNP Epitaxial Planar Silicon Transistor  
 P-Channel Silicon MOSFET

## General-Purpose Switching Device Applications

### Features

- Composite type, facilitating high-density mounting.
- Mounting height 0.75mm.

### Specifications

**Absolute Maximum Ratings** at Ta=25°C

| Parameter                    | Symbol           | Conditions  | Ratings     | Unit |
|------------------------------|------------------|---|-------------|------|
| [TR]                         |                  |   |             |      |
| Collector-to-Base Voltage    | V <sub>CB0</sub> |   | -30         | V    |
| Collector-to-Emitter Voltage | V <sub>CEO</sub> |   | -30         | V    |
| Emitter-to-Collector Voltage | V <sub>ECO</sub> |   | -6.5        | V    |
| Emitter-to-Base Voltage      | V <sub>EBO</sub> |   | -5          | V    |
| Collector Current            | I <sub>C</sub>   |   | -3          | A    |
| Collector Current (Pulse)    | I <sub>CP</sub>  |   | -5          | A    |
| Base Current                 | I <sub>B</sub>   |   | -600        | mA   |
| Collector Dissipation        | P <sub>C</sub>   | When mounted on ceramic substrate (900mm <sup>2</sup> ×0.8mm) 1unit | 1.1         | W    |
| Junction Temperature         | T <sub>J</sub>   |   | 150         | °C   |
| Storage Temperature          | T <sub>stg</sub> |   | -55 to +150 | °C   |
| [FET]                        |                  |   |             |      |
| Drain-to-Source Voltage      | V <sub>DSS</sub> |   | -12         | V    |
| Gate-to-Source Voltage       | V <sub>GSS</sub> |   | ±8          | V    |
| Drain Current (DC)           | I <sub>D</sub>   |   | -4          | A    |
| Drain Current (Pulse)        | I <sub>DP</sub>  | PW≤10μs, duty cycle≤1%  | -16         | A    |
| Allowable Power Dissipation  | P <sub>D</sub>   | When mounted on ceramic substrate (900mm <sup>2</sup> ×0.8mm) 1unit | 1.1         | W    |
| Channel Temperature          | T <sub>ch</sub>  |   | 150         | °C   |
| Storage Temperature          | T <sub>stg</sub> |   | -55 to +150 | °C   |

Marking : AH

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**SANYO Semiconductor Co., Ltd.**

