



### CSTS60J04F Dual N-Ch 40V MOSFETs

#### CSTS60J04F Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$

#### CSTS60J04F Product Summary

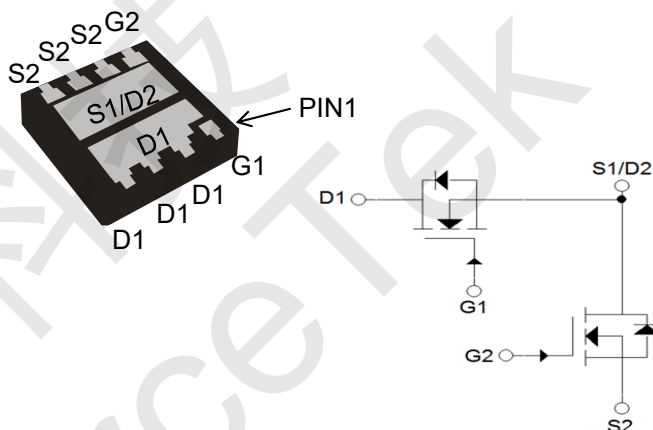


| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 6.9mΩ | 40A |

#### CSTS60J04F Applications

- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

#### CSTS60J04F DFN5060-8L Pin Configuration



#### CSTS60J04F Absolute Maximum Ratings

| Symbol                  | Parameter                                  | Rating     | Units      |
|-------------------------|--|------------|------------|
| $V_{DS}$                | Drain-Source Voltage                       | 40         | V          |
| $V_{GS}$                | Gate-Source Voltage                        | $\pm 20$   | V          |
| $I_D @ T_C=25^\circ C$  | Continuous Drain Current <sup>1</sup>      | 40         | A          |
| $I_D @ T_C=100^\circ C$ | Continuous Drain Current <sup>1</sup>      | 25         | A          |
| $I_{DM}$                | Pulsed Drain Current <sup>2</sup>          | 100        | A          |
| EAS                     | Single Pulse Avalanche Energy <sup>3</sup> | 28         | mJ         |
| $I_{AS}$                | Avalanche Current                          | 40         | A          |
| $P_D @ T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>       | 29         | W          |
| $T_{STG}$               | Storage Temperature Range                  | -55 to 150 | $^\circ C$ |
| $T_J$                   | Operating Junction Temperature Range       | -55 to 150 | $^\circ C$ |

#### CSTS60J04F Thermal Data

| Symbol          | Parameter   | Typ. | Max. | Unit         |
|-----------------|---|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | ---  | 60   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>                   | ---  | 3.2  | $^\circ C/W$ |



#### CSTS60J04F Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

| Symbol       | Parameter                                      | Conditions  | Min. | Typ. | Max.      | Unit       |
|--------------|--|---|------|------|-----------|------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$                           | 40   | ---  | ---       | V          |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=12A$                               | ---  | 6.9  | 8.5       | m $\Omega$ |
|              |  | $V_{GS}=4.5V, I_D=10A$                              | ---  | 10.0 | 15        |            |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}, I_D=250\mu A$                       | 1.35 | ---  | 3         | V          |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=32V, V_{GS}=0V, T_J=25^\circ\text{C}$       | ---  | ---  | 1         | $\mu A$    |
|              |  | $V_{DS}=32V, V_{GS}=0V, T_J=55^\circ\text{C}$       | ---  | ---  | 5         |            |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V, V_{DS}=0V$                         | ---  | ---  | $\pm 100$ | nA         |
| $R_g$        | Gate Resistance                                | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$               | ---  | 1.7  | ---       | $\Omega$   |
| $Q_g$        | Total Gate Charge (4.5V)                       | $V_{DS}=20V, V_{GS}=4.5V, I_D=12A$                  | ---  | 5.8  | ---       | nC         |
| $Q_{gs}$     | Gate-Source Charge                             |   | ---  | 3    | ---       |            |
| $Q_{gd}$     | Gate-Drain Charge                              |   | ---  | 1.2  | ---       |            |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega$<br>$I_D=1A$ | ---  | 14.3 | ---       | ns         |
| $T_r$        | Rise Time                                      |   | ---  | 5.6  | ---       |            |
| $T_{d(off)}$ | Turn-Off Delay Time                            |   | ---  | 20   | ---       |            |
| $T_f$        | Fall Time                                      |   | ---  | 11   | ---       |            |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$              | ---  | 690  | ---       | pF         |
| $C_{oss}$    | Output Capacitance                             |   | ---  | 193  | ---       |            |
| $C_{riss}$   | Reverse Transfer Capacitance                   |   | ---  | 38   | ---       |            |

