

ISL9V3040D3STV

ECOSPARK[®] Ignition IGBT

300 mJ, 400 V, N-Channel Ignition IGBT

Features

- SCIS Energy = 300 mJ at $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- This Device is Pb-Free and is RoHS Compliant
- AEC-Q101 Qualified and PPAP Capable

Applications

- Automotive Ignition Coil Driver Circuits
- High Current Ignition System
- Coil on Plug Applications

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ Unless Otherwise Stated)

| Parameter | Symbol | Value | Units |
|---|----------------|---------------|---------------------|
| Collector to Emitter Breakdown Voltage ($I_C = 1\text{ mA}$) | BV_{CER} | 400 | V |
| Emitter to Collector Voltage – Reverse Battery Condition ($I_C = 10\text{ mA}$) | BV_{ECS} | 24 | V |
| ISCIS = 14.2 A, L = 3.0 mHz, $R_{GE} = 1\text{ K}\Omega$ (Note 1), $T_C = 25^\circ\text{C}$ | E_{SCIS25} | 300 | mJ |
| ISCIS = 10.6 A, L = 3.0 mHz, $R_{GE} = 1\text{ K}\Omega$ (Note 2), $T_C = 150^\circ\text{C}$ | $E_{SCIS150}$ | 170 | mJ |
| Collector Current Continuous, at $V_{GE} = 4.0\text{ V}$, $T_C = 25^\circ\text{C}$ | I_{C25} | 21 | A |
| Collector Current Continuous, at $V_{GE} = 4.0\text{ V}$, $T_C = 110^\circ\text{C}$ | I_{C110} | 17 | A |
| Gate to Emitter Voltage Continuous | V_{GEM} | ± 10 | V |
| Power Dissipation Total, $T_C = 25^\circ\text{C}$ | PD | 150 | W |
| Power Dissipation Derating, $T_C > 25^\circ\text{C}$ | PD | 1 | W/ $^\circ\text{C}$ |
| Operating Junction and Storage Temperature | T_J, T_{STG} | -55 to 175 | $^\circ\text{C}$ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 300 | $^\circ\text{C}$ |
| Reflow soldering according to JESD020C | T_{PKG} | 260 | $^\circ\text{C}$ |
| HBM-Electrostatic Discharge Voltage at 100 pF, 1500 Ω | ESD | 4 | kV |
| CDM-Electrostatic Discharge Voltage at 1 Ω | ESD | 2 | kV |

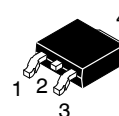
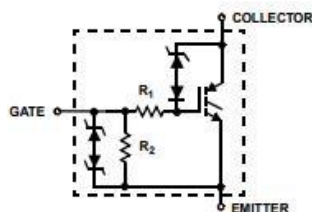
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Self Clamped inductive Switching Energy (E_{SCIS25}) of 300 mJ is based on the test conditions that is starting $T_J = 25^\circ\text{C}$, L = 3 mHz, ISCIS = 14.2 A, $V_{CC} = 100\text{ V}$ during inductor charging and $V_{CC} = 0\text{ V}$ during time in clamp.
2. Self Clamped inductive Switching Energy ($E_{SCIS150}$) of 170 mJ is based on the test conditions that is starting $T_J = 150^\circ\text{C}$, L = 3 mHz, ISCIS = 10.6 A, $V_{CC} = 100\text{ V}$ during inductor charging and $V_{CC} = 0\text{ V}$ during time in clamp.



