Ordering number : ENA0104

SANYO Semiconductors
DATA SHEET

N-Channel and P-Channel Silicon MOSFETs

# VEC2610 — General-Purpose Switching Device Applications

## Features

- The best suited for inverter applications.
- The VEC2610 incorporates an N-channel MOSFET and a P-channel MOSFET that feature low ON-resistance, thereby enabling high-density mounting.
- Mounting height 0.75mm.
- 1.8V drive.

## Specifications

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

| Parameter | Symbol | Conditions | N-channel | P-channel | Unit |
|---|---|---|---|---|---|
| Drain-to-Source Voltage | $V_{DSS}$ | | 20 | -20 | V |
| Gate-to-Source Voltage | $V_{GSS}$ | | ±10 | ±10 | V |
| Drain Current (DC) | $I_D$ | | 4.5 | -3 | A |
| Drain Current (Pulse) | $I_{DP}$ | PW≤10μs, duty cycle≤1% | 18 | -12 | A |
| Allowable Power Dissipation | $P_D$ | Mounted on a ceramic board (900mm²X0.8mm)1unit | 0.9 | | W |
| Total Dissipation | $P_T$ | Mounted on a ceramic board (900mm²X0.8mm) | 1.0 | | W |
| Channel Temperature | Tch | | 150 | | °C |
| Storage Temperature | Tstg | | -55 to +150 | | °C |

### Electrical Characteristics at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| [N-channel] | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=1mA, $V_{GS}$=0V | 20 | | | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=20V, $V_{GS}$=0V | | | 1 | μA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±8V, $V_{DS}$=0V | | | ±10 | μA |
| Cutoff Voltage | $V_{GS}$(off) | $V_{DS}$=10V, $I_D$=1mA | 0.5 | | 1.3 | V |
| Forward Transfer Admittance | \|yfs\| | $V_{DS}$=10V, $I_D$=2.5A | 4.5 | 7.5 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS}$(on)1 | $I_D$=2A, $V_{GS}$=4V | | 32 | 42 | mΩ |
| | $R_{DS}$(on)2 | $I_D$=1A, $V_{GS}$=2.5V | | 40 | 57 | mΩ |
| | $R_{DS}$(on)3 | $I_D$=0.3A, $V_{GS}$=1.8V | | 55 | 80 | mΩ |
| Input Capacitance | Ciss | $V_{DS}$=10V, f=1MHz | | 570 | | pF |
| Output Capacitance | Coss | $V_{DS}$=10V, f=1MHz | | 110 | | pF |
| Reverse Transfer Capacitance | Crss | $V_{DS}$=10V, f=1MHz | | 80 | | pF |

Marking : CG

Continued on next page.



