

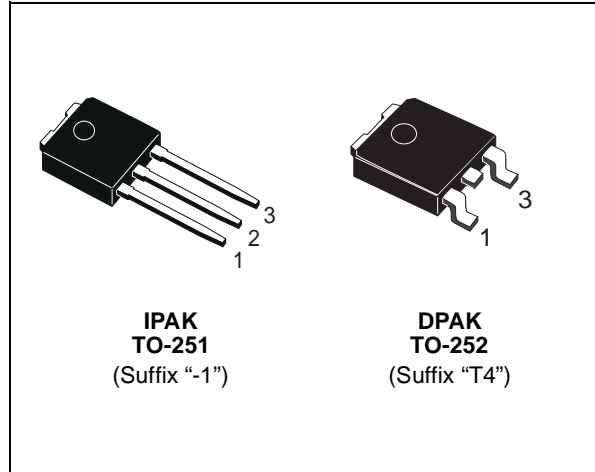


STD10PF06

P-CHANNEL 60V - 0.18 Ω - 10A IPAK/DPAK STripFET™ II POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STD10PF06 | 60 V | < 0.20 Ω | 10 A |

- TYPICAL R_{DS(on)} = 0.18 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX "-1")
- SURFACE-MOUNTING DPAK (TO-252) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")



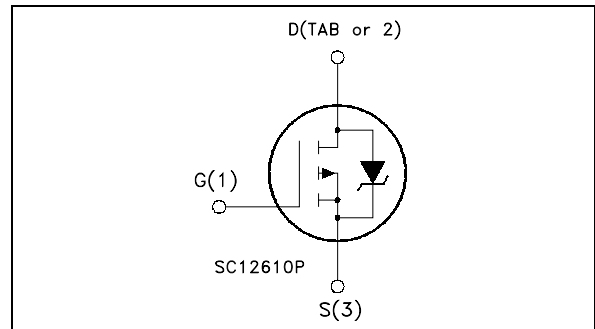
DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 60 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 k Ω) | 60 | V |
| V _{GS} | Gate- source Voltage | ± 20 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 10 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 7 | A |
| I _{DM} (*) | Drain Current (pulsed) | 40 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 40 | W |
| | Derating Factor | 0.27 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 6 | V/ns |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(*) Pulse width limited by safe operating area.
Note: P-CHANNEL MOSFET actual polarity of voltages and current has to be reversed

(1) I_{SD} \leq 10A, di/dt \leq 300A/ μ s, V_{DD} \leq V_{(BR)DSS}, T_j \leq T_{JMAX}

STD10PF06**THERMAL DATA**

| | | | | |
|----------------|------------------------------------------------|-----|------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 3.75 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 100 | °C/W |
| T _l | Maximum Lead Temperature For Soldering Purpose | | 275 | °C |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|-----------|------|
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max) | 10 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 25 V) | 125 | mJ |

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 μA, V _{GS} = 0 | 60 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating T _C = 125°C | | | 1 10 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 20V | | | ±1 | μA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|-----------------------------------------------------------|------|------|------|------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 μA | 2 | | 4 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 5 A | | 0.18 | 0.20 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|------------------------------------------------------|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} = 25 V I _D = 5 A | 2 | 5 | | S |
| C _{iSS} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 850 | | pF |
| C _{oSS} | Output Capacitance | | | 230 | | pF |
| C _{rSS} | Reverse Transfer Capacitance | | | 75 | | pF |

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ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------|--------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 30\text{ V}$ $I_D = 5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 20 40 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 48\text{ V}$ $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$ | | 16 4 6 | 21 | nC nC nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------|----------------|------|----------------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 30\text{ V}$ $I_D = 5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 40 10 | | ns ns |
| $t_r(V_{off})$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{clamp} = 48\text{ V}$ $I_D = 10\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Inductive Load, Figure 5) | | 10 17 30 | | ns ns ns |