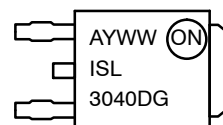
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DPAK (SINGLE GAUGE)
CASE 369C

MARKING DIAGRAM



ISL3040DG = Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ISL9V3040D3STV

THERMAL RESISTANCE RATINGS

| Characteristic | Symbol | Max | Units |
|--|-----------------|-----|-------|
| Junction-to-Case – Steady State (Drain) (Notes 1, 3 and 4) | $R_{\theta JC}$ | 1 | °C/W |

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | | |
|--|------------|--|---------------------------|----------|------|----------|---------------|
| Collector to Emitter Breakdown Voltage | BV_{CER} | $I_{CE} = 2\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 1\text{ K}\Omega$, $T_J = -40\text{ to }150^\circ\text{C}$ | 370 | 400 | 430 | V | |
| Collector to Emitter Breakdown Voltage | BV_{CES} | $I_{CE} = 10\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 0$, $T_J = -40\text{ to }150^\circ\text{C}$ | 390 | 420 | 450 | V | |
| Emitter to Collector Breakdown Voltage | BV_{ECS} | $I_{CE} = -75\text{ mA}$, $V_{GE} = 0\text{ V}$, $T_J = 25^\circ\text{C}$ | 30 | – | – | V | |
| Gate to Emitter Breakdown Voltage | BV_{GES} | $I_{GES} = \pm 2\text{ mA}$ | ± 12 | ± 14 | – | V | |
| Collector to Emitter Leakage Current | I_{CER} | $V_{CE} = 175\text{ V}$, $R_{GE} = 1\text{ K}\Omega$ | $T_J = 25^\circ\text{C}$ | – | – | 25 | μA |
| | | | $T_J = 150^\circ\text{C}$ | – | – | 1 | mA |
| Emitter to Collector Leakage Current | I_{ECS} | $V_{EC} = 24\text{ V}$ | $T_J = 25^\circ\text{C}$ | – | – | 1 | mA |
| | | | $T_J = 150^\circ\text{C}$ | – | – | 40 | |
| Series Gate Resistance | R_1 | | – | 70 | – | Ω | |
| Gate to Emitter Resistance | R_2 | | 10 K | – | 26 K | Ω | |

ON CHARACTERISTICS

| | | | | | | |
|---|---------------|---|---|------|------|---|
| Collector to Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{CE} = 6\text{ A}$, $V_{GE} = 4\text{ V}$, $T_J = 25^\circ\text{C}$ | – | 1.25 | 1.65 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{CE} = 10\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_J = 150^\circ\text{C}$ | – | 1.58 | 1.80 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{CE} = 15\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_J = 150^\circ\text{C}$ | – | 1.90 | 2.20 | V |

DYNAMIC CHARACTERISTICS

| | | | | | | | |
|-----------------------------------|--------------|---|---------------------------|------|---|-----|---|
| Gate Charge | $Q_{G(ON)}$ | $I_{CE} = 10\text{ A}$, $V_{CE} = 12\text{ V}$, $V_{GE} = 5\text{ V}$ | – | 17 | – | nC | |
| Gate to Emitter Threshold Voltage | $V_{GE(TH)}$ | $I_{CE} = 1\text{ mA}$, $V_{CE} = V_{GE}$ | $T_J = 25^\circ\text{C}$ | 1.3 | – | 2.2 | V |
| | | | $T_J = 150^\circ\text{C}$ | 0.75 | – | 1.8 | |
| Gate to Emitter Plateau Voltage | V_{GEP} | $V_{CE} = 12\text{ V}$, $I_{CE} = 10\text{ A}$ | – | 3.0 | – | V | |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------------------------|---------------|--|---|-----|----|---------------|
| Current Turn-On Delay Time-Resistive | $t_{d(ON)R}$ | $V_{CE} = 14\text{ V}$, $R_L = 1\text{ }\Omega$, $V_{GE} = 5\text{ V}$, $R_G = 470\text{ }\Omega$, $T_J = 25^\circ\text{C}$ | – | 0.7 | 4 | μs |
| Current Rise Time-Resistive | t_{rR} | | – | 2.1 | 7 | |
| Current Turn-Off Delay Time-Inductive | $t_{d(OFF)L}$ | $V_{CE} = 300\text{ V}$, $L = 1\text{ mH}$, $V_{GE} = 5\text{ V}$, $R_G = 470\text{ }\Omega$, $I_{CE} = 6.5\text{ A}$, $T_J = 25^\circ\text{C}$ | – | 4.8 | 15 | |
| Current Fall Time-Inductive | t_{fL} | | – | 2.8 | 15 | |

PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device | Package | Reel Diameter | Tape Width | Qty |
|----------------|----------------|-------------------|---------------|------------|------|
| ISL9V3040G1 | ISL9V3040D3STV | DPAK (Pb-Free) | 330 mm | 16 mm | 2500 |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ISL9V3040D3STV

TYPICAL CHARACTERISTICS

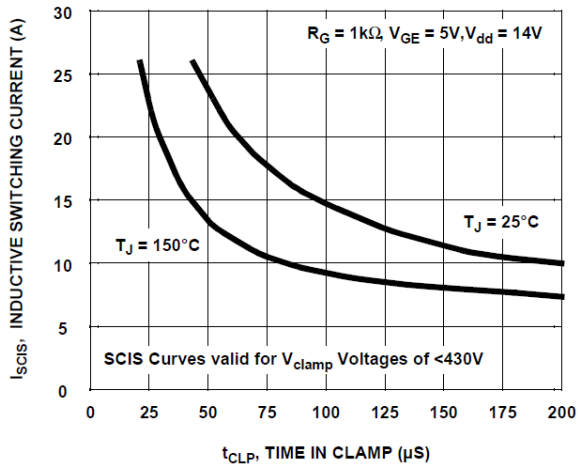


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

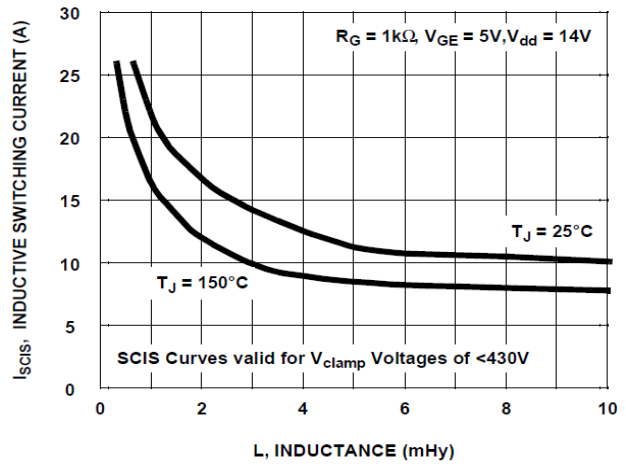


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

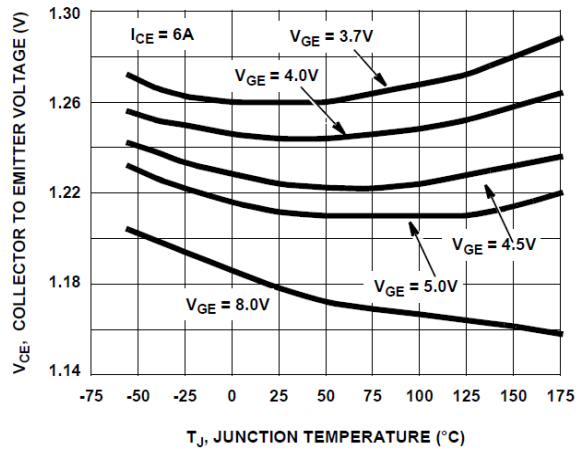


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

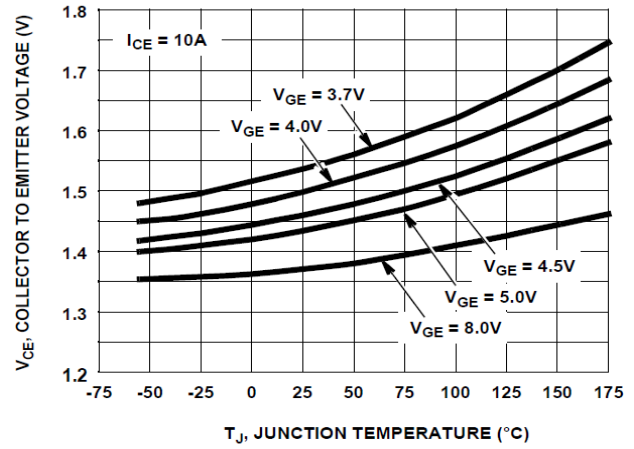


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

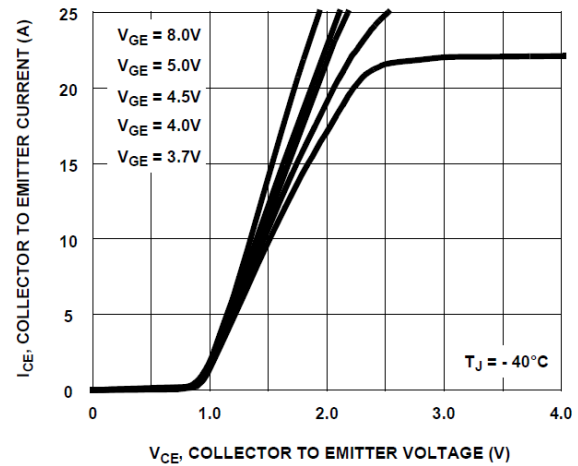


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

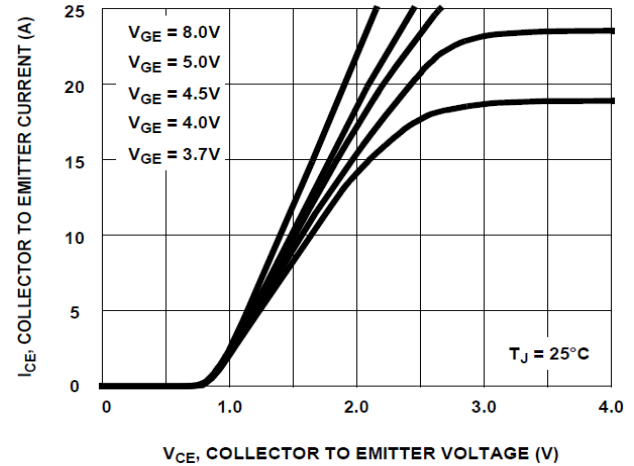


Figure 6. Collector to Emitter On- State Voltage vs. Collector Current

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TYPICAL CHARACTERISTICS (continued)