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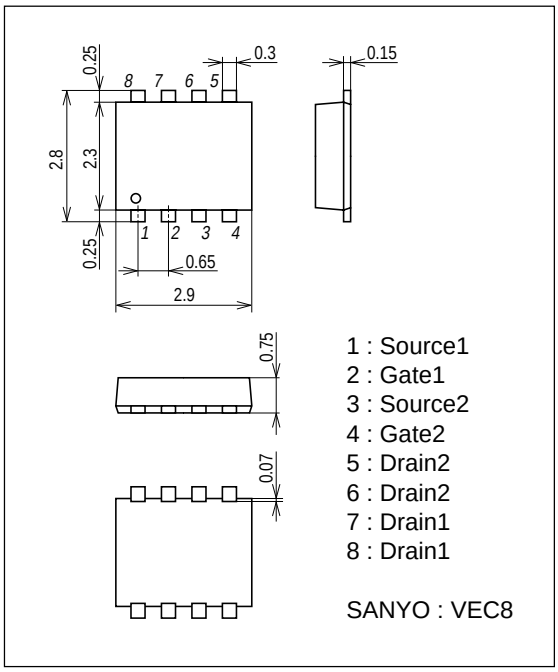
Continued from preceding page.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Turn-ON Delay Time | $t_{d(on)}$ | See specified Test Circuit. | | 15 | | ns |
| Rise Time | $t_r$ | See specified Test Circuit. | | 105 | | ns |
| Turn-OFF Delay Time | $t_{d(off)}$ | See specified Test Circuit. | | 50 | | ns |
| Fall Time | $t_f$ | See specified Test Circuit. | | 52 | | ns |
| Total Gate Charge | Qg | $V_{DS}$=10V, $V_{GS}$=4V, $I_D$=4.5A | | 7.6 | | nC |
| Gate-to-Source Charge | Qgs | $V_{DS}$=10V, $V_{GS}$=4V, $I_D$=4.5A | | 1.2 | | nC |
| Gate-to-Drain “Miller” Charge | Qgd | $V_{DS}$=10V, $V_{GS}$=4V, $I_D$=4.5A | | 2.1 | | nC |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=4.5A, $V_{GS}$=0V | | 0.85 | 1.2 | V |
| [P-channel] | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=–1mA, $V_{GS}$=0V | –20 | | | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=–20V, $V_{GS}$=0V | | | –1 | μA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±8V, $V_{DS}$=0V | | | ±10 | μA |
| Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$=–10V, $I_D$=–1mA | –0.4 | | –1.3 | V |
| Forward Transfer Admittance | $\|yfs\|$ | $V_{DS}$=–10V, $I_D$=–1.5A | 2.9 | 4.9 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$ | $I_D$=–2A, $V_{GS}$=–4.5V | | 62 | 81 | mΩ |
| | $R_{DS(on)2}$ | $I_D$=–1A, $V_{GS}$=–2.5V | | 87 | 120 | mΩ |
| | $R_{DS(on)3}$ | $I_D$=–0.3A, $V_{GS}$=–1.8V | | 145 | 205 | mΩ |
| Input Capacitance | Ciss | $V_{DS}$=–10V, f=1MHz | | 680 | | pF |
| Output Capacitance | Coss | $V_{DS}$=–10V, f=1MHz | | 115 | | pF |
| Reverse Transfer Capacitance | Crss | $V_{DS}$=–10V, f=1MHz | | 80 | | pF |
| Turn-ON Delay Time | $t_{d(on)}$ | See specified Test Circuit. | | 13 | | ns |
| Rise Time | $t_r$ | See specified Test Circuit. | | 53 | | ns |
| Turn-OFF Delay Time | $t_{d(off)}$ | See specified Test Circuit. | | 77 | | ns |
| Fall Time | $t_f$ | See specified Test Circuit. | | 62 | | ns |
| Total Gate Charge | Qg | $V_{DS}$=–10V, $V_{GS}$=–4.5V, $I_D$=–3A | | 8.2 | | nC |
| Gate-to-Source Charge | Qgs | $V_{DS}$=–10V, $V_{GS}$=–4.5V, $I_D$=–3A | | 1.7 | | nC |
| Gate-to-Drain “Miller” Charge | Qgd | $V_{DS}$=–10V, $V_{GS}$=–4.5V, $I_D$=–3A | | 2.1 | | nC |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=–3A, $V_{GS}$=0V | | –0.88 | –1.2 | V |

## Package Dimensions

unit : mm

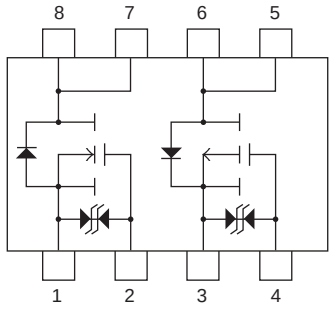
7012-002




1 : Source1
2 : Gate1
3 : Source2
4 : Gate2
5 : Drain2
6 : Drain2
7 : Drain1
8 : Drain1

