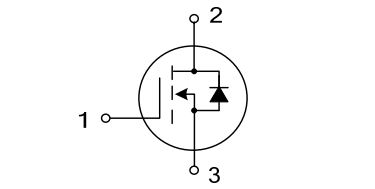
# 10A, 650V N-CHANNEL MOSFET

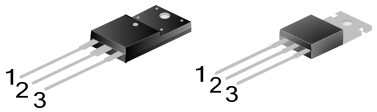
## GENERAL DESCRIPTION

SVF10N65T/F is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.




1.Gate 2.Drain 3.Source




TO-220F-3L TO-220-3L

## FEATURES

- 10A,650V,$R_{DS(on)(typ.)}$=0.80Ω@$V_{GS}$=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

## NOMENCLATURE

S V F X N E X X X

Silan VDMOS Code of F-Cell process

Nominal current,using 1 or 2 digits:
Example:4 denotes 4A,
10 denotes 10A,
08 denotes 0.8A

N denotes N Channel

Special Features indication, May be omitted.
Example: E denotes embeded ESD structure

Nominal Voltage,using 2 digits
Example: 60 denotes 600V,
65 denotes 650V.

Package information.
Example:T:TO-220;F:TO-220F.

## ORDERING INFORMATION

| Part No. | Package | Marking | Material | Packing |
|---|---|---|---|---|
| SVF10N65T | TO-220-3L | SVF10N65T | Pb free | Tube |
| SVF10N65F | TO-220F-3L | SVF10N65F | Pb free | Tube |

## ABSOLUTE MAXIMUM RATINGS ($T_C$=25°C unless otherwise noted)

| Characteristics | | Symbol | Ratings | | Unit |
|---|---|---|---|---|---|
| | | | SVF10N65T | SVF10N65F | |
| Drain-Source Voltage | | $V_{DS}$ | 650 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | | V |
| Drain Current | $T_C$ = 25°C | $I_D$ | 10 | | A |
| | $T_C$ = 100°C | | 5.5 | | |
| Drain Current Pulsed | | $I_{DM}$ | 40 | | A |
| Power Dissipation($T_C$=25°C) | | $P_D$ | 156 | 50 | W |
| -Derate above 25°C | | | 1.25 | 0.4 | W/°C |
| Single Pulsed Avalanche Energy (Note 1) | | $E_{AS}$ | 608 | | mJ |
| Operation Junction Temperature Range | | $T_J$ | -55～+150 | | °C |
| Storage Temperature Range | | $T_{stg}$ | -55～+150 | | °C |

## THERMAL CHARACTERISTICS

| Characteristics | Symbol | Ratings | | Unit |
|---|---|---|---|---|
| | | SVF10N65T | SVF10N65F | |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.8 | 2.5 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | 120 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C unless otherwise noted)

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain -Source Breakdown Voltage | $B_{VDSS}$ | $V_{GS}$=0V, $I_D$=250μA | 650 | -- | -- | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=650V, $V_{GS}$=0V | -- | -- | 10 | μA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V, $V_{DS}$=0V | -- | -- | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$= $V_{DS}$, $I_D$=250μA | 2.0 | -- | 4.0 | V |
| Static Drain- Source On State Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=5.0A | -- | 0.8 | 1.0 | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V,$V_{GS}$=0V, f=1.0MHZ | -- | 1143.2 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 128.8 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 3.5 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=325V, $I_D$=10A, $R_G$=25Ω (Note 2,3) | -- | 40.00 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 73.67 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 52.13 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 34.80 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=520V,$I_D$=10A, $V_{GS}$=10V (Note 2,3) | -- | 20.00 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 7.47 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 6.48 | -- | |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current | $I_S$ | Integral Reverse p-n Junction Diode in the MOSFET | -- | -- | 10 | A |
| Pulsed Source Current | $I_{SM}$ | | -- | -- | 40 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=10A,$V_{GS}$=0V | -- | -- | 1.3 | V |
| Reverse Recovery Time | $T_{rr}$ | $I_S$=10A,$V_{GS}$=0V, $dI_F/dt$=100A/μS | -- | 450 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 4.2 | -- | μC |

**Notes:**

1. L=30mH, $I_{AS}$=5.82A, $V_{DD}$=150V, $R_G$=25Ω, starting $T_J$=25°C;
2. Pulse Test: Pulse width ≤300μs,Duty cycle≤2%;
3. Essentially independent of operating temperature.

## TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

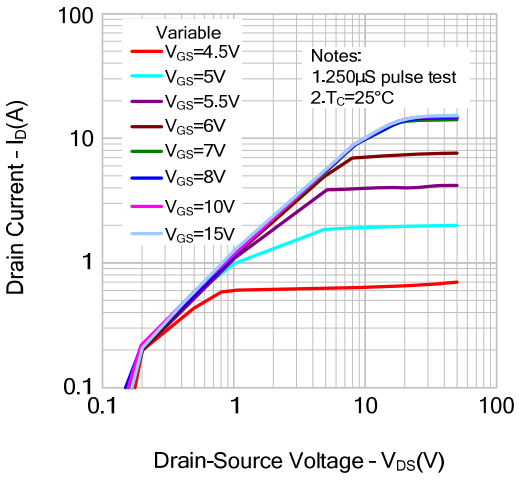



Figure 2. Transfer Characteristics

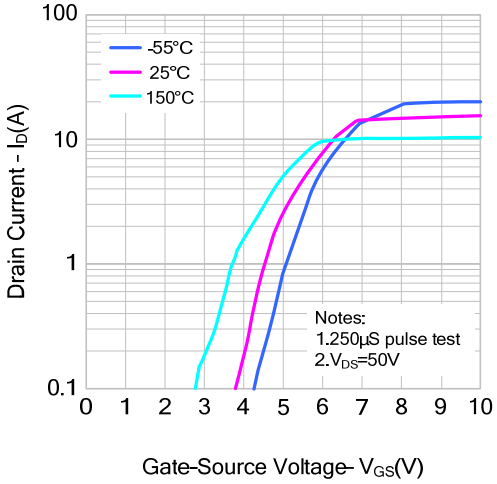



Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

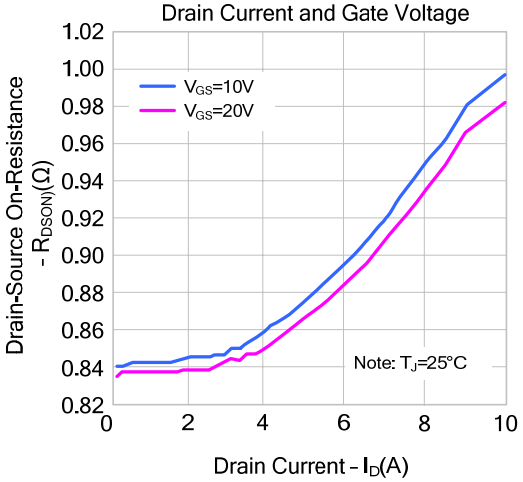



Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

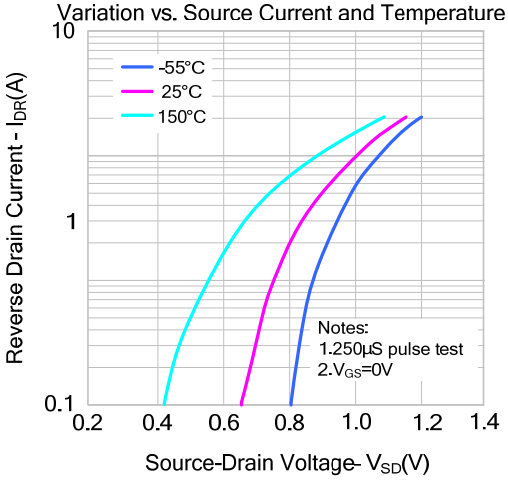



Figure 5. Capacitance Characteristics

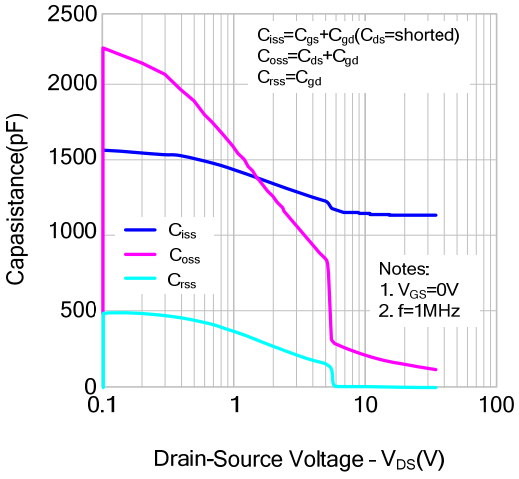
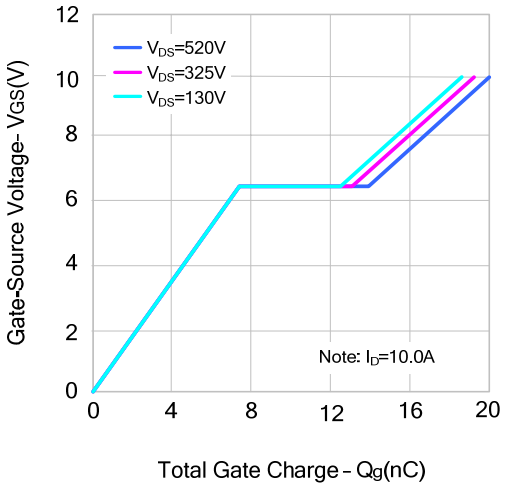