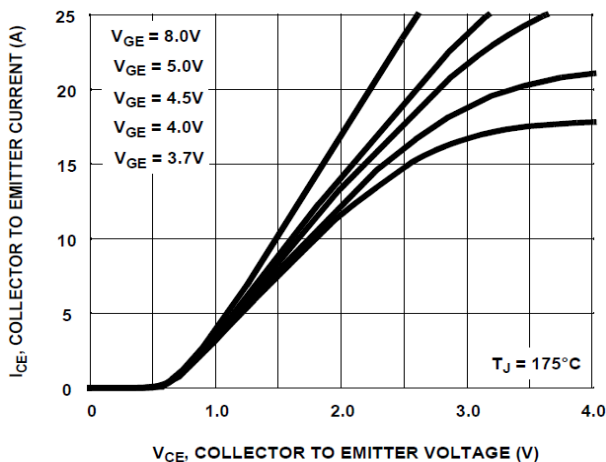


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

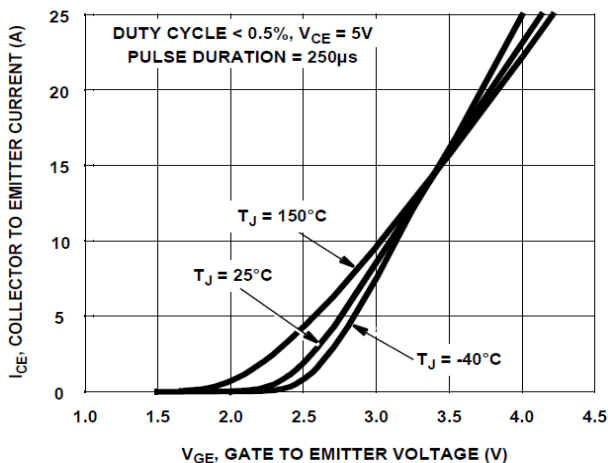


Figure 8. Transfer Characteristics

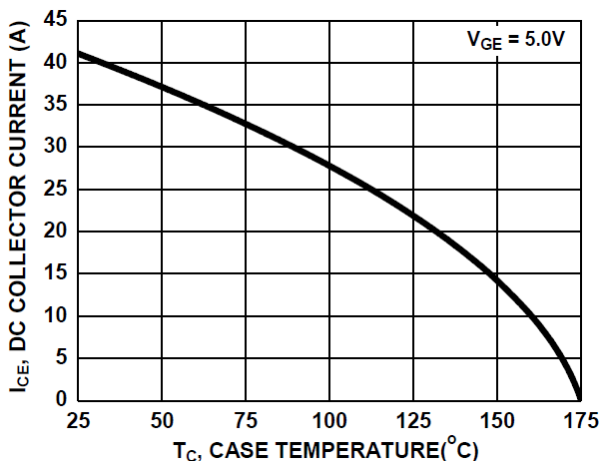


Figure 9. DC Collector Current vs. Case Temperature