SANYO : VEC8

## Electrical Connection

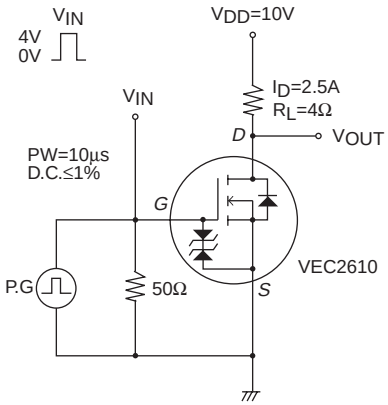



1 : Source1
2 : Gate1
3 : Source2
4 : Gate2
5 : Drain2
6 : Drain2
7 : Drain1
8 : Drain1

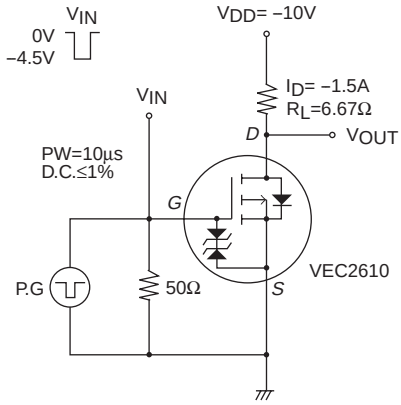
Top view

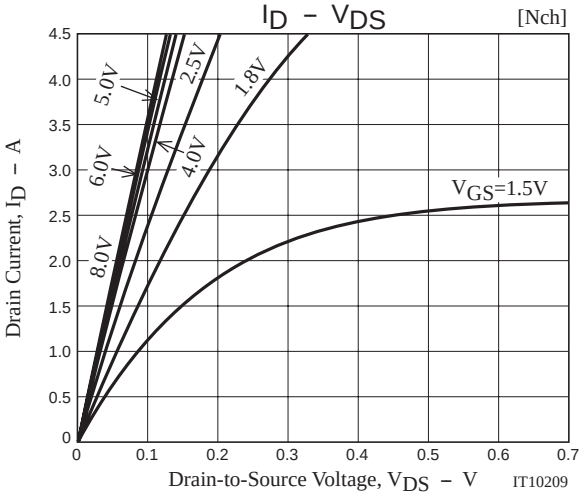
## Switching Time Test Circuit

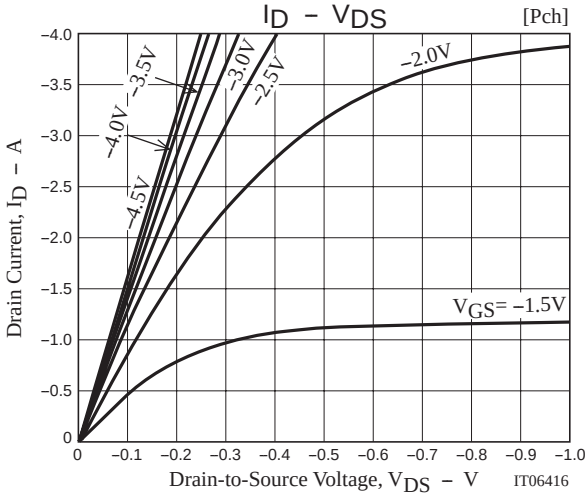
[N-channel]