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# VEC2904

## Electrical Characteristics at Ta=25°C

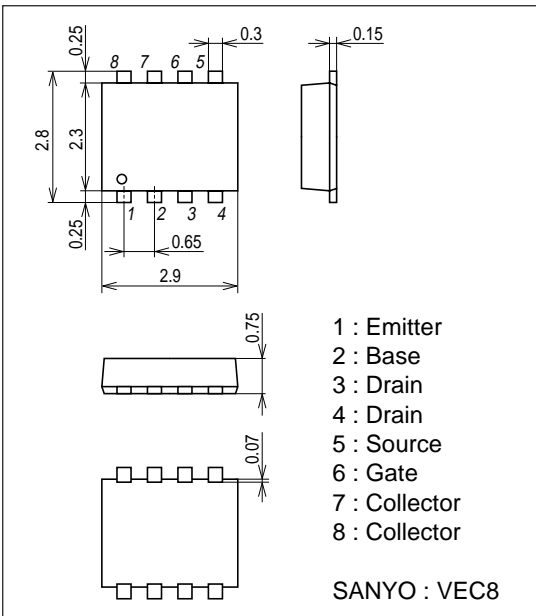
| Parameter                                  | Symbol         | Conditions                          | Ratings |       |          | Unit       |
|--|----------------|-------------------------------------|---------|-------|----------|------------|
|  |                |                                     | min     | typ   | max      |            |
| [TR]                                       |                |                                     |         |       |          |            |
| Collector Cutoff Current                   | $I_{CBO}$      | $V_{CB}=-30V, I_E=0A$               |         |       | -0.1     | $\mu A$    |
| Emitter Cutoff Current                     | $I_{EBO}$      | $V_{EB}=-4V, I_C=0A$                |         |       | -0.1     | $\mu A$    |
| DC Current Gain                            | $h_{FE}$       | $V_{CE}=-2V, I_C=-500mA$            | 200     |       | 560      |            |
| Gain-Bandwidth Product                     | $f_T$          | $V_{CE}=-10V, I_C=-500mA$           |         | 380   |          | MHz        |
| Output Capacitance                         | $C_{ob}$       | $V_{CB}=-10V, f=1MHz$               |         | 25    |          | pF         |
| Collector-to-Emitter Saturation Voltage    | $V_{CE(sat)1}$ | $I_C=-1.5A, I_B=-30mA$              |         | -160  | -235     | mV         |
|  | $V_{CE(sat)2}$ | $I_C=-1.5A, I_B=-75mA$              |         | -110  | -160     | mV         |
| Base-to-Emitter Saturation Voltage         | $V_{BE(sat)}$  | $I_C=-1.5A, I_B=-30mA$              |         | -0.83 | -1.2     | V          |
| Collector-to-Base Breakdown Voltage        | $V_{(BR)CBO}$  | $I_C=-10\mu A, I_E=0A$              | -30     |       |          | V          |
| Collector-to-Emitter Breakdown Voltage     | $V_{(BR)CEO}$  | $I_C=-1mA, R_{BE}=\infty$           | -30     |       |          | V          |
| Emitter-to-Collector Breakdown Voltage     | $V_{(BR)ECO}$  | $I_C=-10\mu A, R_{CB}=\infty$       | -6.5    |       |          | V          |
| Emitter-to-Base Breakdown Voltage          | $V_{(BR)EBO}$  | $I_E=-10\mu A, I_C=0A$              | -5      |       |          | V          |
| Turn-ON Time                               | $t_{on}$       | See specified Test Circuit.         |         | 50    |          | ns         |
| Storage Time                               | $t_{stg}$      | See specified Test Circuit.         |         | 270   |          | ns         |
| Fall Time                                  | $t_f$          | See specified Test Circuit.         |         | 25    |          | ns         |