#### CSTS60J04F Diode Characteristics

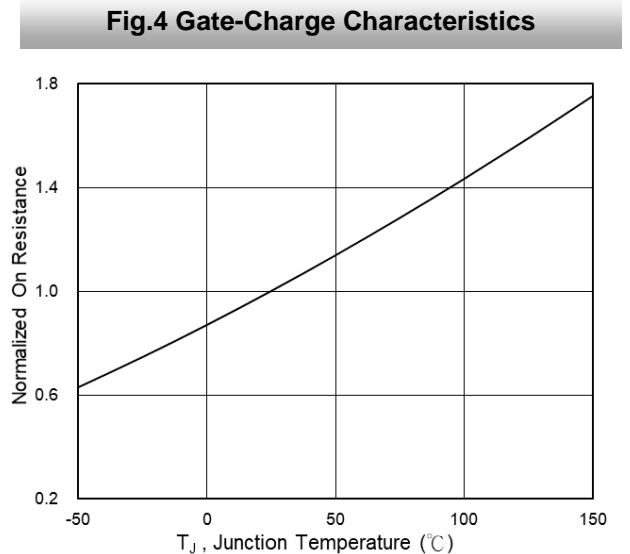
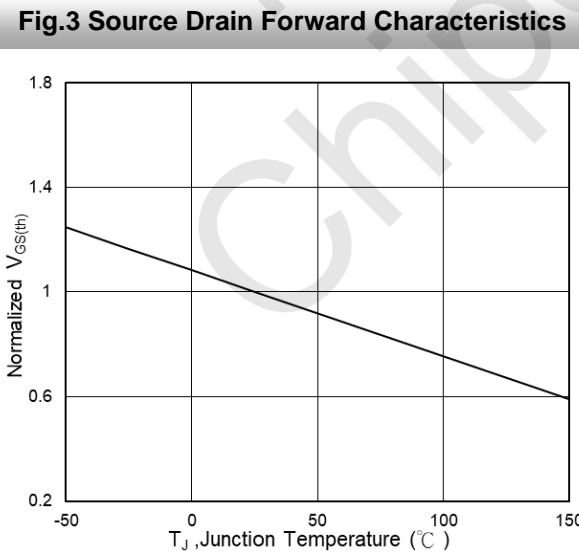
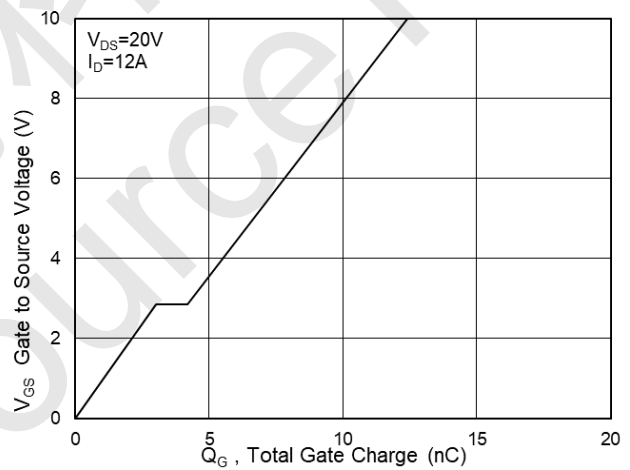
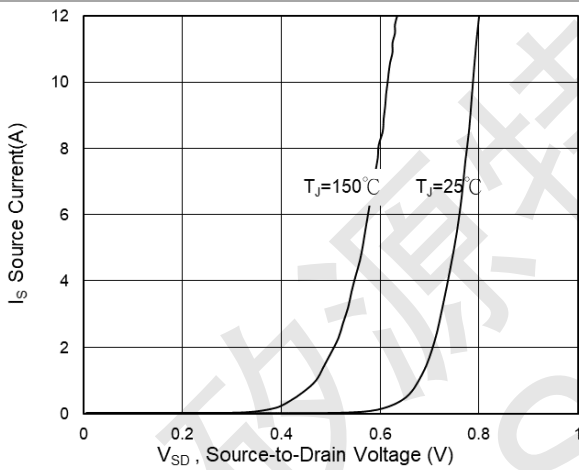
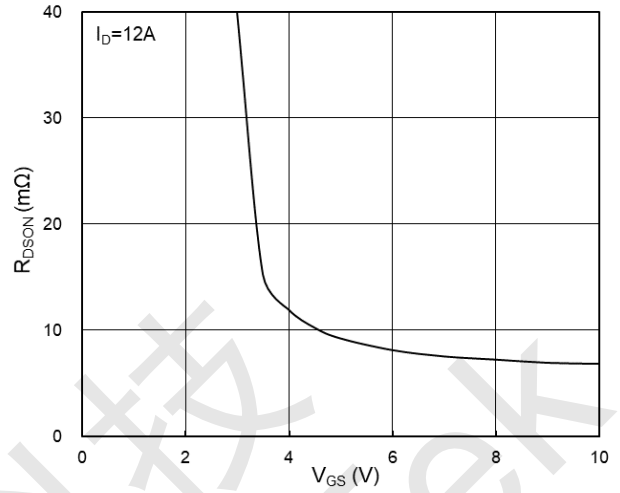
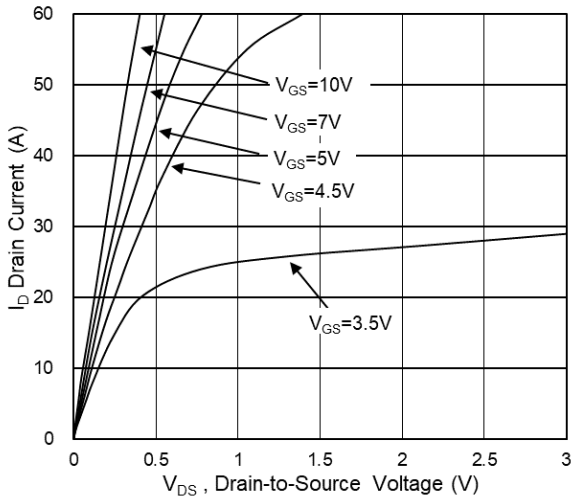
| Symbol   | Parameter                                | Conditions                                | Min. | Typ. | Max. | Unit |
|----------|--|---|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,5</sup> | $V_G=V_D=0V$ , Force Current              | ---  | ---  | 40   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$ | ---  | ---  | 1    | V    |

#### Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The EAS data shows Max. rating. The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=31A$
- The power dissipation is limited by 150 $^\circ\text{C}$  junction temperature
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.



#### CSTS60J04F Typical Characteristics





### CSTS60J04F Dual N-Ch 40V MOSFETs

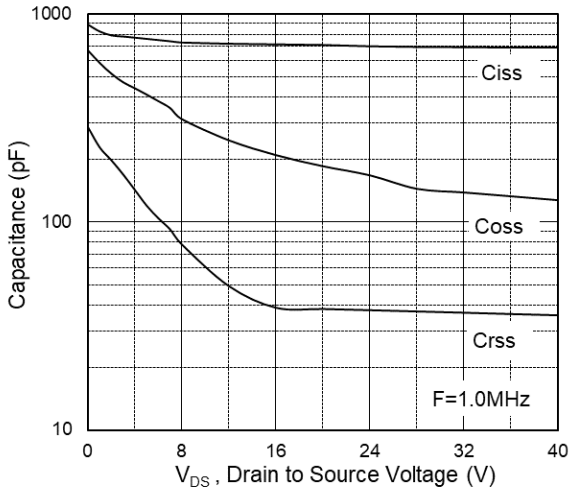


Fig.7 Capacitance

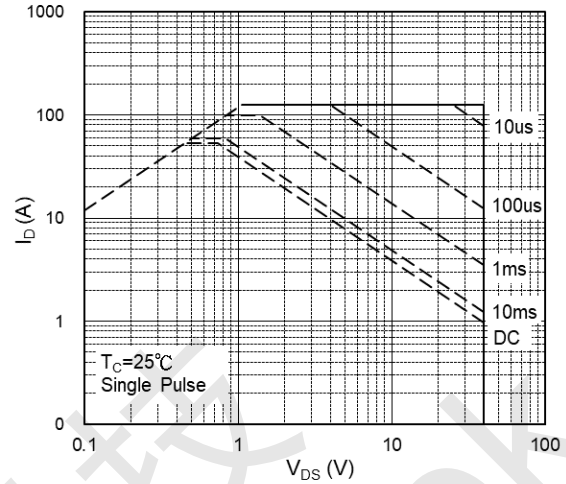


Fig.8 Safe Operating Area

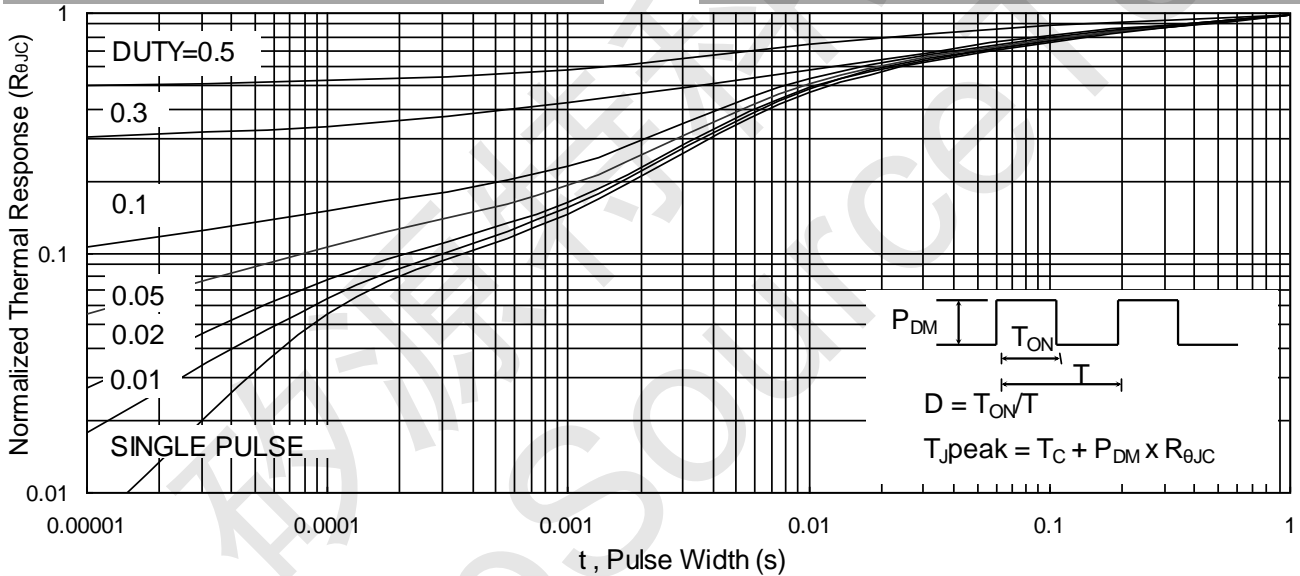


Fig.9 Normalized Maximum Transient Thermal Impedance

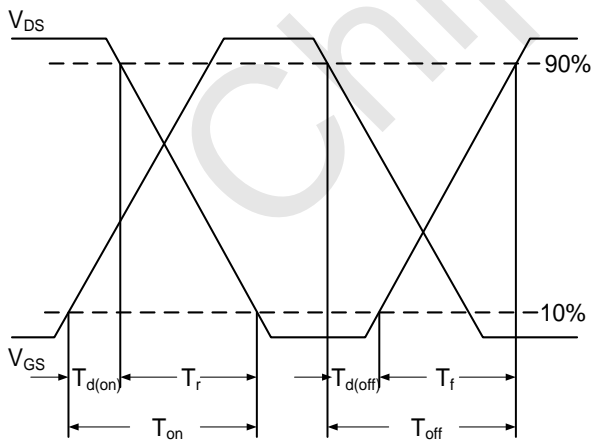


Fig.10 Switching Time Waveform

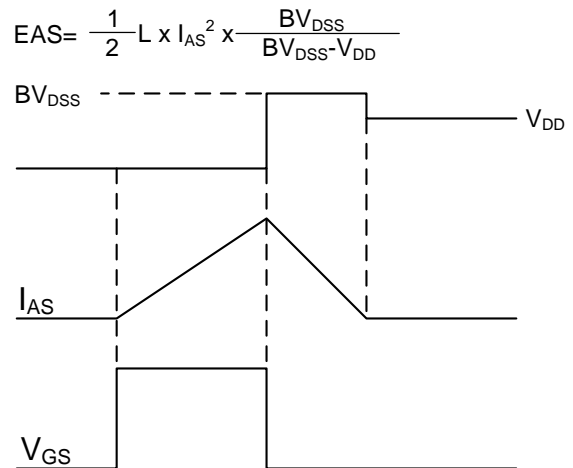
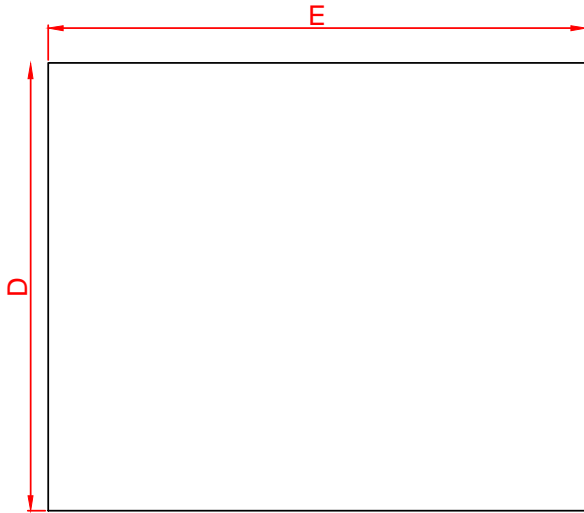


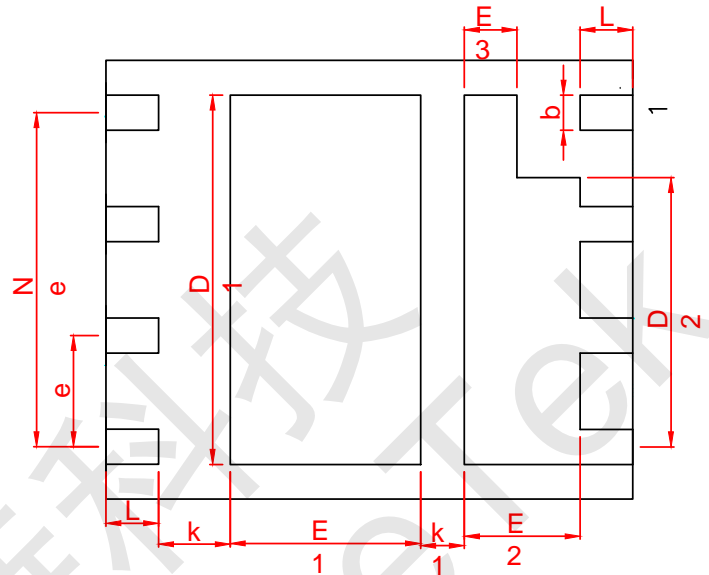
Fig.11 Unclamped Inductive Waveform