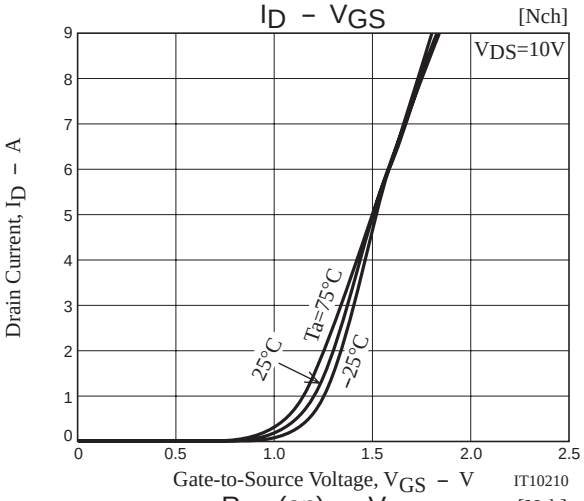


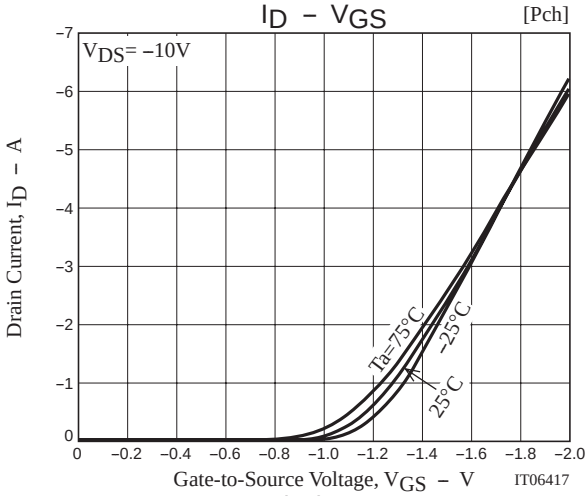

[P-channel]

