

TRENCHSTOP™ RC-Drives Fast Series

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|-------------|--------------|--------------------|
| Collector-emitter voltage, $T_{vj} \geq 25^{\circ}\text{C}$ | V_{CE} | 600 | V |
| DC collector current, limited by T_{vjmax} $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$ | I_C | 30.0 15.0 | A |
| Pulsed collector current, t_p limited by T_{vjmax} ¹⁾ | I_{Cpuls} | 45.0 | A |
| Turn off safe operating area $V_{CE} \leq 600\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}$ ²⁾ | - | 45.0 | A |
| Diode forward current, limited by T_{vjmax} $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$ | I_F | 30.0 15.0 | A |
| Diode pulsed current, t_p limited by T_{vjmax} ¹⁾ | I_{Fpuls} | 45.0 | A |
| Gate-emitter voltage | V_{GE} | ± 20 | V |
| Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 400\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 150^{\circ}\text{C}$ | t_{SC} | 5 | μs |
| Power dissipation $T_C = 25^{\circ}\text{C}$ | P_{tot} | 240.0 | W |
| Operating junction temperature | T_{vj} | -40...+175 | $^{\circ}\text{C}$ |
| Storage temperature | T_{stg} | -55...+150 | $^{\circ}\text{C}$ |
| Soldering temperature, reflow soldering (MSL1 according to JEDEC J-STA-020) | | 260 | $^{\circ}\text{C}$ |

Thermal Resistance

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---------------|------------|-------|------|------|------|
| | | | min. | typ. | max. | |
| R_{th} Characteristics | | | | | | |
| IGBT thermal resistance, ³⁾ junction - case | $R_{th(j-c)}$ | | - | - | 0.62 | K/W |
| Diode thermal resistance, ⁴⁾ junction - case | $R_{th(j-c)}$ | | - | - | 2.00 | K/W |
| Thermal resistance, min. footprint junction - ambient | $R_{th(j-a)}$ | | - | - | 75 | K/W |
| Thermal resistance, 6cm ² Cu on PCB junction - ambient | $R_{th(j-a)}$ | | - | - | 50 | K/W |

¹⁾ Defined by design. Not subject to production test. $I_{Cpulsmax}$ limited by bondwire for $t_{pmax}=20\text{ms}$.

²⁾ Defined by design. Not subject to production test.

³⁾ R_{th}/Z_{th} based on single cooling pulse. Please be aware that a correct R_{th} measurement of the IGBT, is not possible using a thermocouple.

⁴⁾ R_{th}/Z_{th} based on single cooling pulse. Please be aware that a correct R_{th} measurement of the Diode, is not possible using a thermocouple.

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Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--------------------------------------|---------------|--|--------|--------------|-----------|---------------|
| | | | min. | typ. | max. | |
| Static Characteristic | | | | | | |
| Collector-emitter breakdown voltage | $V_{(BR)CES}$ | $V_{GE} = 0\text{V}, I_C = 0.20\text{mA}$ | 600 | - | - | V |
| Collector-emitter saturation voltage | V_{CEsat} | $V_{GE} = 15.0\text{V}, I_C = 15.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - - | 2.20 2.30 | 2.50 - | V |
| Diode forward voltage | V_F | $V_{GE} = 0\text{V}, I_F = 15.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - - | 2.10 2.00 | 2.40 - | V |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $I_C = 0.25\text{mA}, V_{CE} = V_{GE}$ | 4.3 | 5.0 | 5.7 | V |
| Zero gate voltage collector current | I_{CES} | $V_{CE} = 600\text{V}, V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - - | - 650 | 40 - | μA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\text{V}, V_{GE} = 20\text{V}$ | - | - | 100 | nA |
| Transconductance ¹⁾ | g_{fs} | $V_{CE} = 10\text{V}, I_C = 15.0\text{A}$ | - | 6.6 | - | S |
| Integrated gate resistor | r_G | | | none | | Ω |

Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|-------------|--|-------|------|------|------|
| | | | min. | typ. | max. | |
| Dynamic Characteristic | | | | | | |
| Input capacitance | C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | - | 961 | - | pF |
| Output capacitance | C_{oes} | | - | 53 | - | |
| Reverse transfer capacitance | C_{res} | | - | 33 | - | |
| Gate charge | Q_G | $V_{CC} = 480\text{V}, I_C = 15.0\text{A},$ $V_{GE} = 15\text{V}$ | - | 90.0 | - | nC |
| Internal emitter inductance measured 5mm (0.197 in.) from case | L_E | | - | 7.0 | - | nH |
| Short circuit collector current Max. 1000 short circuits Time between short circuits: $\geq 1.0\text{s}$ | $I_{C(SC)}$ | $V_{GE} = 15.0\text{V}, V_{CC} \leq 400\text{V},$ $t_{SC} \leq 5\mu\text{s}$ $T_{vj} = 25^{\circ}\text{C}$ | - | 112 | - | A |

Switching Characteristic, Inductive Load

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|--------------|---|-------|------|------|------|
| | | | min. | typ. | max. | |
| IGBT Characteristic, at $T_{vj} = 25^{\circ}\text{C}$ | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_{vj} = 25^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 15.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(on)} = 15.0\Omega, R_{G(off)} = 15.0\Omega,$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 34\text{pF}$ L_{σ}, C_{σ} from Fig. E | - | 13 | - | ns |
| Rise time | t_r | | - | 15 | - | ns |
| Turn-off delay time | $t_{d(off)}$ | | - | 160 | - | ns |
| Fall time | t_f | | - | 17 | - | ns |
| Turn-on energy | E_{on} | | - | 0.27 | - | mJ |
| Turn-off energy | E_{off} | | - | 0.25 | - | mJ |
| Total switching energy | E_{ts} | | - | 0.52 | - | mJ |

¹⁾ Typical value of transconductance determined at $T_{vj} = 175^{\circ}\text{C}$.