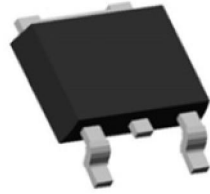


### Main Product Characteristics:

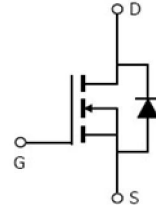
|              |       |
|--------------|-------|
| $V_{DSS}$    | 25V   |
| $R_{DS(on)}$ | 8mohm |
| $I_D$        | 55A   |



TO-252 DPAK



Marking and pin assignment



### Features and Benefits:

- Advanced trench MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature
- Lead free product

### Description:

It utilizes the latest FRRMOS (fast reverse recovery MOS) trench processing techniques to achieve extremely low on resistance, fast switching speed and short reverse recovery time. These features combine to make this design an extremely efficient and reliable device for use in PWM, load switching and a wide variety of other applications

### Absolute Max Rating:

| Symbol                   | Parameter                                        | Max.         | Units |
|--------------------------|--------------------------------------------------|--------------|-------|
| $I_D @ TC = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ ①       | 55           | A     |
| $I_D @ TC = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ ①       | 45           |       |
| IDM                      | Pulsed Drain Current②                            | 120          |       |
| ISM                      | Pulsed Source Current (Body Diode)②              | 120          |       |
| $PD @ TC = 25^\circ C$   | Power Dissipation③                               | 50           | W     |
| $PD @ TC = 100^\circ C$  | Power Dissipation③                               | 25           | W     |
| VDS                      | Drain-Source Voltage                             | 25           | V     |
| VGS                      | Gate-to-Source Voltage                           | $\pm 20$     | V     |
| EAS                      | Single Pulse Avalanche Energy @ $L=0.1mH$ ②      | 80           | mJ    |
| IAR                      | Avalanche Current @ $L=0.1mH$ ②                  | 40           | A     |
| TJ TSTG                  | Operating Junction and Storage Temperature Range | -55 to + 175 | °C    |

### Thermal Resistance

| Symbol          | Characterizes                                     | Value | Unit |
|-----------------|---------------------------------------------------|-------|------|
| $R_{\theta JC}$ | Junction-to-case③                                 | 2.5   | °C/W |
| $R_{\theta JA}$ | Junction-to-ambient ( $t \leq 10s$ ) ④            | 14    | °C/W |
|                 | Junction-to-Ambient (PCB mounted, steady-state) ④ | 38    | °C/W |

### Electrical Characteristics @ $T_A=25^{\circ}\text{C}$ unless otherwise specified

| Symbol         | Parameter                            | Min. | Typ. | Max | Units      | Conditions                                                                        |
|----------------|--------------------------------------|------|------|-----|------------|-----------------------------------------------------------------------------------|
| BVDSS          | Drain-to-Source breakdown voltage    | 25   | —    | —   | V          | $V_{GS} = 0V$ ,<br>$I_D = 250\mu A$                                               |
| RDS(on)        | Static Drain-to-Source on-resistance | —    | 6    | 8   | m $\Omega$ | $V_{GS} = 10V$ ,<br>$I_D = 30A$                                                   |
| VGS(th)        | Gate threshold voltage               | 1.5  | 2    | 2.5 | V          | $V_{DS} = V_{GS}$ ,<br>$I_D = 250\mu A$                                           |
| IDSS           | Drain-to-Source leakage current      | —    | —    | 10  | $\mu A$    | $V_{DS} = 25V$ ,<br>$V_{GS} = 0V$                                                 |
|                |                                      | —    | —    | 50  |            | $V_{DS} = 25V$ ,<br>$V_{GS} = 0V$ ,<br>$T_J = 55^{\circ}\text{C}$                 |
| IGSS           | Gate-to-Source forward leakage       | —    | —    | 100 | nA         | $V_{GS} = 20V$                                                                    |
|                | Gate-to-Source reverse leakage       | -100 | —    | —   |            | $V_{GS} = -20V$                                                                   |
| Qg             | Total gate charge                    | —    | 20.6 | 25  | nC         | $I_D = 30A$ ,<br>$V_{DS} = 12.5V$ ,<br>$V_{GS} = 10V$                             |
| Qgs            | Gate-to-Source charge                | —    | 5.3  | 6   |            |                                                                                   |
| Qgd            | Gate-to-Drain("Miller") charge       | —    | 5.9  | 6.5 |            |                                                                                   |
| Qg(th)         | Gate charge at shreshold             | —    | 2.6  | 3   |            |                                                                                   |
| Vplateau       | gate plateau voltage                 | —    | 4.1  | 5   | V          |                                                                                   |
| td(on)         | Turn-on delay time                   | —    | 10.4 | —   | ns         | $V_{GS} = 10V$ ,<br>$V_{DS} = 15V$ ,<br>$R_L = 10\Omega$ ,<br>$R_{GEN} = 3\Omega$ |
| tr             | Rise time                            | —    | 6.4  | —   |            |                                                                                   |
| td(off)        | Turn-Off delay time                  | —    | 22.4 | —   |            |                                                                                   |
| tf             | Fall time                            | —    | 7.2  | —   |            |                                                                                   |
| Ciss           | Input capacitance                    | —    | 1210 | —   | pF         | $V_{GS} = 0V$ ,<br>$V_{DS} = 15V$ ,<br>$f = 1.0\text{MHz}$                        |
| Coss           | Output capacitance                   | —    | 320  | —   |            |                                                                                   |
| Crss           | Reverse transfer capacitance         | —    | 220  | —   |            |                                                                                   |
| R <sub>g</sub> | Gate resistance                      | —    | 1.5  | —   | $\Omega$   | $V_{GS} = 0V$ , $V_{DS} = 0V$ ,<br>$f = 1\text{MHz}$                              |