| [FET]                                      |                |                                     |         |       |          |            |
| Drain-to-Source Breakdown Voltage          | $V_{(BR)DSS}$  | $I_D=-1mA, V_{GS}=0V$               | -12     |       |          | V          |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$      | $V_{DS}=-12V, V_{GS}=0V$            |         |       | -10      | $\mu A$    |
| Gate-to-Source Leakage Current             | $I_{GSS}$      | $V_{GS}=\pm 6.4V, V_{DS}=0V$        |         |       | $\pm 10$ | $\mu A$    |
| Cutoff Voltage                             | $V_{GS(off)}$  | $V_{DS}=-6V, I_D=-1mA$              | -0.3    |       | -1.0     | V          |
| Forward Transfer Admittance                | $ y_{fs} $     | $V_{DS}=-6V, I_D=-2A$               | 4.5     | 7.6   |          | S          |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$  | $I_D=-2A, V_{GS}=-4.5V$             |         | 37    | 49       | m $\Omega$ |
|  | $R_{DS(on)2}$  | $I_D=-1A, V_{GS}=-2.5V$             |         | 54    | 75       | m $\Omega$ |
|  | $R_{DS(on)3}$  | $I_D=-0.3A, V_{GS}=-1.8V$           |         | 76    | 107      | m $\Omega$ |
| Input Capacitance                          | $C_{iss}$      | $V_{DS}=-6V, f=1MHz$                |         | 940   |          | pF         |
| Output Capacitance                         | $C_{oss}$      | $V_{DS}=-6V, f=1MHz$                |         | 230   |          | pF         |
| Reverse Transfer Capacitance               | $C_{rss}$      | $V_{DS}=-6V, f=1MHz$                |         | 180   |          | pF         |
| Turn-ON Delay Time                         | $t_d(on)$      | See specified Test Circuit.         |         | 14    |          | ns         |
| Rise Time                                  | $t_r$          | See specified Test Circuit.         |         | 120   |          | ns         |
| Turn-OFF Delay Time                        | $t_d(off)$     | See specified Test Circuit.         |         | 97    |          | ns         |
| Fall Time                                  | $t_f$          | See specified Test Circuit.         |         | 110   |          | ns         |
| Total Gate Charge                          | $Q_g$          | $V_{DS}=-6V, V_{GS}=-4.5V, I_D=-4A$ |         | 11    |          | nC         |
| Gate-to-Source Charge                      | $Q_{gs}$       | $V_{DS}=-6V, V_{GS}=-4.5V, I_D=-4A$ |         | 1.6   |          | nC         |
| Gate-to-Drain "Miller" Charge              | $Q_{gd}$       | $V_{DS}=-6V, V_{GS}=-4.5V, I_D=-4A$ |         | 2.8   |          | nC         |
| Diode Forward Voltage                      | $V_{SD}$       | $I_S=-4A, V_{GS}=0V$                |         | -0.85 | -1.2     | V          |

