ECOSPARK® Ignition IGBT

250 mJ, 400 V, N-Channel Ignition IGBT

ISL9V2540S3ST-F085C

ON Semiconductor®

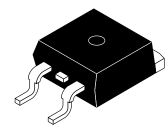
www.onsemi.com

Features

- SCIS Energy = 250 mJ at T_J = 25°C
- Logic Level Gate Drive
- AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

Applications

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



D²PAK−3
CASE 418AJ

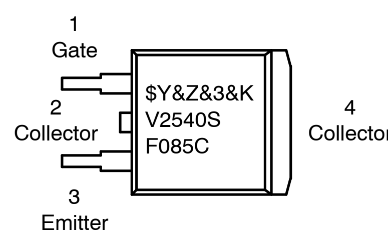
MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Collector to Emitter Breakdown Voltage (I_C = 1 mA)	BV_{CER}	430	V
Emitter to Collector Voltage − Reverse Battery Condition (I_C = 10 mA)	BV_{ECS}	24	V
I_{SCIS} = 12.9 A, L = 3.0 mHy, R_{GE} = 1 kΩ, T_C = 25°C (Note 1)	E_{SCIS25}	250	mJ
I_{SCIS} = 10 A, L = 3.0 mHy, R_{GE} = 1 kΩ, T_C = 150°C (Note 2)	$E_{SCIS150}$	150	mJ
Collector Current Continuous, at V_{GE} = 4.0 V, T_C = 25°C	IC25	15.5	A
Collector Current Continuous, at V_{GE} = 4.0 V, T_C = 110°C	IC110	15.3	A
Gate to Emitter Voltage Continuous	V_{GEM}	±10	V
Power Dissipation Total, T_C = 25°C	PD	166.7	W
Power Dissipation Derating, T_C > 25°C	PD	1.11	W/°C
Operating Junction and Storage Temperature	T_J, T_{STG}	−40 to 175	°C
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)	T_L	300	°C
Reflow soldering according to JESD020C	T_{PKG}	260	°C
HBM−Electrostatic Discharge Voltage at 100 pF, 1500 Ω	ESD	4	kV
CDM−Electrostatic Discharge Voltage at 1 Ω	ESD	2	kV

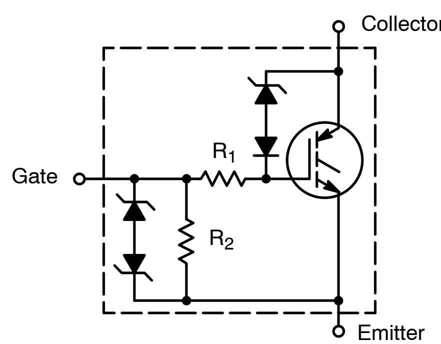
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Self Clamped inductive Switching Energy (ESCIS25) of 250 mJ is based on the test conditions that is starting T_J = 25°C, L = 3 mHy, I_{SCIS} = 12.9 A, V_{CC} = 100 V during inductor charging and V_{CC} = 0 V during time in clamp.
2. Self Clamped inductive Switching Energy (ESCIS150) of 150 mJ is based on the test conditions that is starting T_J = 150°C, L = 3 mHy, I_{SCIS} = 10 A, V_{CC} = 100 V during inductor charging and V_{CC}=0 V during time in clamp.

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Date Code (Week & Year)
&K	= Lot Code
V2540SF085C	= Specific Device Code