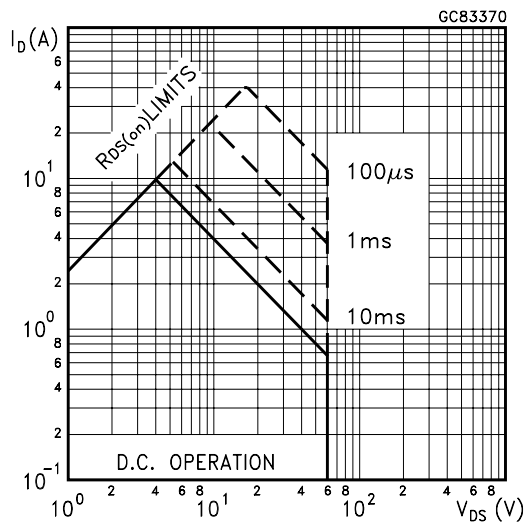
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------|----------|--------------------------|
| I_{SD} $I_{SDM} (\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 10 40 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 10\text{ A}$ $V_{GS} = 0$ | | | 2.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 100 260 5.2 | | ns μC A |

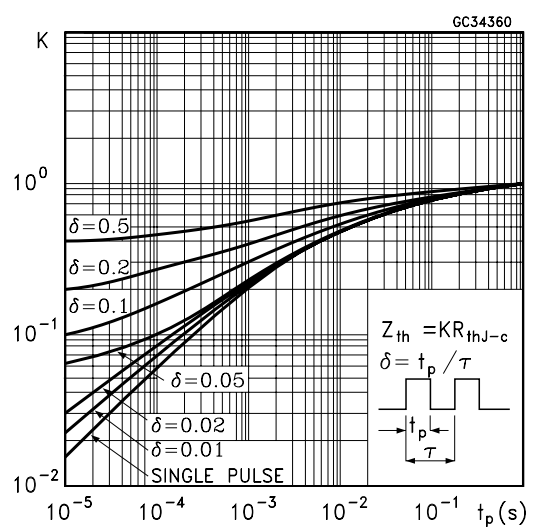
(*)Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

(\bullet)Pulse width limited by safe operating area.