Note : The specifications shown above are for each individual transistor.

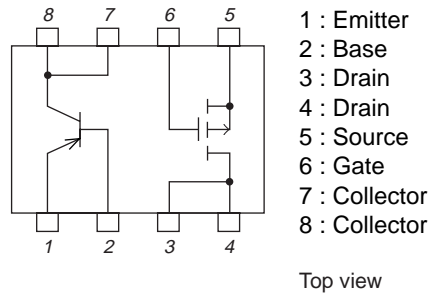
## Package Dimensions

unit : mm (typ)

7012-010



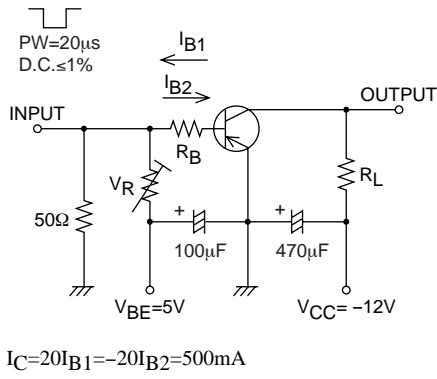
## Electrical Connection



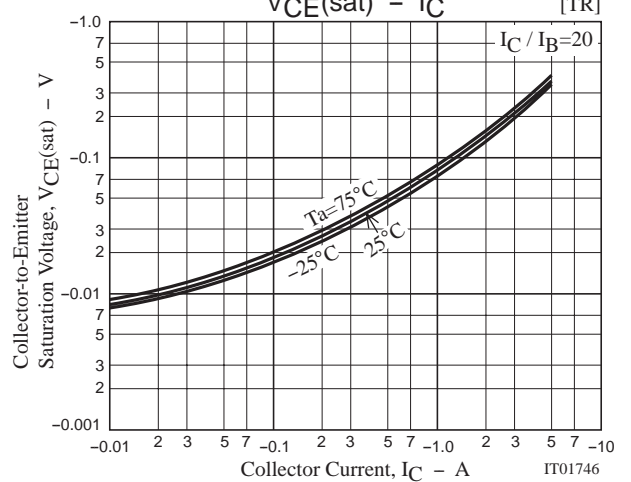
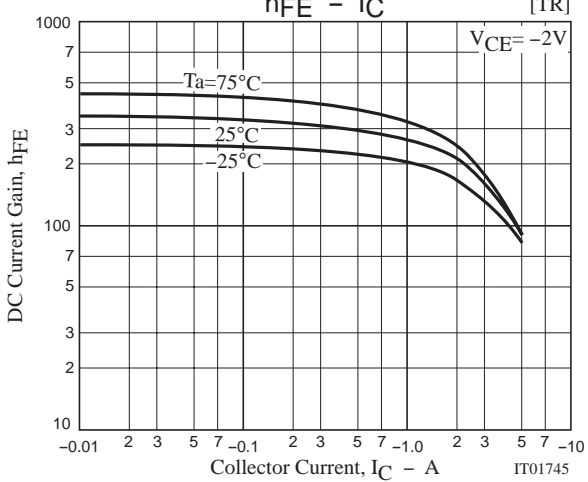
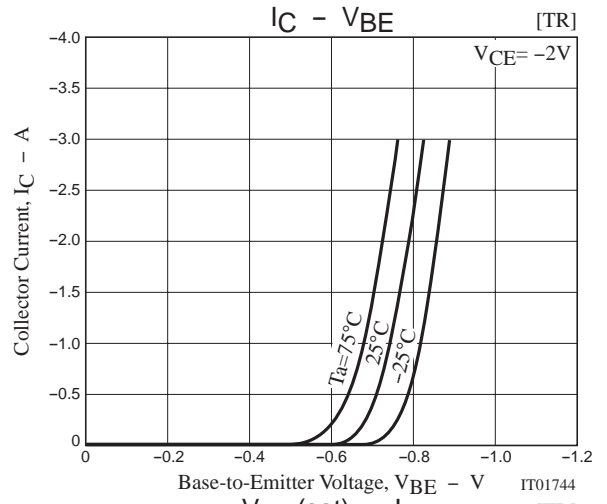
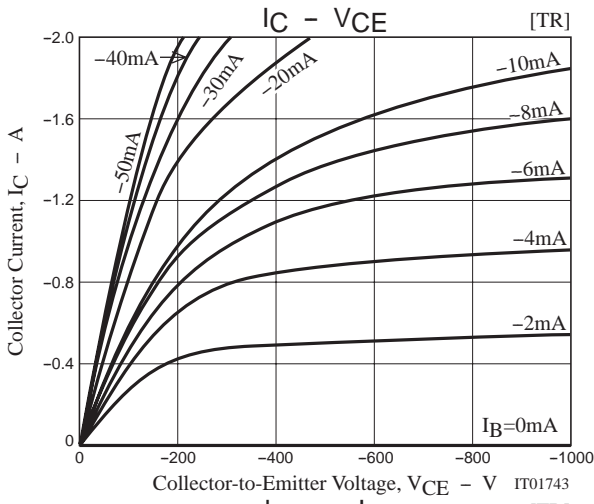
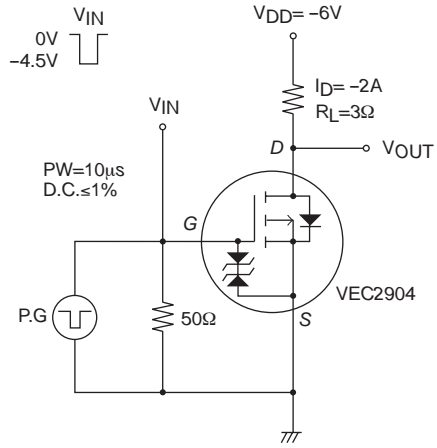
# VEC2904