ORDERING INFORMATION

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

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Case – Steady State (Drain)	$R_{\theta JC}$	0.9	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Collector to Emitter Breakdown Voltage	BV_{CER}	I_{CE} = 2 mA, V_{GE} = 0 V, R_{GE} = 1 kΩ, T_J = −40 to 150°C		370	400	430	V
Collector to Emitter Breakdown Voltage	BV_{CES}	I_{CE} = 10 mA, V_{GE} = 0 V, R_{GE} = 0 Ω, T_J = −40 to 150°C		390	420	450	V
Emitter to Collector Breakdown Voltage	BV_{ECS}	I_{CE} = −75 mA, V_{GE} = 0 V, T_J = 25°C		30	–	–	V
Gate to Emitter Breakdown Voltage	BV_{GES}	I_{GES} = ±2 mA		±12	±14	–	V
Collector to Emitter Leakage Current	I_{CER}	V_{CE} = 175 V, R_{GE} = 1 kΩ	T_J = 25°C	–	–	25	μA
			T_J = 150°C	–	–	1	mA
Emitter to Collector Leakage Current	I_{ECS}	V_{EC} = 24 V	T_J = 25°C	–	–	1	mA
			T_J = 150°C	–	–	40	
Series Gate Resistance	R_1			–	70	–	Ω
Gate to Emitter Resistance	R_2			10	–	26	kΩ
ON CHARACTERISTICS							
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{CE} = 6 A, V_{GE} = 4 V, T_J = 25°C		–	1.37	1.8	V
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{CE} = 10 A, V_{GE} = 4.5 V, T_J = 150°C		–	1.77	2.2	V
DYNAMIC CHARACTERISTICS							
Gate Charge	$Q_{G(ON)}$	I_{CE} = 10 A, V_{CE} = 12 V, V_{GE} = 5 V		–	15.1	–	nC
Gate to Emitter Threshold Voltage	$V_{GE(TH)}$	I_{CE} = 1 mA, V_{CE} = V_{GE}	T_J = 25°C	1.3	–	2.2	V
			T_J = 150°C	0.75	–	1.8	
Gate to Emitter Plateau Voltage	V_{GEP}	V_{CE} = 12 V, I_{CE} = 12 A		–	3.1	–	V
SWITCHING CHARACTERISTICS							
Current Turn−On Delay Time−Resistive	$td_{(ON)R}$	V_{CE} = 14 V, R_L = 1 Ω, V_{GE} = 5 V, R_G = 1 kΩ, T_J = 25°C		–	0.61	–	μs
Current Rise Time−Resistive	t_{rR}			–	2.17	–	
Current Turn−Off Delay Time−Inductive	$td_{(OFF)L}$	V_{CE} = 300 V, L = 500 μH, V_{GE} = 5 V, R_G = 1 kΩ, T_J = 25°C		–	3.64	–	
Current Fall Time−Inductive	t_{fL}			–	2.36	–	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

ORDERING INFORMATION

Device	Package	Shipping†
ISL9V2540S3ST−F085C	D^2PAK−3 (Pb−Free)	800 / Tape & Reel

†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.