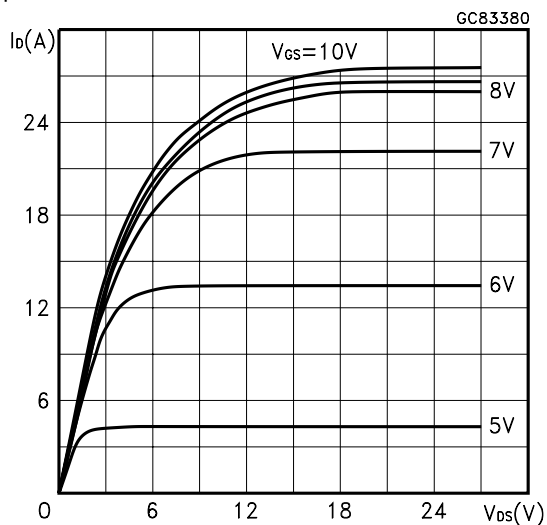
Safe Operating Area



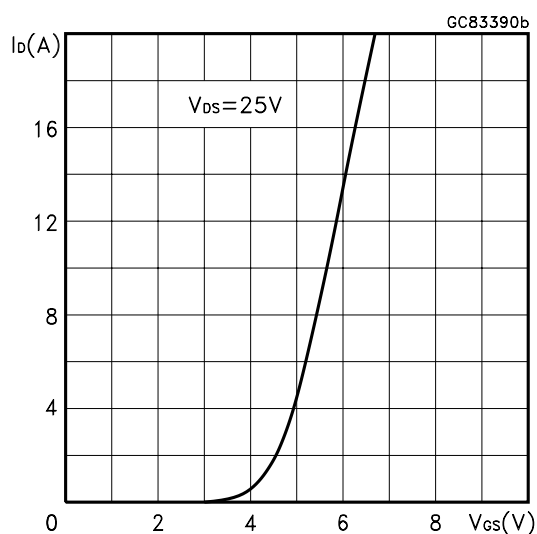
Thermal Impedance



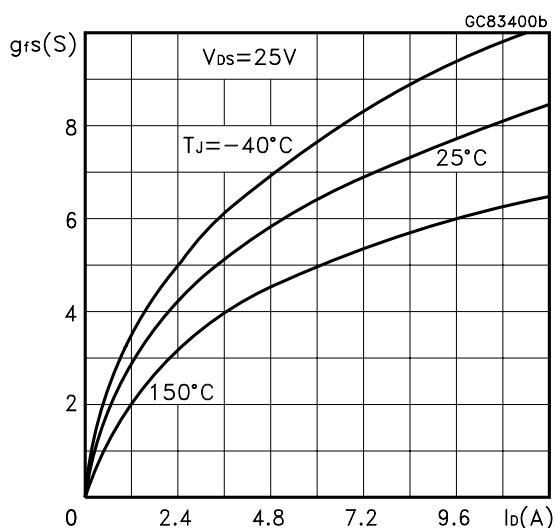
Output Characteristics



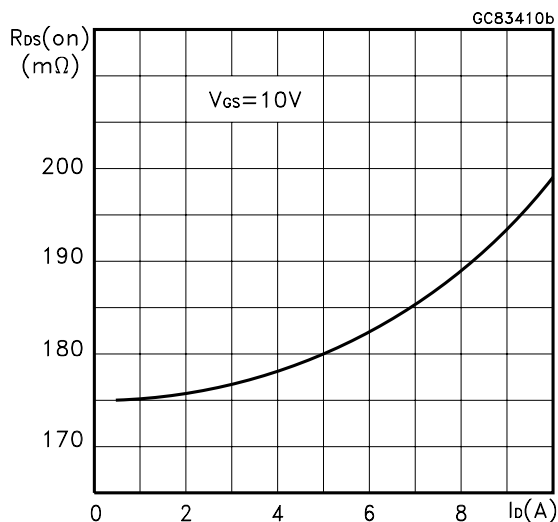
Transfer Characteristics



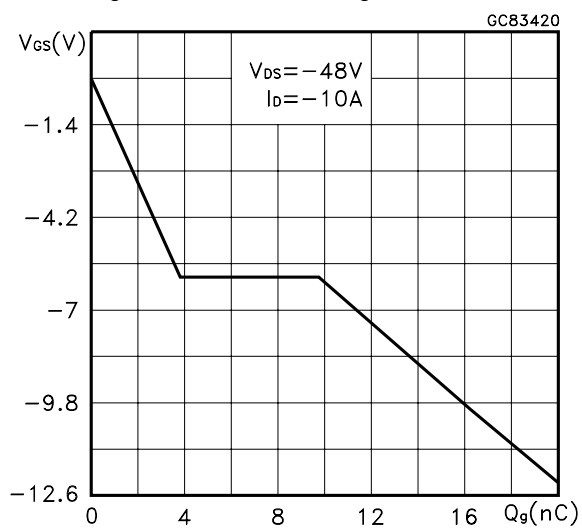
Transconductance



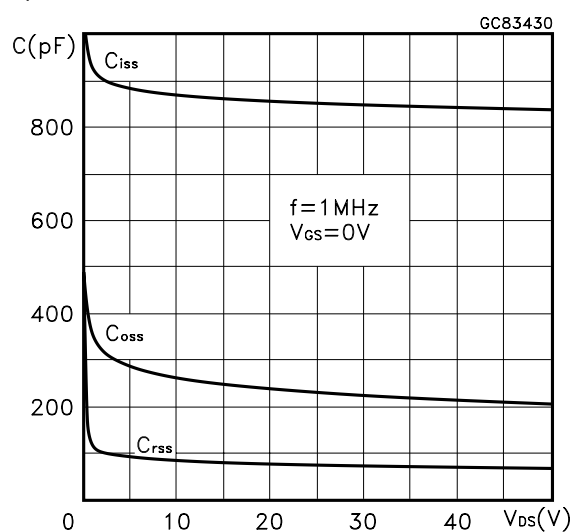