## Switching Time Test Circuit

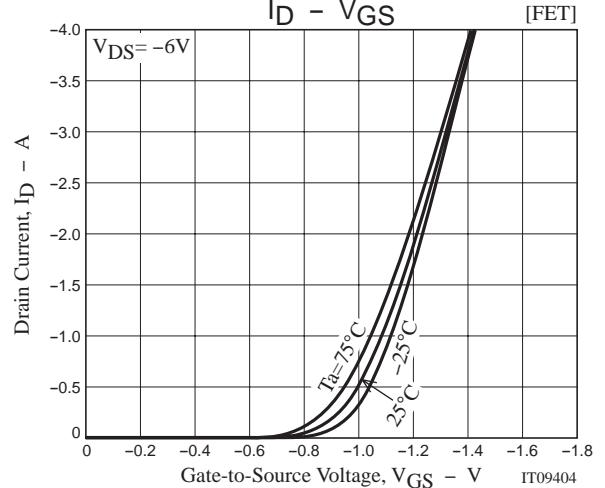
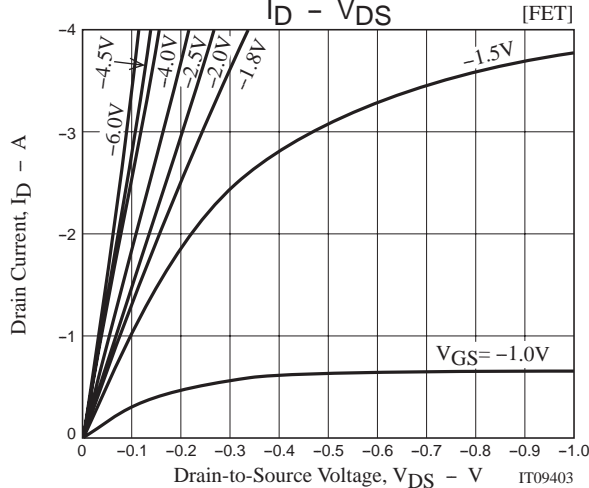
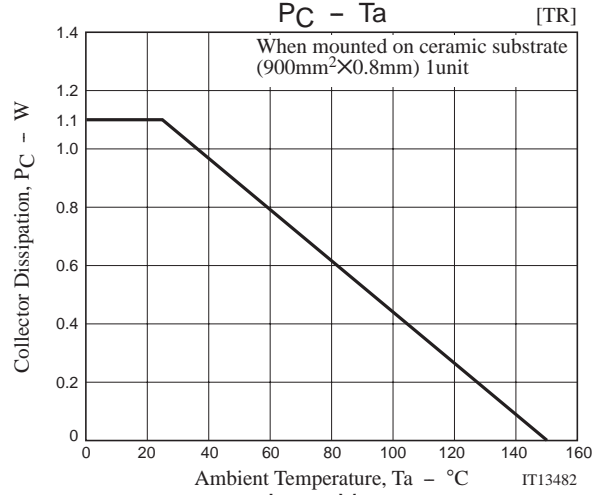
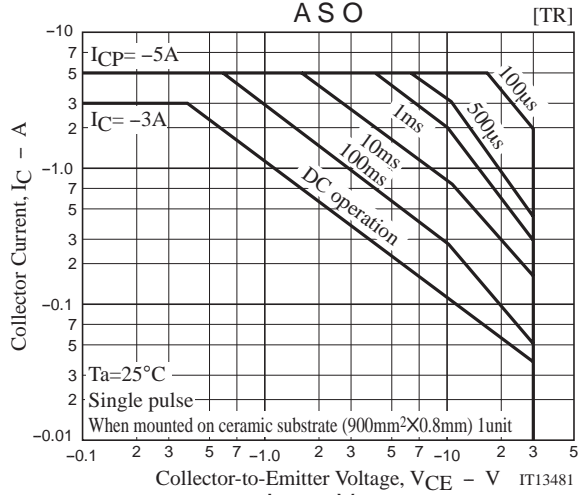