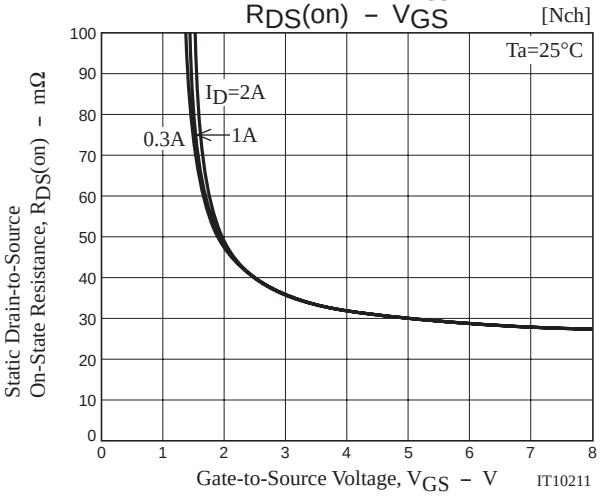


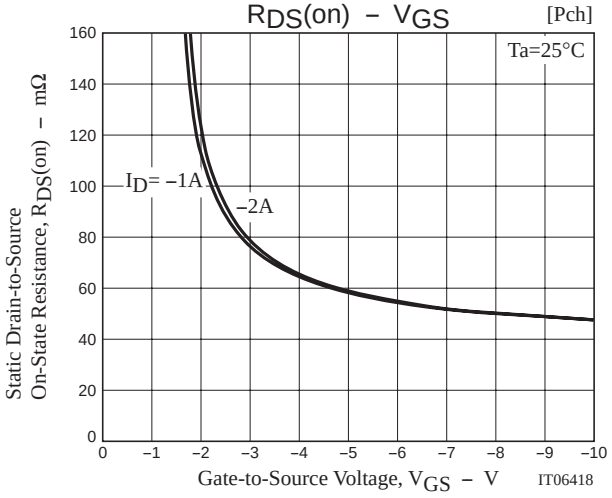



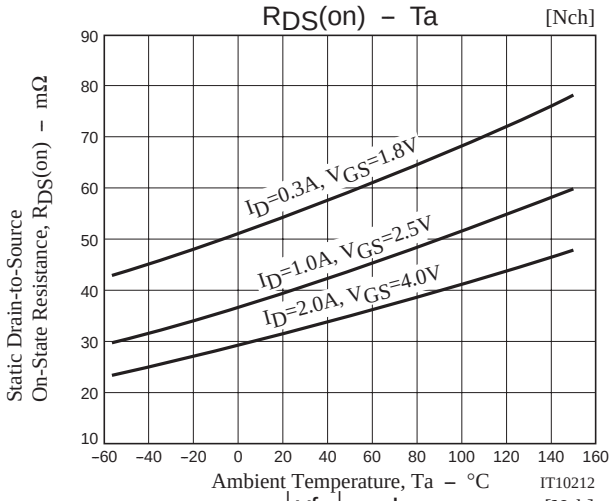



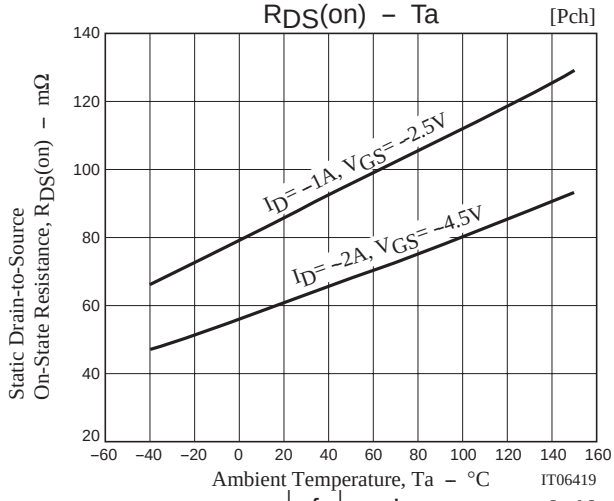



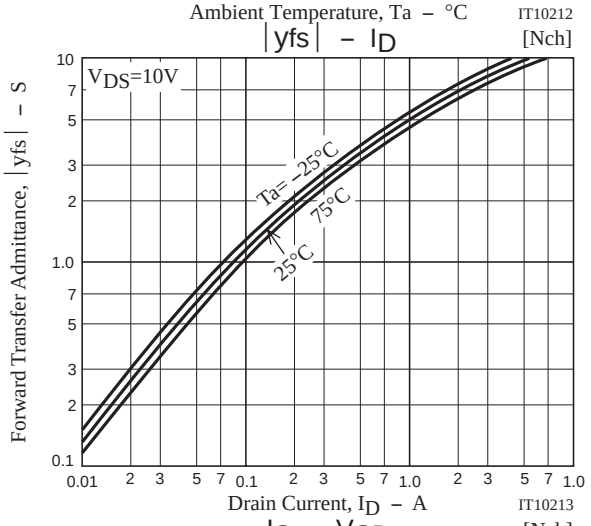



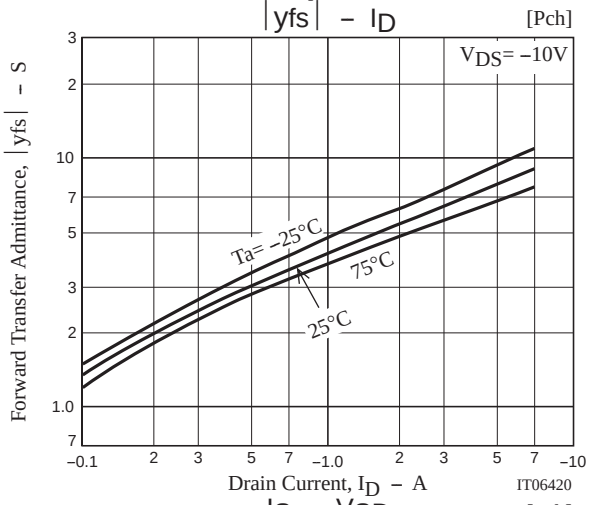



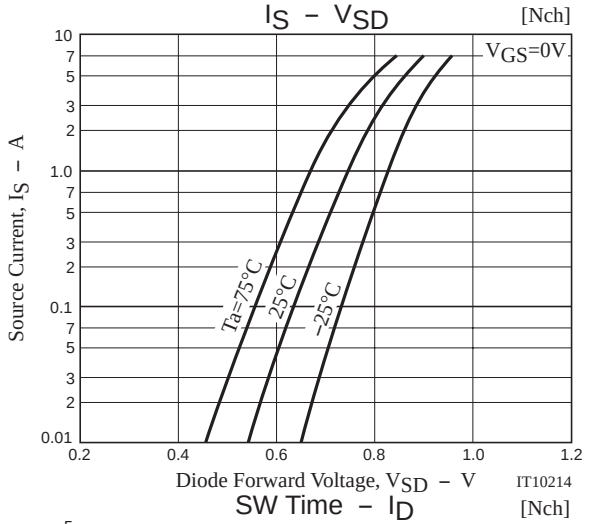



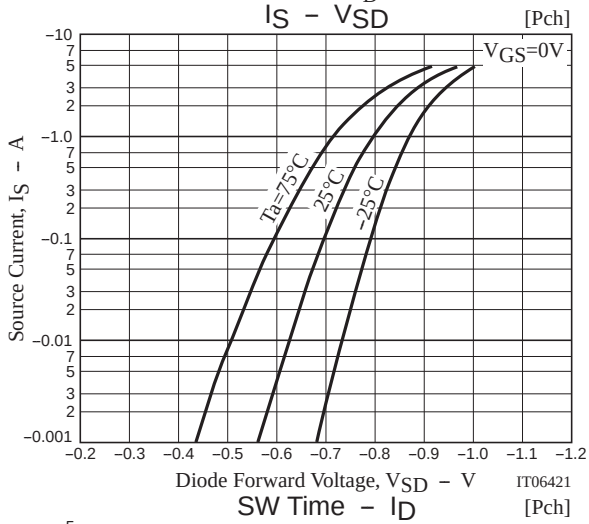

RDS(on) – Ta
[Nch]
Static Drain-to-Source On-State Resistance, RDS(on) – mΩ
ID=0.3A, VGS=1.8V
ID=1.0A, VGS=2.5V
ID=2.0A, VGS=4.0V
Ambient Temperature, Ta – °C