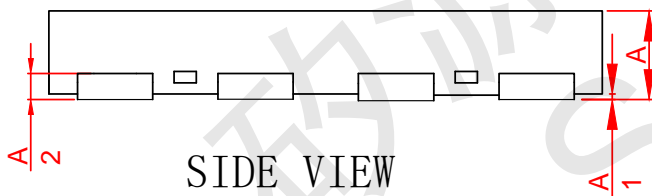
CSTS60J04F DFN5060-8L Package Information



TOP VIEW



BOTTOM VIEW



SIDE VIEW

| SYMBOL | MILLIMETER |      |      |
|--------|------------|------|------|
|        | MIN        | NOM  | MAX  |
| A      | 0.70       | 0.75 | 0.80 |
| * A1   | 0.00       | 0.02 | 0.05 |
| * b    | 0.36       | 0.41 | 0.46 |
| * A2   | 0.203 BSC  |      |      |
| * D    | 4.90       | 5.00 | 5.10 |
| * D1   | 4.15       | 4.20 | 4.25 |
| * D2   | 2.87       | 3.07 | 3.27 |
| * E    | 5.90       | 6.00 | 6.10 |
| * E1   | 2.02       | 2.17 | 2.32 |
| E2     | 1.22       | 1.32 | 1.42 |
| E3     | 0.55       | 0.60 | 0.65 |
| * e    | 1.27 REF   |      |      |
| * Ne   | BSC 3.81   |      |      |
| k      | 0.71       | 0.81 | 0.91 |
| * k1   | 0.40       | 0.50 | 0.60 |
| * L    | 0.55       | 0.60 | 0.65 |