TYPICAL CHARACTERISTICS

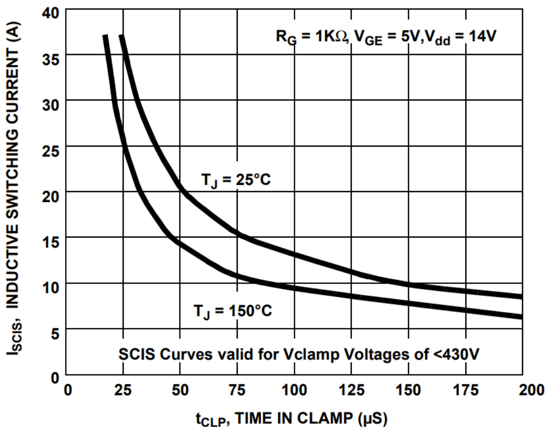


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

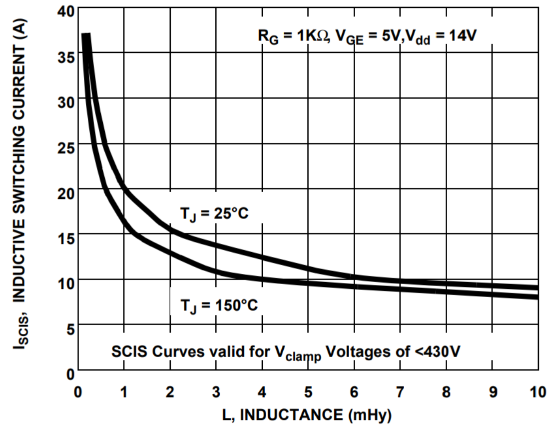


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

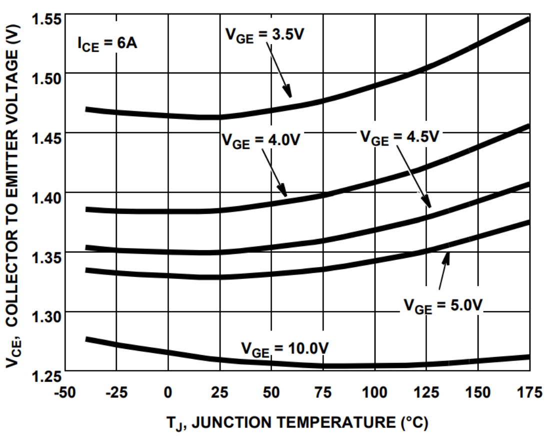


Figure 3. Collector to Emitter On−State Voltage vs. Junction Temperature

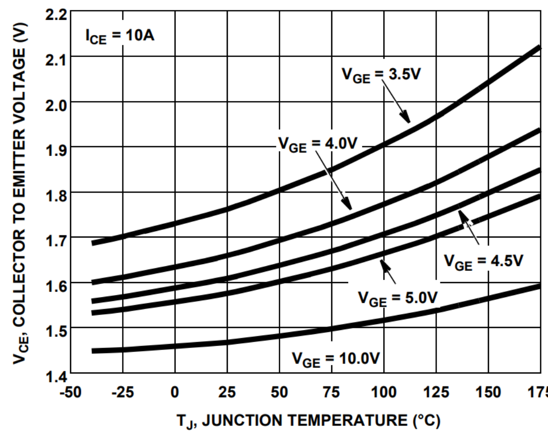


Figure 4. Collector to Emitter On−State Voltage vs. Junction Temperature

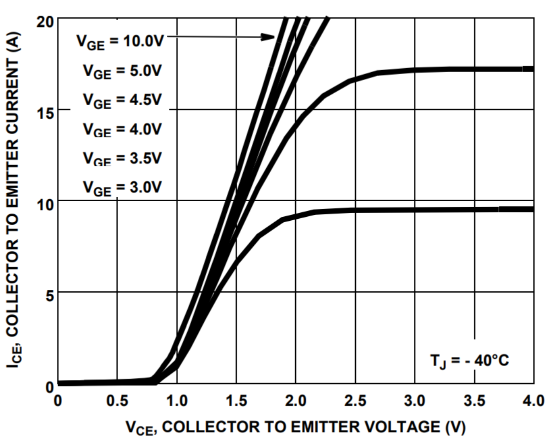


Figure 5. Collector to Emitter On−State Voltage vs. Collector Current

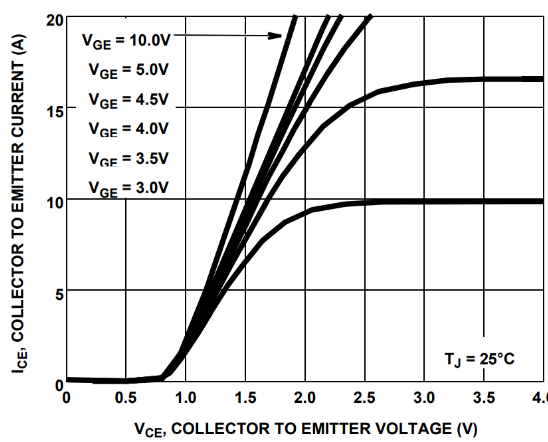


Figure 6. Collector to Emitter On− State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS (Continued)