Static Drain-source On Resistance



Gate Charge vs Gate-source Voltage

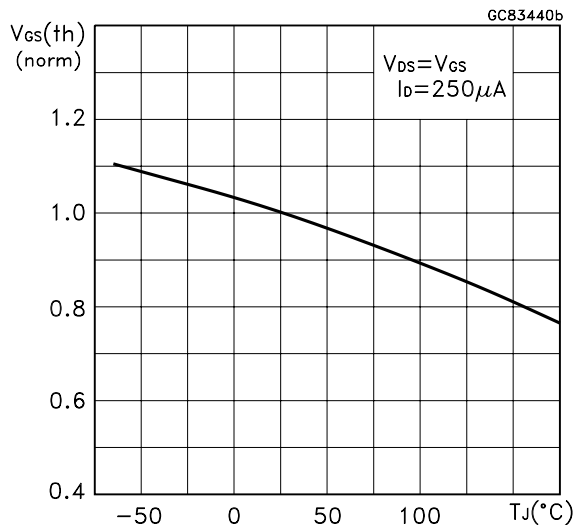


Capacitance Variations

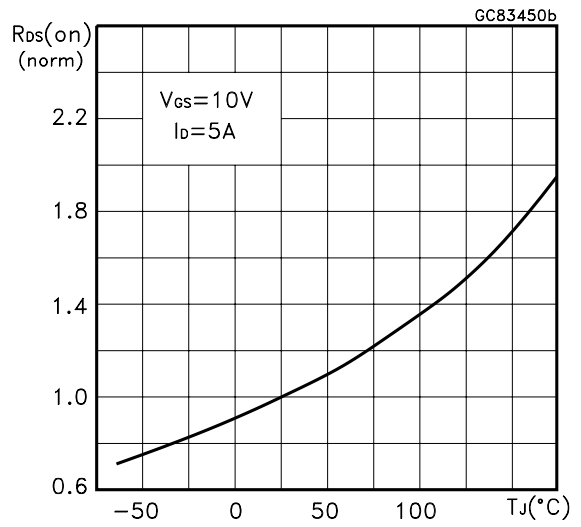


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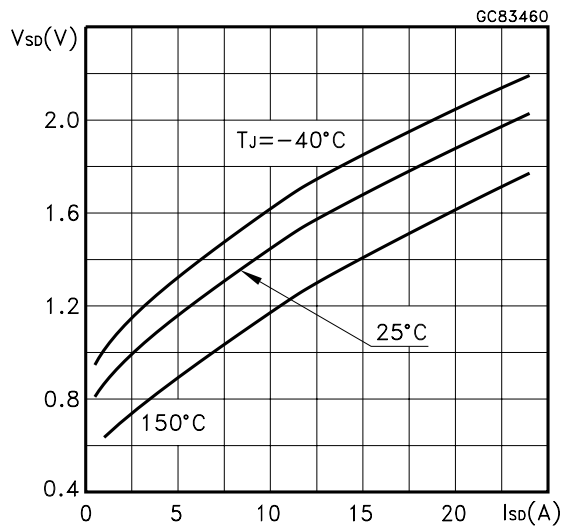
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage Temperature