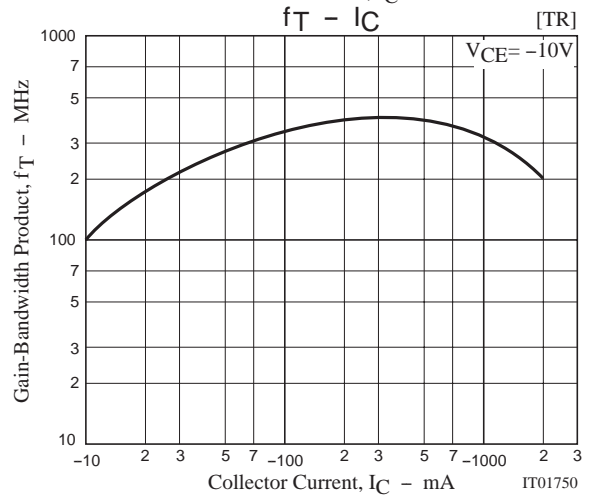
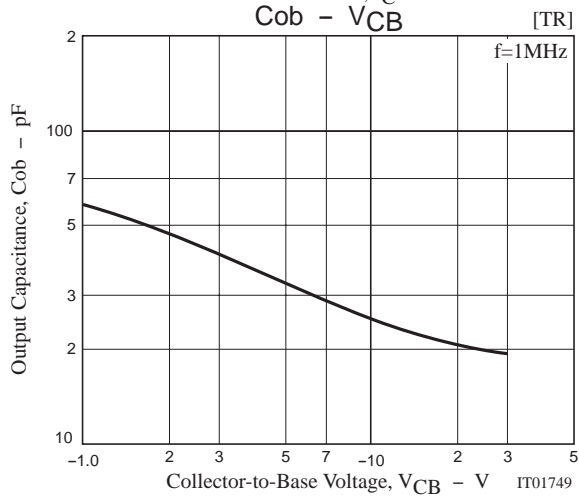
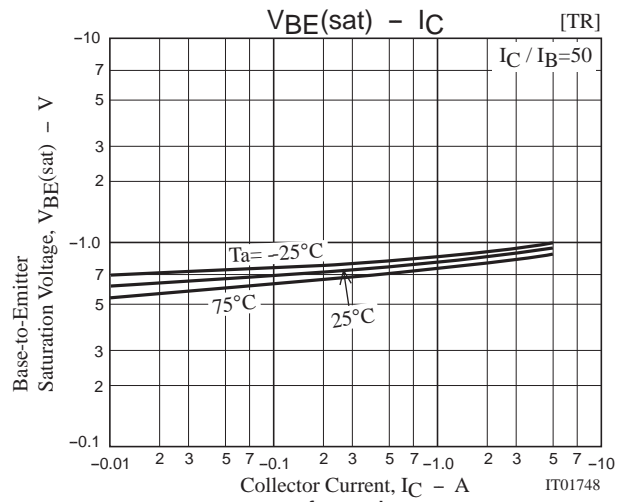
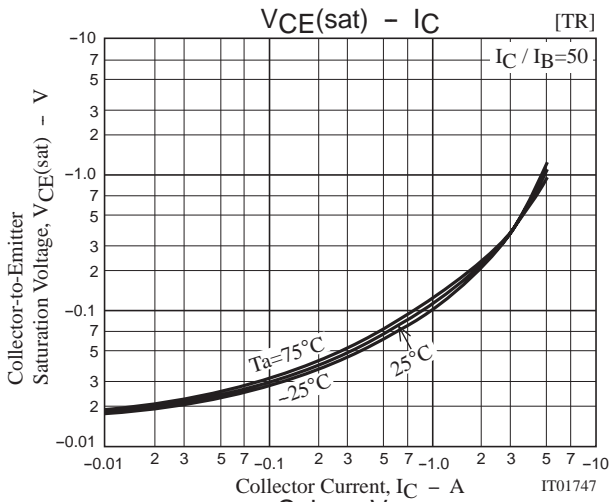
[TR]