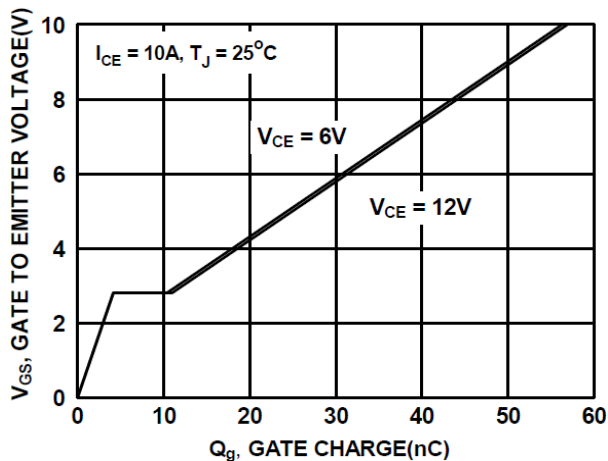


Figure 10. Gate Charge

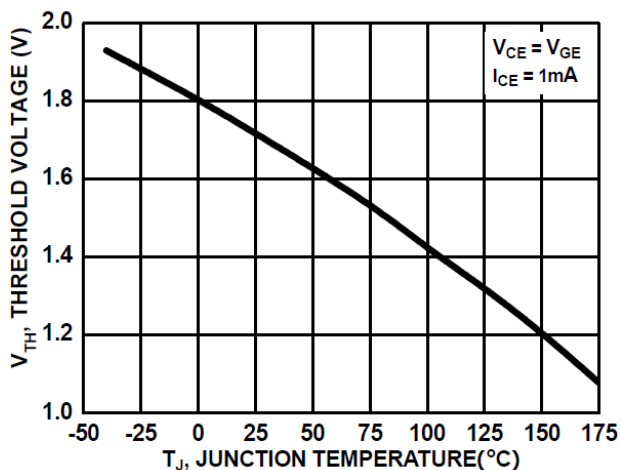


Figure 11. Threshold Voltage vs. Junction Temperature

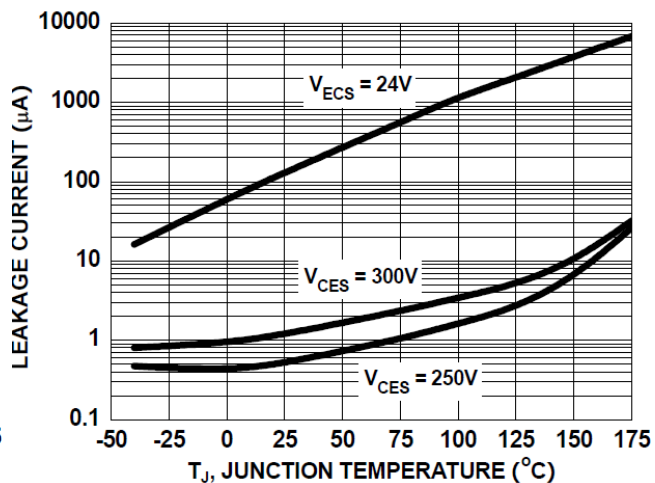


Figure 12. Leakage Current vs. Junction Temperature

ISL9V3040D3STV

TYPICAL CHARACTERISTICS (continued)