### Source-Drain Ratings and Characteristics

| Symbol | Parameter                             | Min.                                                                    | Typ. | Max | Units | Conditions                                 |
|--------|---------------------------------------|-------------------------------------------------------------------------|------|-----|-------|--------------------------------------------|
| IS     | Maximum Body-Diode Continuous Current |                                                                         | 55   | —   | A     |                                            |
| VSD    | Diode Forward Voltage                 | —                                                                       | 0.7  | 1   | V     | $I_S = 1A$ , $V_{GS} = 0V$                 |
| trr    | Reverse Recovery Time                 | —                                                                       | 9.5  | —   | ns    | $T_J = 25^{\circ}\text{C}$ , $I_F = 30A$ , |
| Qrr    | Reverse Recovery Charge               | —                                                                       | 3.8  | —   | nC    | $V_{DD} = 30V$ , $di/dt = 200A/\mu s$      |
| ton    | Forward Turn-on Time                  | Intrinsic turn-on time is negligible<br>(turn-on is dominated by LS+LD) |      |     |       |                                            |

### Typical Electrical and Thermal Characteristics

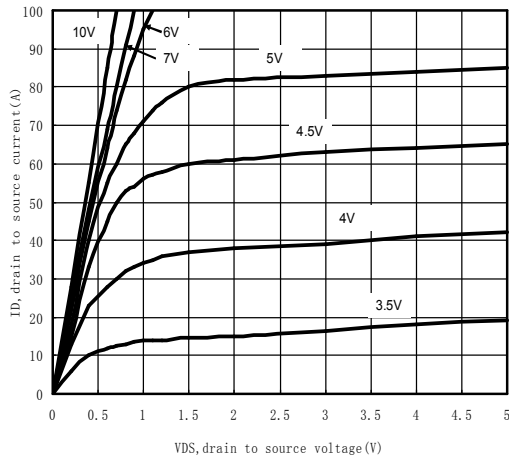


Figure 1: Typical Output Characteristics

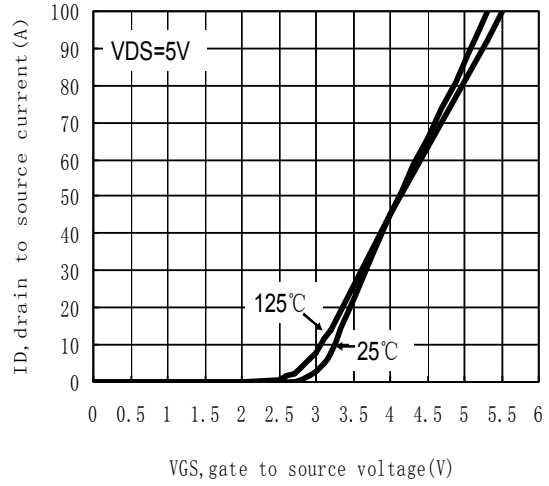


Figure 2: Typical Transfer Characteristics

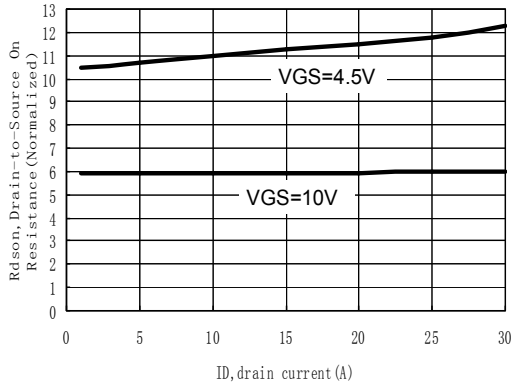


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

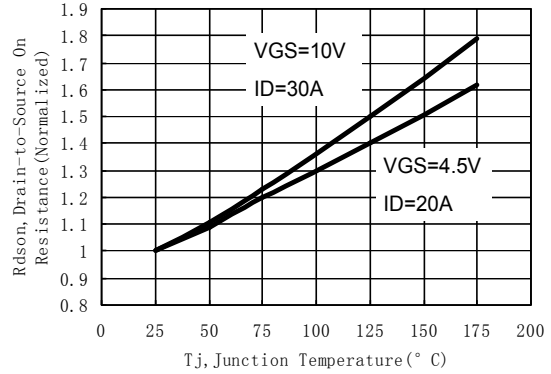


Figure 4: On-Resistance vs. Junction Temperature

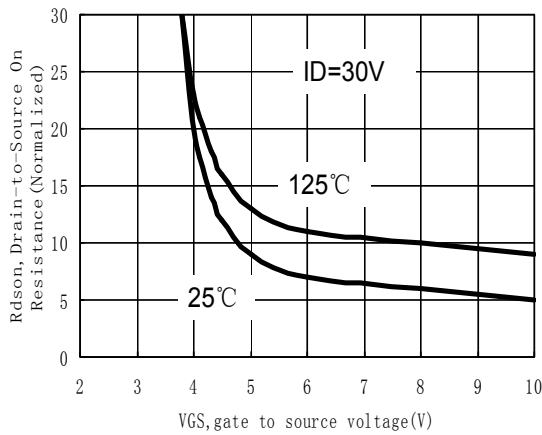


Figure 5: On-Resistance vs. Gate-Source Voltage

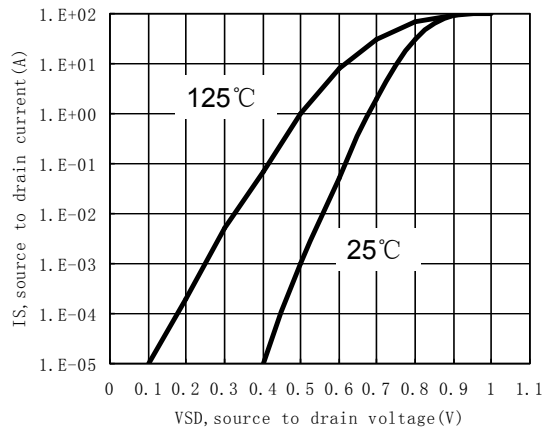


Figure 6: Body-Diode Characteristics

### Typical Electrical and Thermal Characteristics

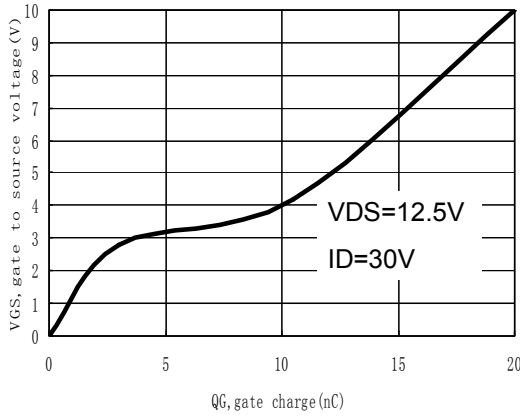
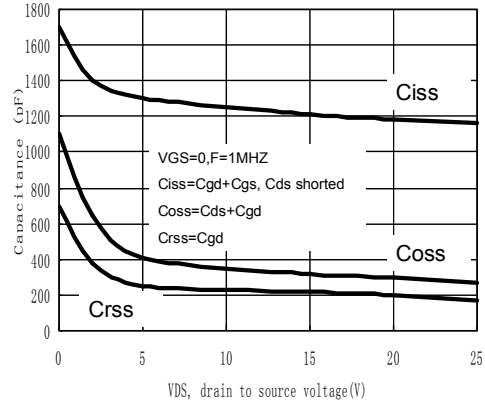