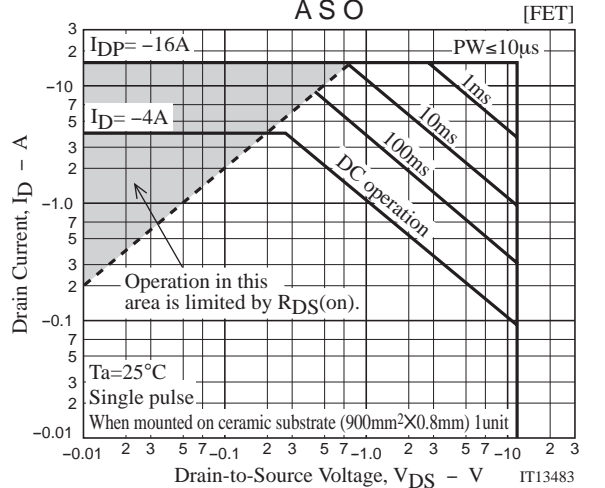
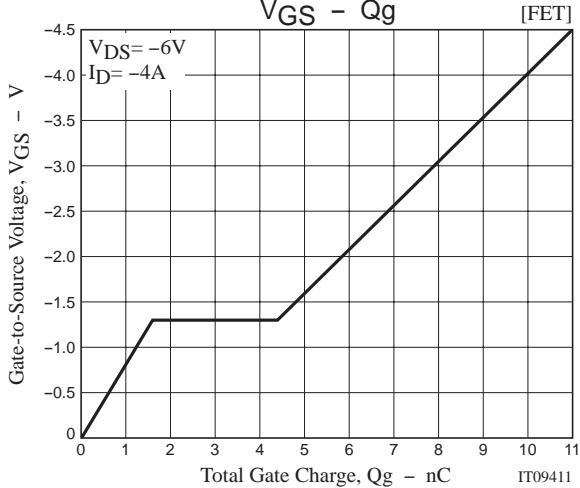
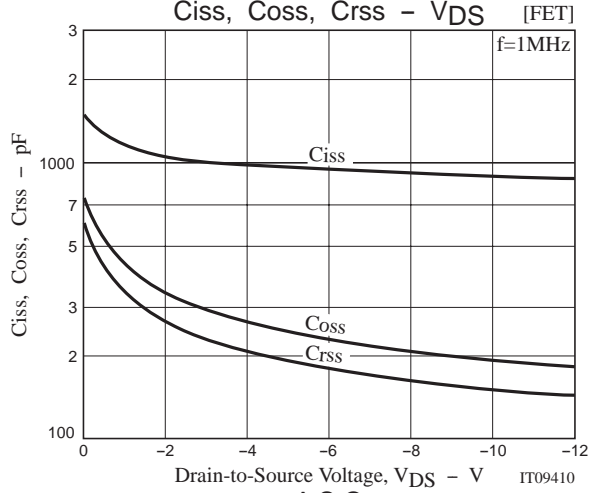
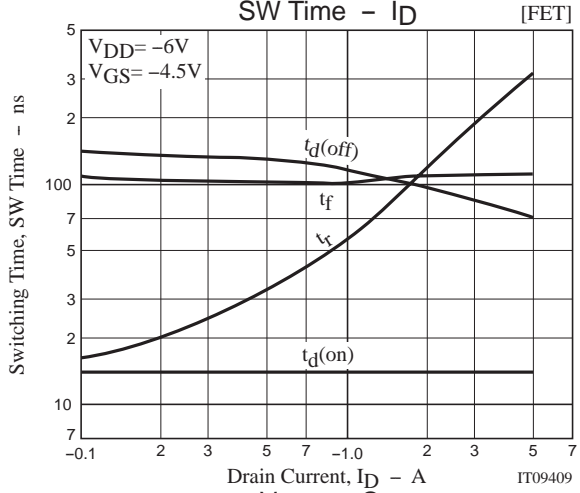
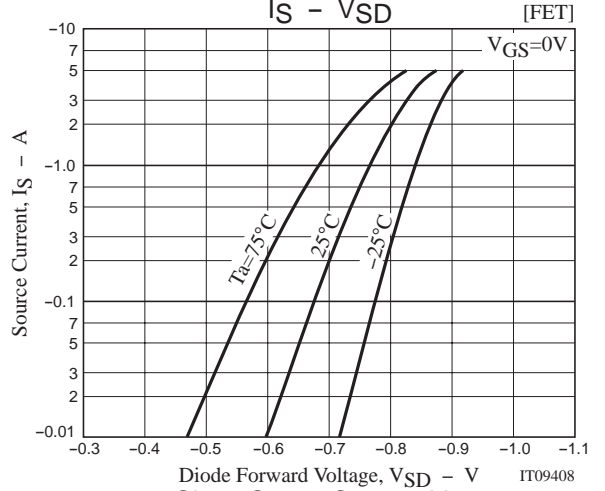
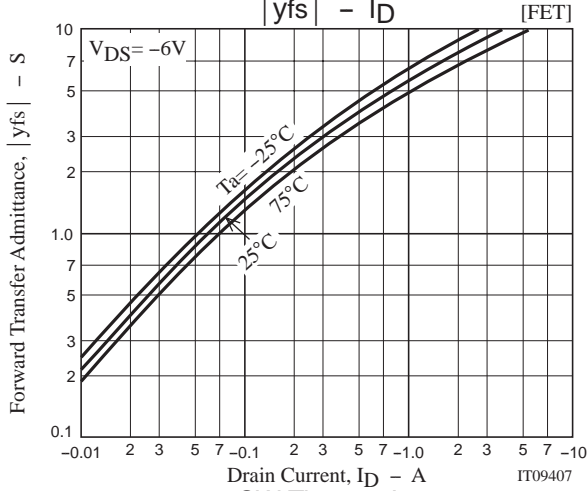