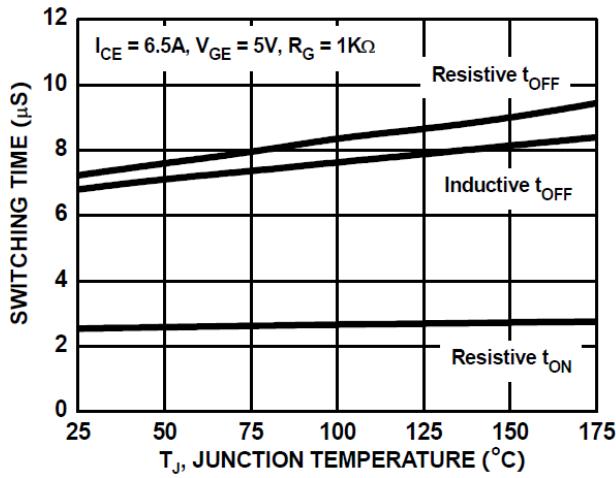


Figure 13. Switching Time vs. Junction Temperature

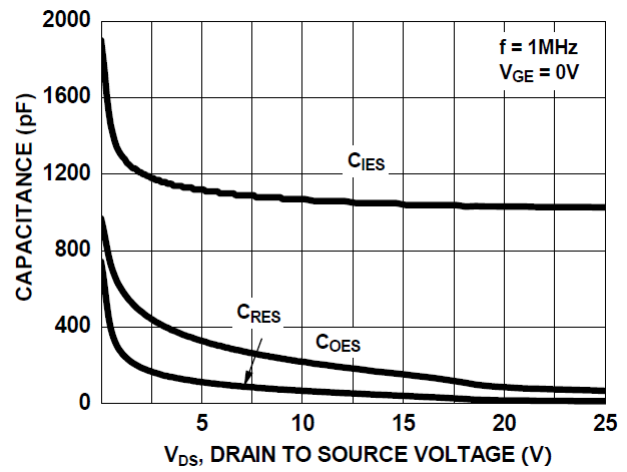


Figure 14. Capacitance vs. Collector to Emitter Voltage

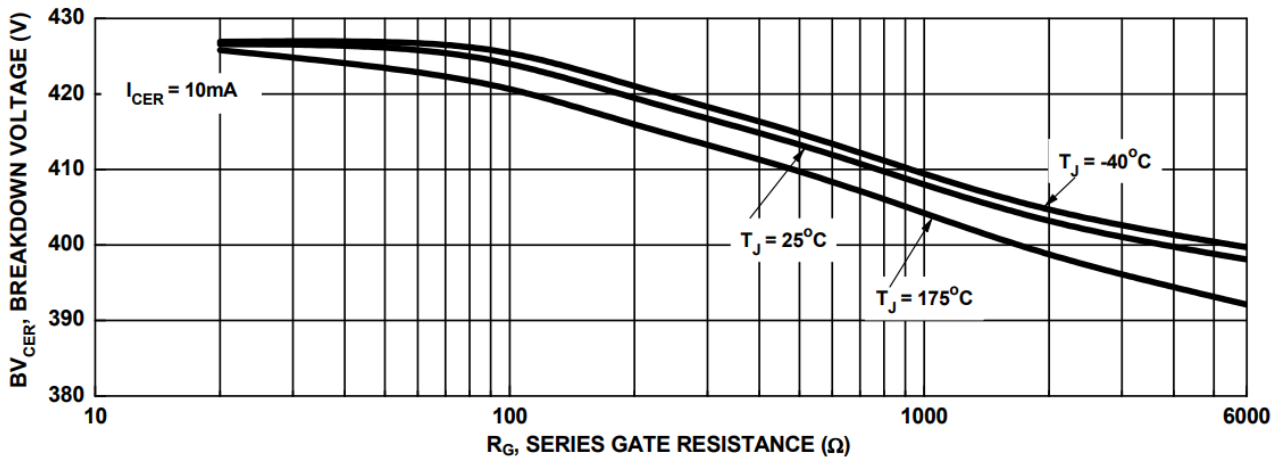


Figure 15. Break down Voltage vs. Series Resistance

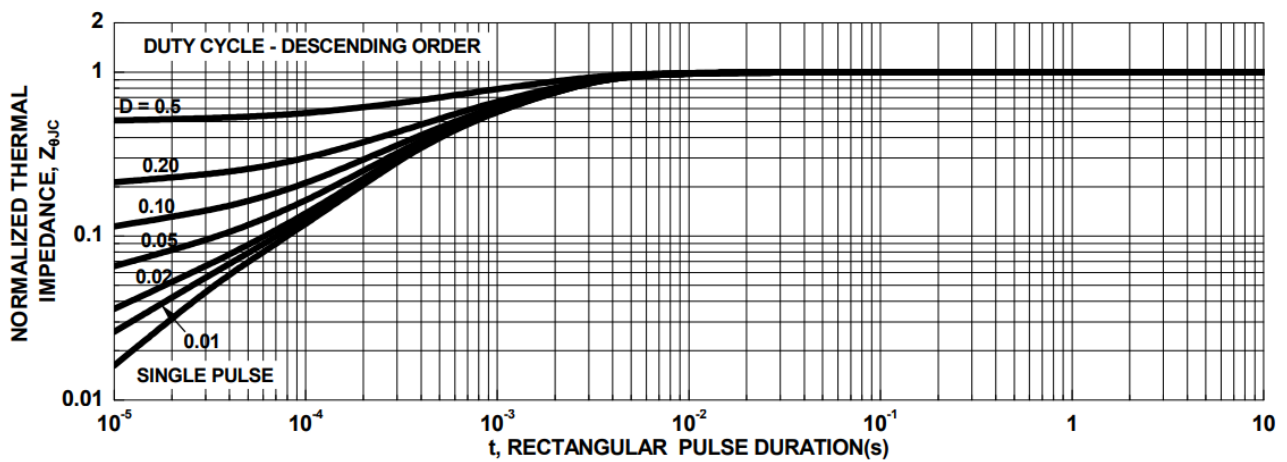


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

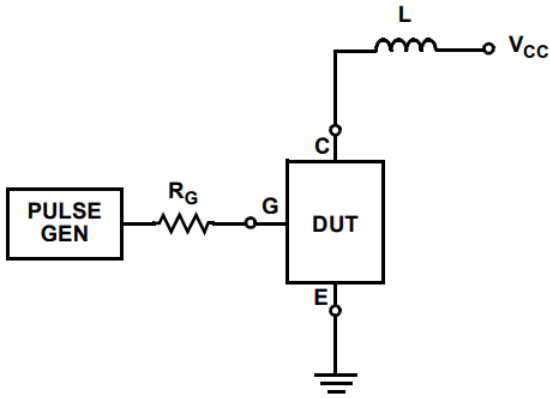


Figure 17. Inductive Switching Test Circuit

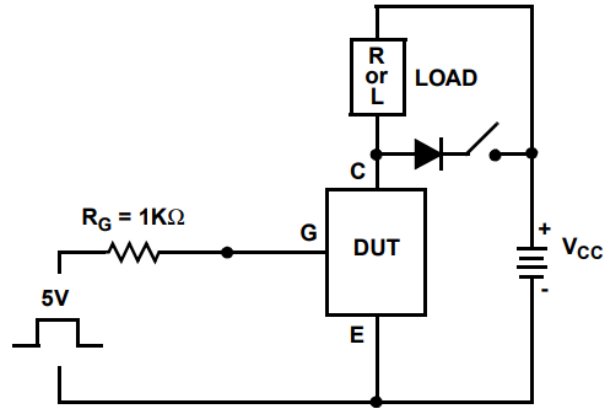


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

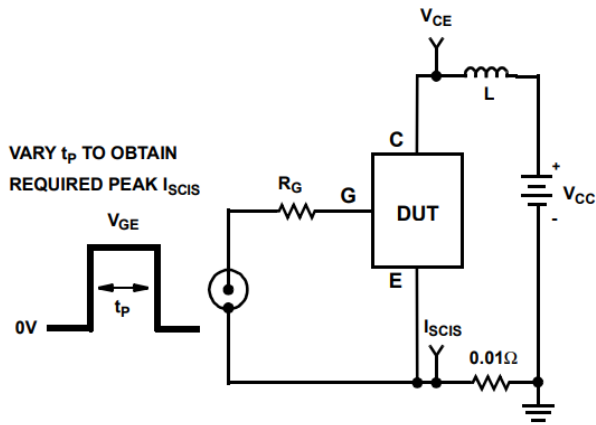


Figure 19. Energy Test Circuit

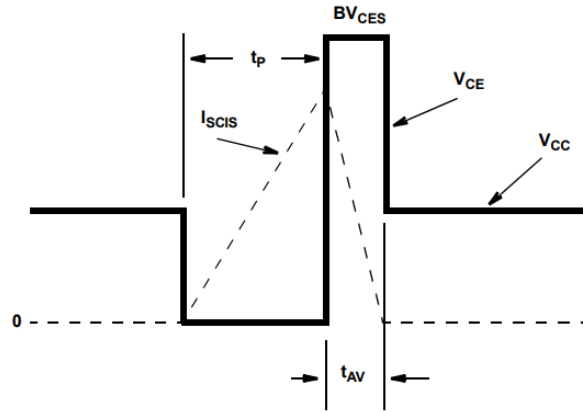
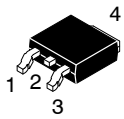


Figure 20. Energy Waveforms

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1

DPAK (SINGLE GAUGE)

CASE 369C

ISSUE F

DATE 21 JUL 2015