Figure 7: Gate-Charge Characteristics Figure



8: Capacitance Characteristics

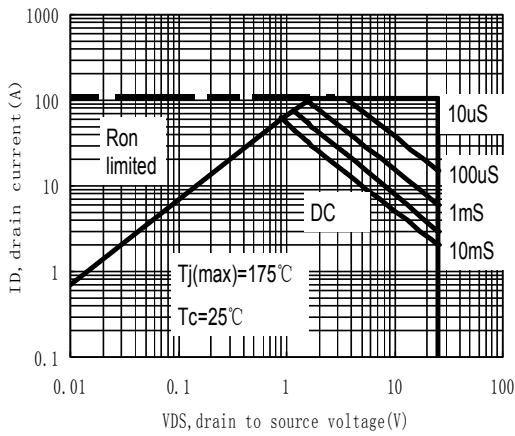


Figure 9: Maximum Forward Biased Safe Operating Area (SOA)

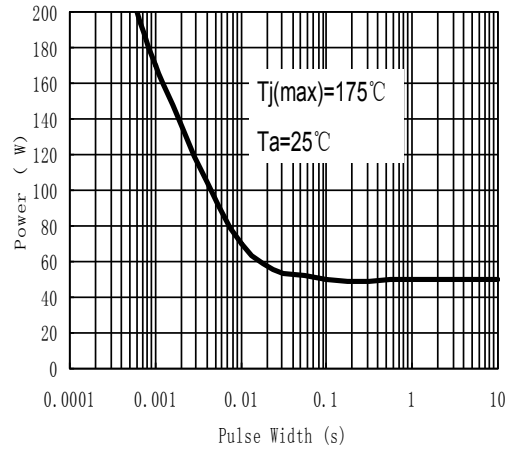


Figure 10: Single Pulse Power Rating Junction-to-Case (JC)

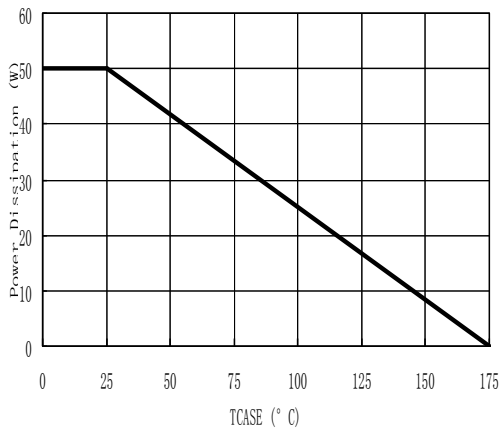


Figure 11: Power De-rating (JC)