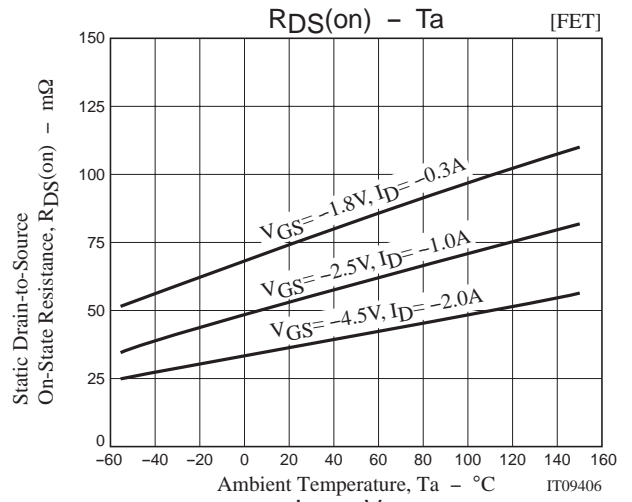
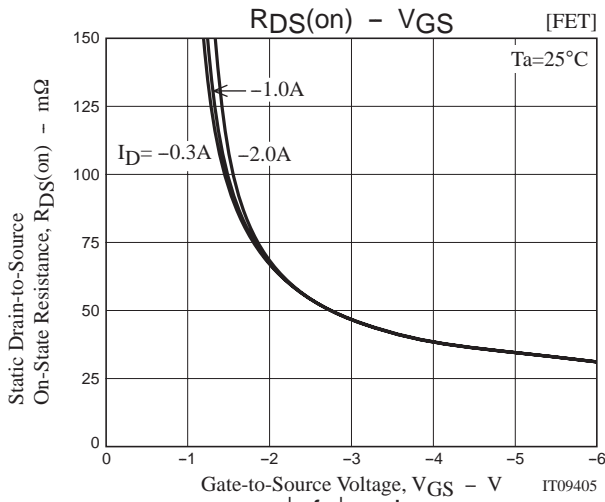
[FET]



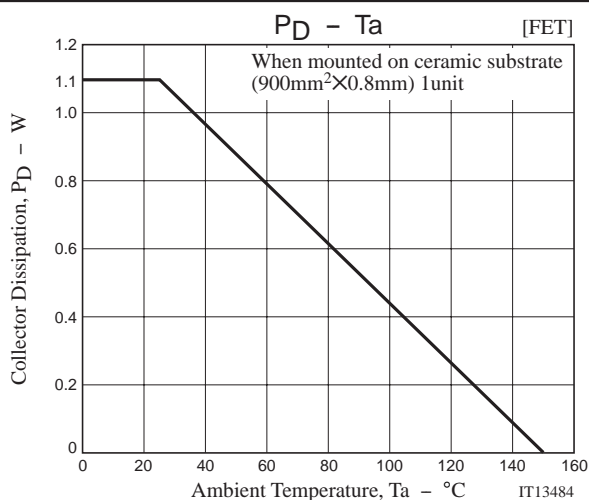
# VEC2904



# VEC2904



## VEC2904



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