Figure 6. Gate Charge Characteristics



## TYPICAL CHARACTERISTICS(continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

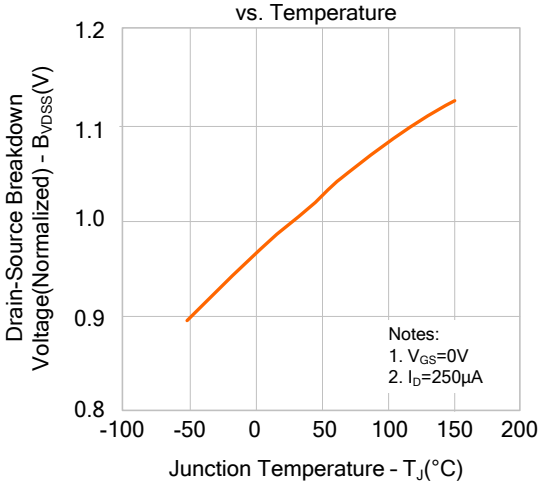



Figure 8. On-resistance Variation vs. Temperature

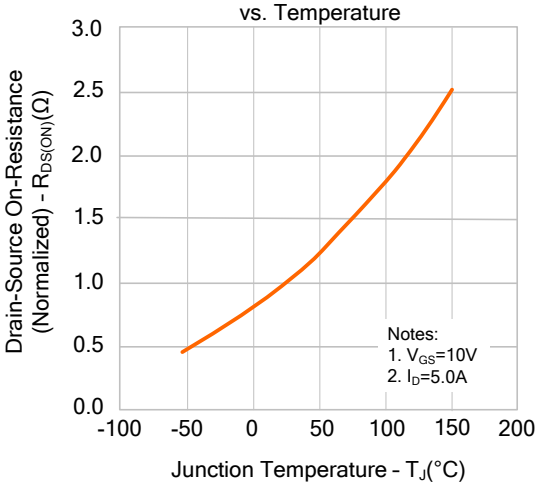



Figure 9-1. Max. Safe Operating Area(SVF10N65T)

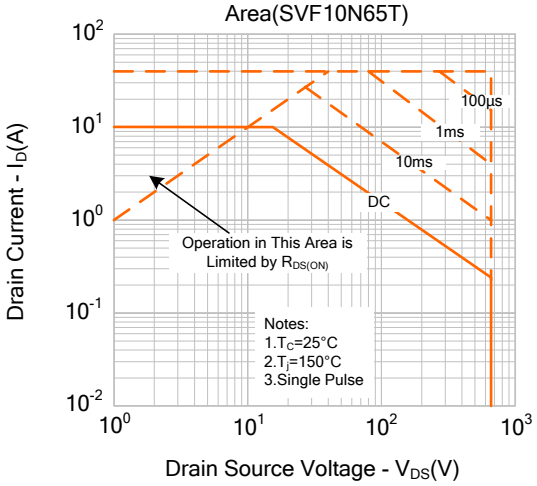



Figure 9-2. Max. Safe Operating Area(SVF10N65F)