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.086 | 0.094 | 2.18 | 2.38 |
| A1 | 0.000 | 0.005 | 0.00 | 0.13 |
| b | 0.025 | 0.035 | 0.63 | 0.89 |
| b2 | 0.028 | 0.045 | 0.72 | 1.14 |
| b3 | 0.180 | 0.215 | 4.57 | 5.46 |
| c | 0.018 | 0.024 | 0.46 | 0.61 |
| c2 | 0.018 | 0.024 | 0.46 | 0.61 |
| D | 0.235 | 0.245 | 5.97 | 6.22 |
| E | 0.250 | 0.265 | 6.35 | 6.73 |
| e | 0.090 BSC | | 2.29 BSC | |
| H | 0.370 | 0.410 | 9.40 | 10.41 |
| L | 0.055 | 0.070 | 1.40 | 1.78 |
| L1 | 0.114 REF | | 2.90 REF | |
| L2 | 0.020 BSC | | 0.51 BSC | |
| L3 | 0.035 | 0.050 | 0.89 | 1.27 |
| L4 | --- | 0.040 | --- | 1.01 |
| Z | 0.155 | --- | 3.93 | --- |

GENERIC MARKING DIAGRAM*



- XXXXXX = Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking.

- | | | | | |
|--|--|---|---|--|
| <p>STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN</p> | <p>STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 4: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE</p> | <p>STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE</p> |
| <p>STYLE 6: PIN 1. MT1 2. MT2 3. GATE 4. MT2</p> | <p>STYLE 7: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 8: PIN 1. N/C 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 9: PIN 1. ANODE 2. CATHODE 3. RESISTOR ADJUST 4. CATHODE</p> | <p>STYLE 10: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. ANODE</p> |

SOLDERING FOOTPRINT*



SCALE 3:1 (mm / inches)

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

| | | |
|-------------------------|----------------------------|--|
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Конструкторский отдел помогает осуществить:

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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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