IT10212

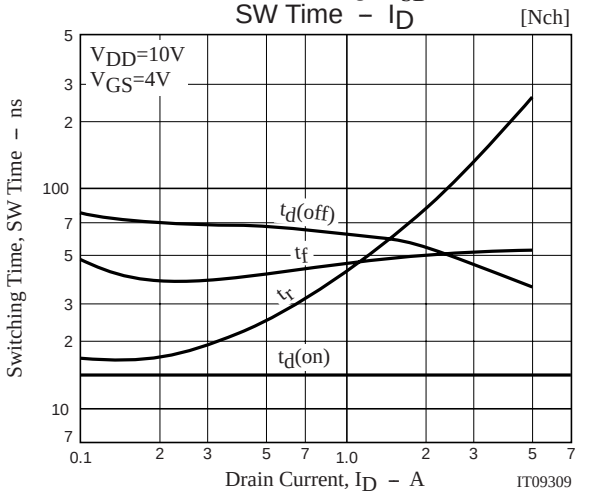

RDS(on) – Ta
[Pch]
Static Drain-to-Source On-State Resistance, RDS(on) – mΩ
ID= –1A, VGS= –2.5V
ID= –2A, VGS= –4.5V
Ambient Temperature, Ta – °C
IT06419

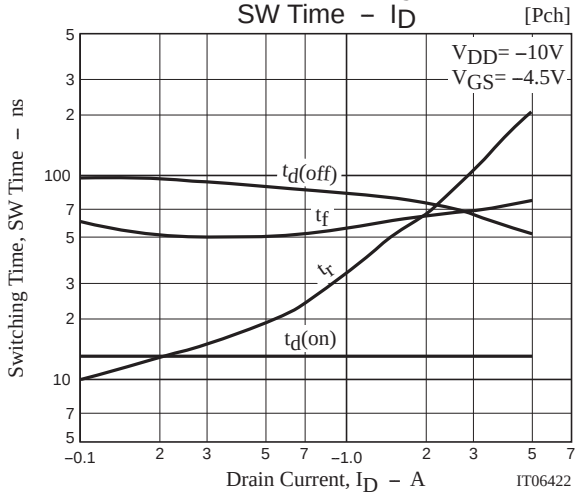

|yfs| – ID
[Nch]
VDS=10V
Forward Transfer Admittance, |yfs| – S
Ta= –25°C
75°C
25°C
Drain Current, ID – A
IT10213


|yfs| – ID
[Pch]
VDS= –10V
Forward Transfer Admittance, |yfs| – S
Ta= –25°C
75°C
25°C
Drain Current, ID – A
IT06420