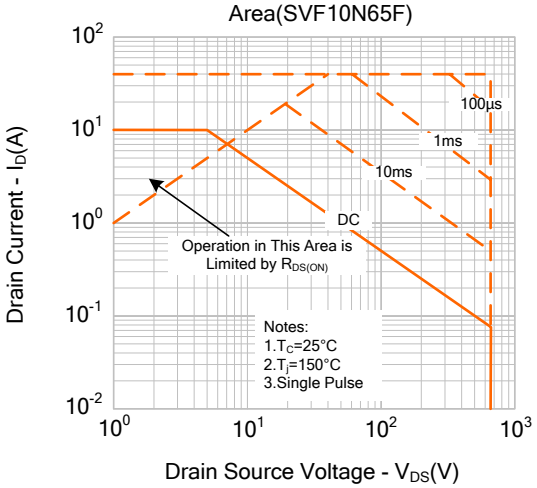
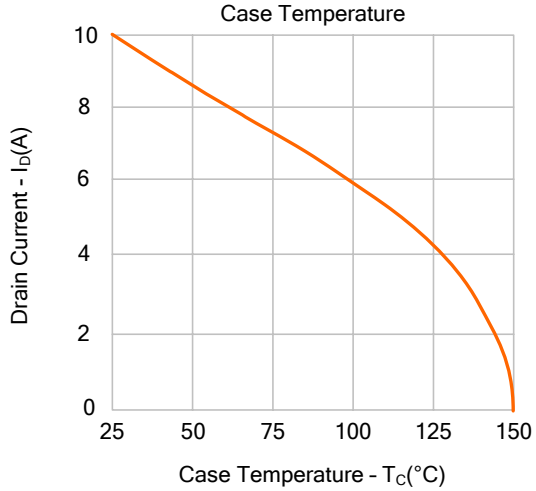
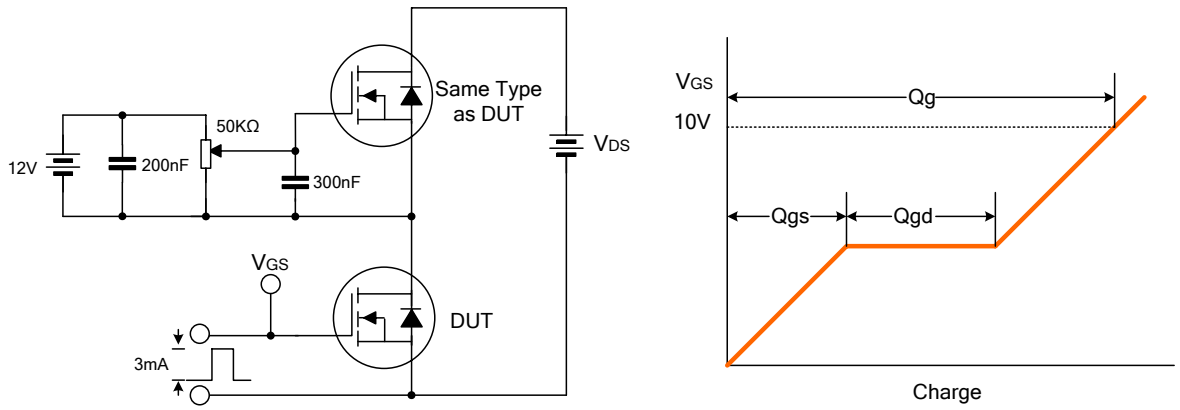