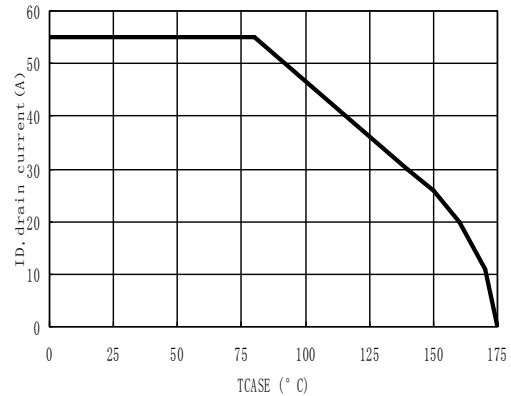
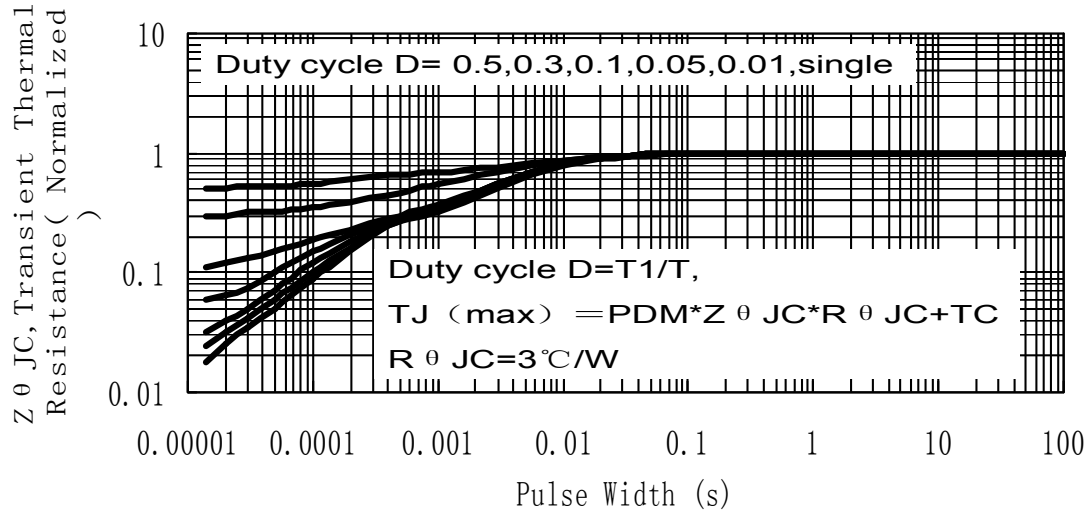
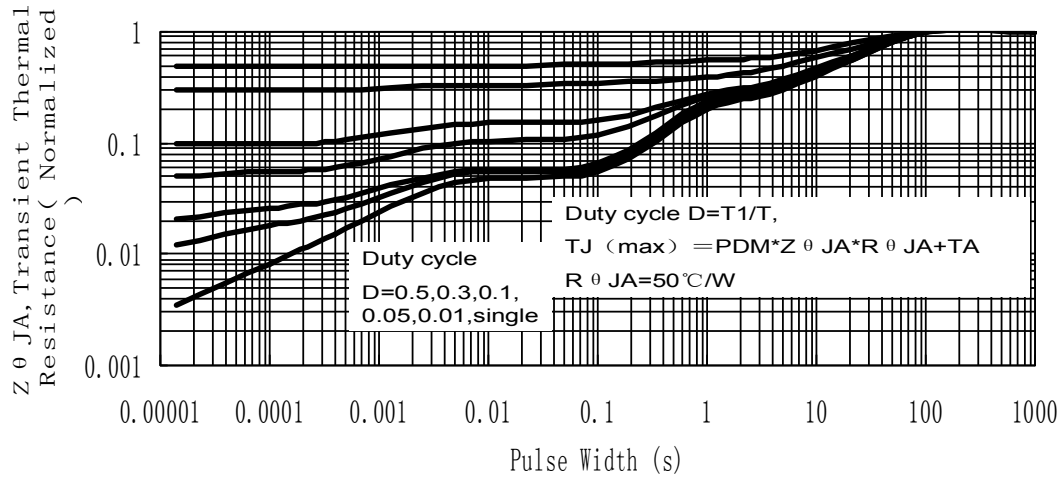


Figure 12: Current De-rating (JC)

**Typical Electrical and Thermal Characteristics**

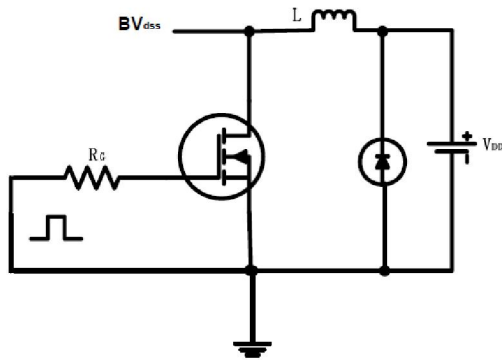


**Figure 13: Normalized Maximum Transient Thermal Impedance (θ)**

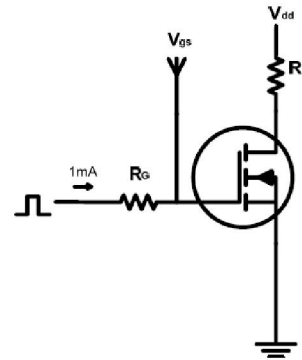


**Figure 14: Normalized Maximum Transient Thermal Impedance (θ)**

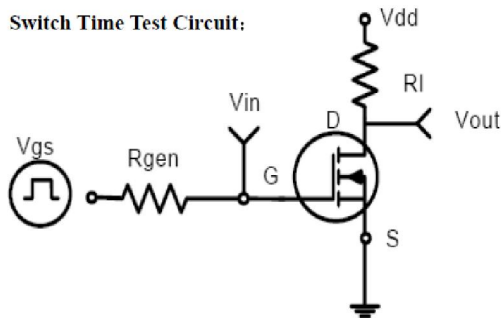
EAS test circuits:



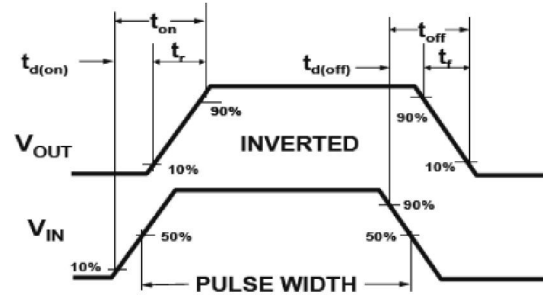
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



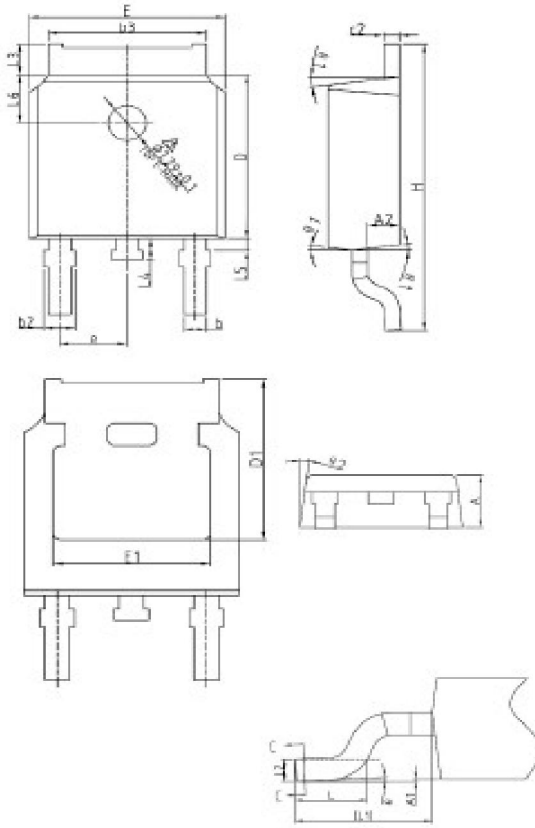
### Notes:

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_J(\text{MAX}) = 175^\circ\text{C}$ .
- ⑥ The maximum current rating is limited by bond-wires.

## Mechanical Data:

### TO-252E-2-M PACKAGE INFORMATION

#### Dimensions in Millimeters



| SYMBOL | MIN     | NOM   | MAX   |
|--------|---------|-------|-------|
| A      | 2.20    | 2.30  | 2.38  |
| A1     | 0       | —     | 0.10  |
| A2     | 0.90    | 1.01  | 1.10  |
| b      | 0.72    | —     | 0.85  |
| b1     | 0.71    | 0.76  | 0.81  |
| b2     | 0.72    | —     | 0.90  |
| b3     | 5.13    | 5.33  | 5.46  |
| c      | 0.47    | —     | 0.60  |
| c1     | 0.46    | 0.51  | 0.56  |
| c2     | 0.47    | —     | 0.60  |
| D      | 6.00    | 6.10  | 6.20  |
| D1     | 5.25    | —     | —     |
| E      | 6.50    | 6.60  | 6.70  |
| E1     | 4.70    | —     | —     |
| e      | 2.186   | 2.286 | 2.386 |
| H      | 9.80    | 10.10 | 10.40 |
| L      | 1.40    | 1.50  | 1.70  |
| L1     | 2.90REF |       |       |
| L2     | 0.51BSC |       |       |
| L3     | 0.90    | —     | 1.25  |
| L4     | 0.60    | 0.80  | 1.00  |
| L5     | 0.15    | —     | 0.75  |
| L6     | 1.80REF |       |       |
| θ      | 0°      | —     | 8°    |
| θ 1    | 5°      | 7°    | 9°    |
| θ 2    | 5°      | 7°    | 9°    |