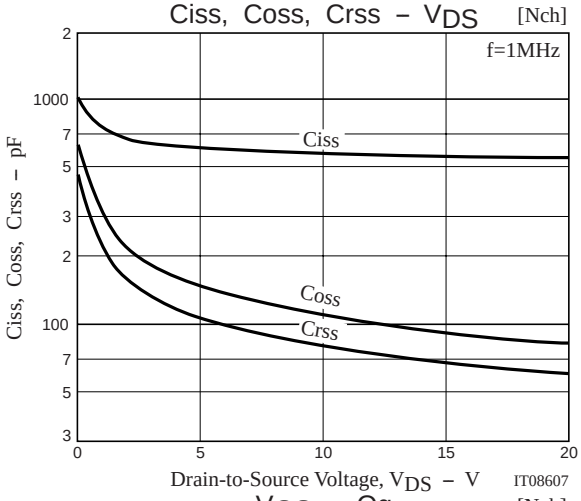

IS – VSD
[Nch]
VGS=0V
Source Current, IS – A
Ta=75°C
25°C
–25°C
Diode Forward Voltage, VSD – V
IT10214


IS – VSD
[Pch]
VGS=0V
Source Current, IS – A
Ta=75°C
25°C
–25°C
Diode Forward Voltage, VSD – V
IT06421

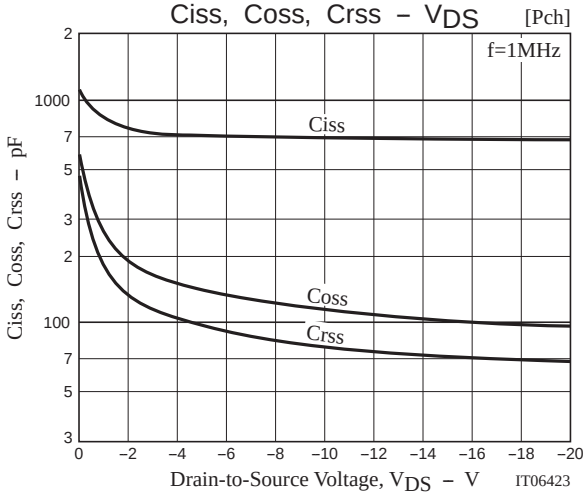

SW Time – ID
[Nch]
VDD=10V
VGS=4V
Switching Time, SW Time – ns
td(off)
tf
tr
td(on)
Drain Current, ID – A
IT09309


SW Time – ID
[Pch]
VDD= –10V
VGS= –4.5V
Switching Time, SW Time – ns
td(off)
tf
tr
td(on)
Drain Current, ID – A
IT06422

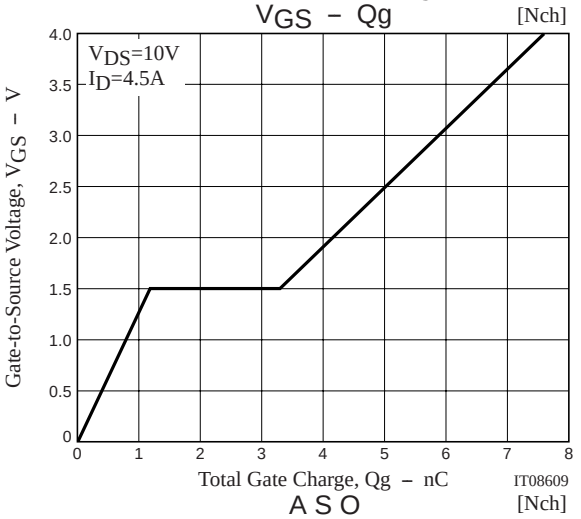
Ciss, Coss, Crss – $V_{DS}$ [Nch]