Figure 10. Maximum Drain Current vs. Case Temperature

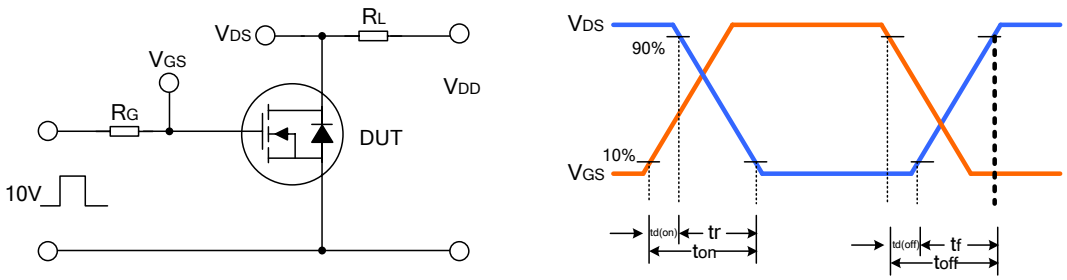


## TYPICAL TEST CIRCUIT

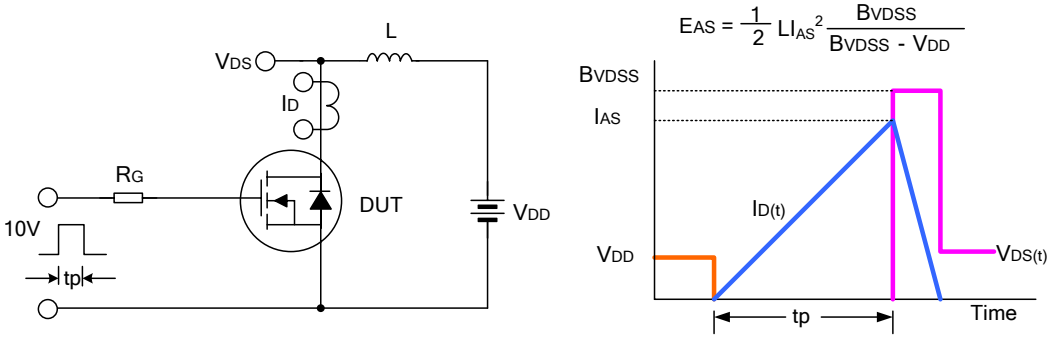
Gate Charge Test Circuit & Waveform




Resistive Switching Test Circuit & Waveform

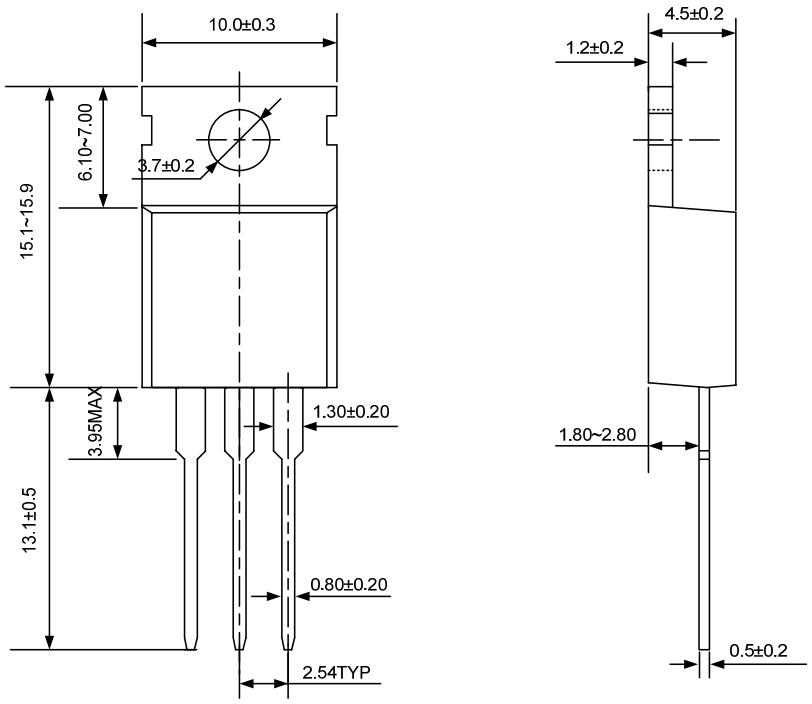



Unclamped Inductive Switching Test Circuit & Waveform

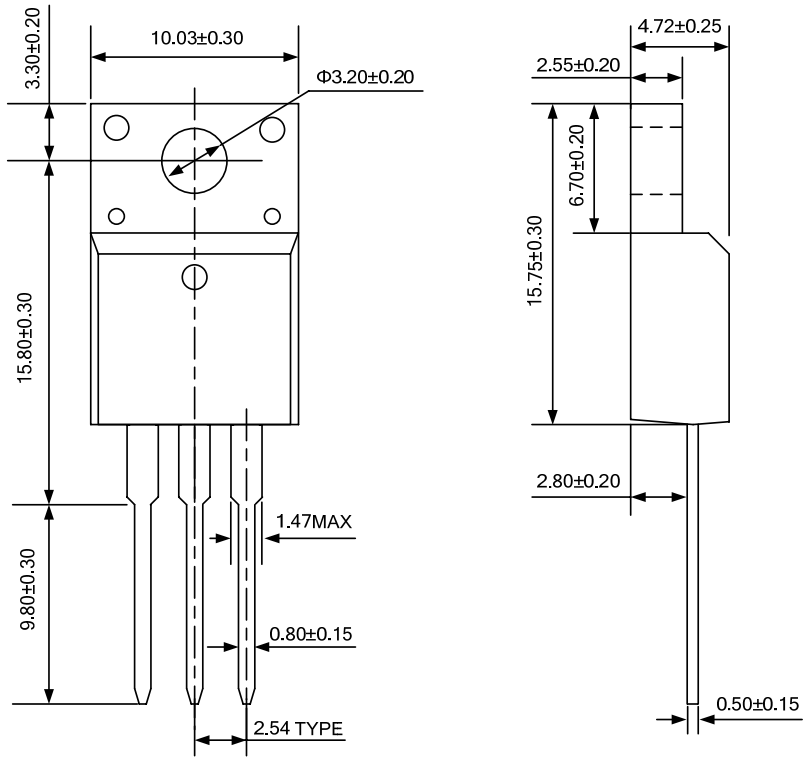


## PACKAGE OUTLINE

**TO-220-3L** UNIT: mm




**TO-220F-3L** UNIT: mm



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## ATTACHMENT

### Revision History

| Date | REV | Description | Page |
|---|---|---|---|
| 2010.12.13 | 1.0 | Original | |
| 2011.01.26 | 1.1 | Modify “ELECTRICAL CHARACTERISTICS” | |