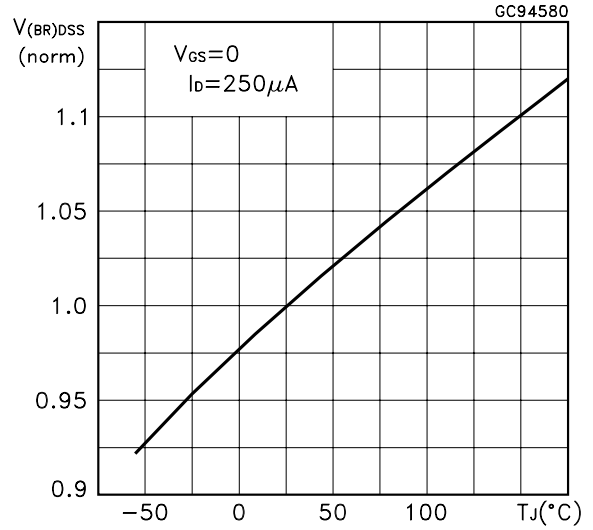


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

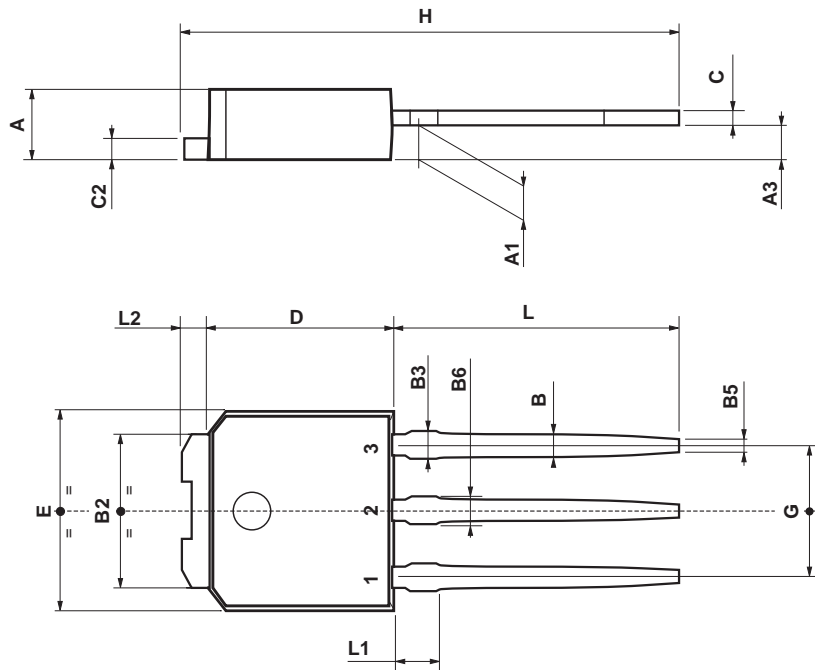


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-251 (IPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.2 | | 2.4 | 0.086 | | 0.094 |
| A1 | 0.9 | | 1.1 | 0.035 | | 0.043 |
| A3 | 0.7 | | 1.3 | 0.027 | | 0.051 |
| B | 0.64 | | 0.9 | 0.025 | | 0.031 |
| B2 | 5.2 | | 5.4 | 0.204 | | 0.212 |
| B3 | | | 0.85 | | | 0.033 |
| B5 | | 0.3 | | | 0.012 | |
| B6 | | | 0.95 | | | 0.037 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 0.48 | | 0.6 | 0.019 | | 0.023 |
| D | 6 | | 6.2 | 0.236 | | 0.244 |
| E | 6.4 | | 6.6 | 0.252 | | 0.260 |
| G | 4.4 | | 4.6 | 0.173 | | 0.181 |
| H | 15.9 | | 16.3 | 0.626 | | 0.641 |
| L | 9 | | 9.4 | 0.354 | | 0.370 |
| L1 | 0.8 | | 1.2 | 0.031 | | 0.047 |
| L2 | | 0.8 | 1 | | 0.031 | 0.039 |



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TO-252 (DPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.2 | | 2.4 | 0.086 | | 0.094 |
| A1 | 0.9 | | 1.1 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.64 | | 0.9 | 0.025 | | 0.035 |
| B2 | 5.2 | | 5.4 | 0.204 | | 0.212 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 0.48 | | 0.6 | 0.019 | | 0.023 |
| D | 6 | | 6.2 | 0.236 | | 0.244 |
| E | 6.4 | | 6.6 | 0.252 | | 0.260 |
| G | 4.4 | | 4.6 | 0.173 | | 0.181 |
| H | 9.35 | | 10.1 | 0.368 | | 0.397 |
| L2 | | 0.8 | | | 0.031 | |
| L4 | 0.6 | | 1 | 0.023 | | 0.039 |



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