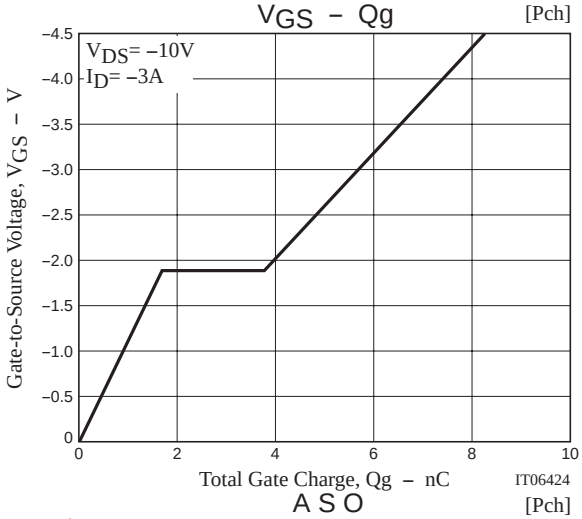

Ciss, Coss, Crss – $V_{DS}$ [Pch]



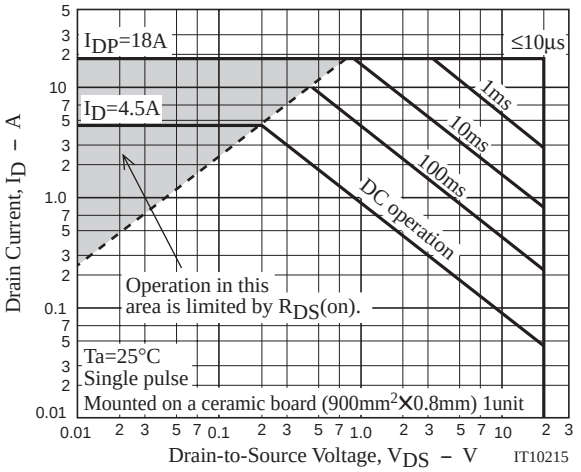

$V_{GS}$ – Qg [Nch]



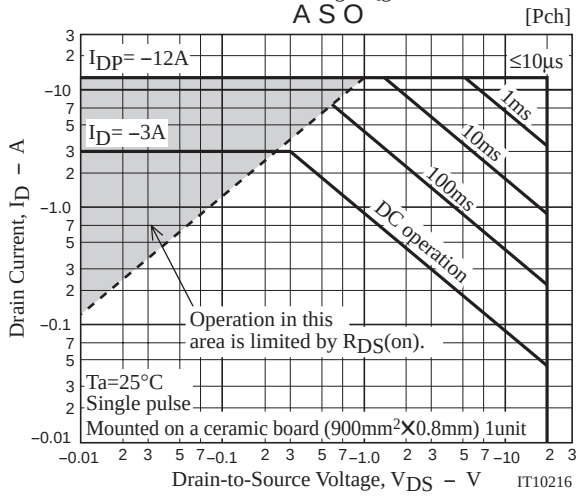

$V_{GS}$ – Qg [Pch]



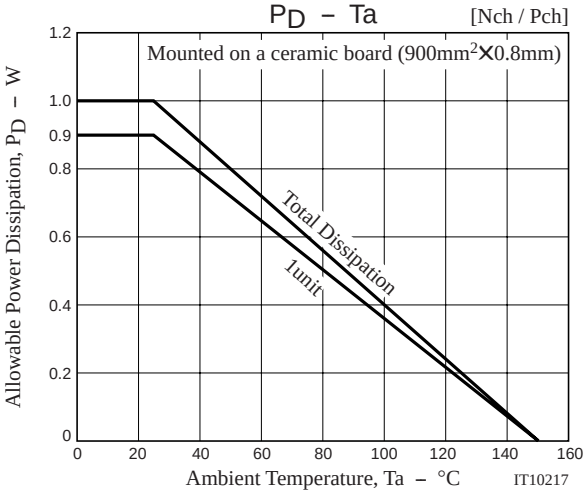

A S O [Nch]




A S O [Pch]




$P_D$ – Ta [Nch / Pch]



Note on usage : Since the VEC2610 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.