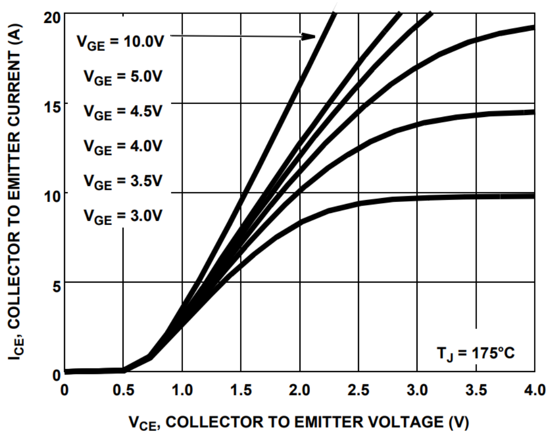


Figure 7. Collector to Emitter On−State Voltage vs. Collector Current

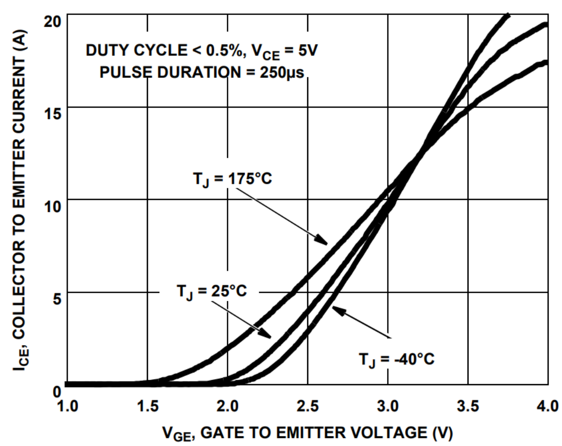


Figure 8. Transfer Characteristics

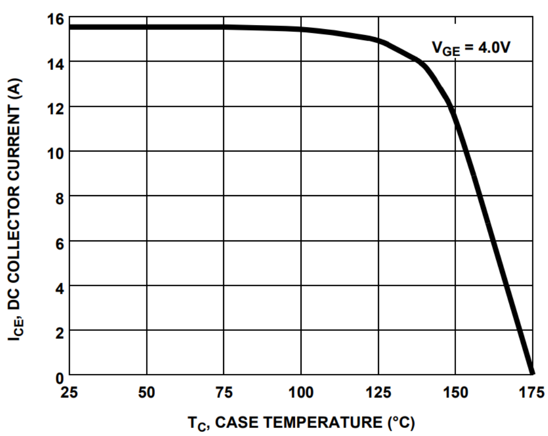


Figure 9. DC Collector Current vs. Case Temperature

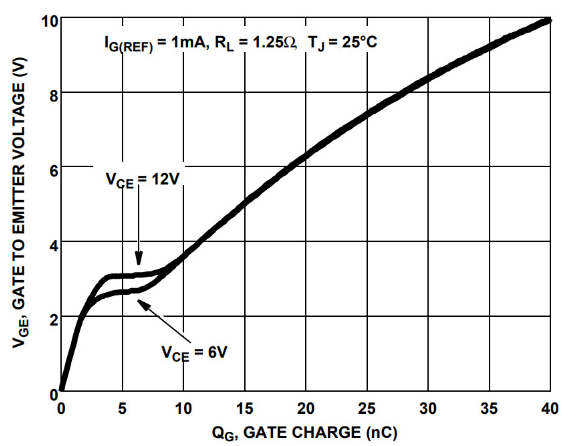


Figure 10. Gate Charge

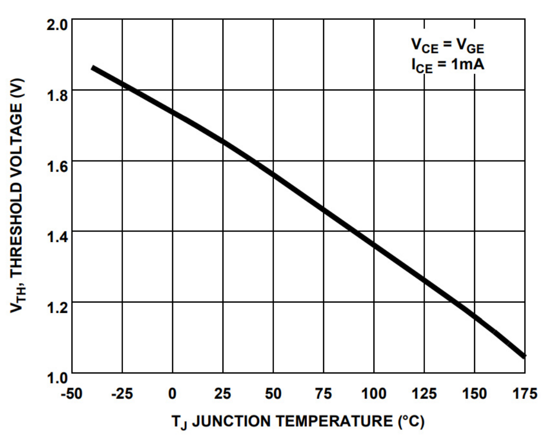


Figure 11. Threshold Voltage vs. Junction Temperature

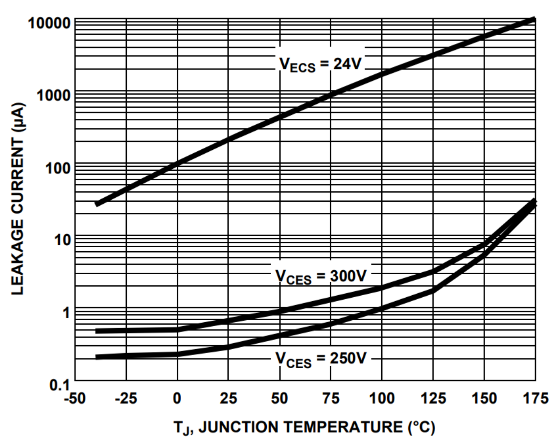


Figure 12. Leakage Current vs. Junction Temperature

TYPICAL CHARACTERISTICS (Continued)

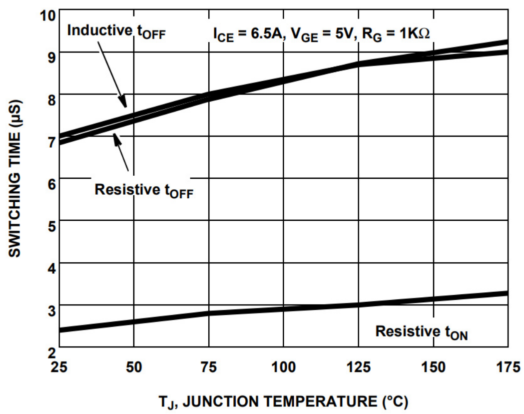


Figure 13. Switching Time vs. Junction Temperature

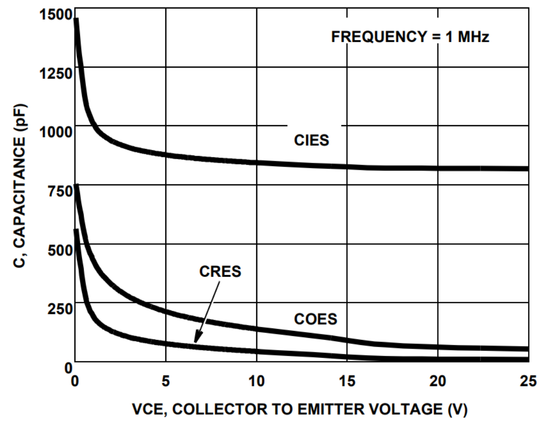


Figure 14. Capacitance vs. Collector to Emitter Voltage

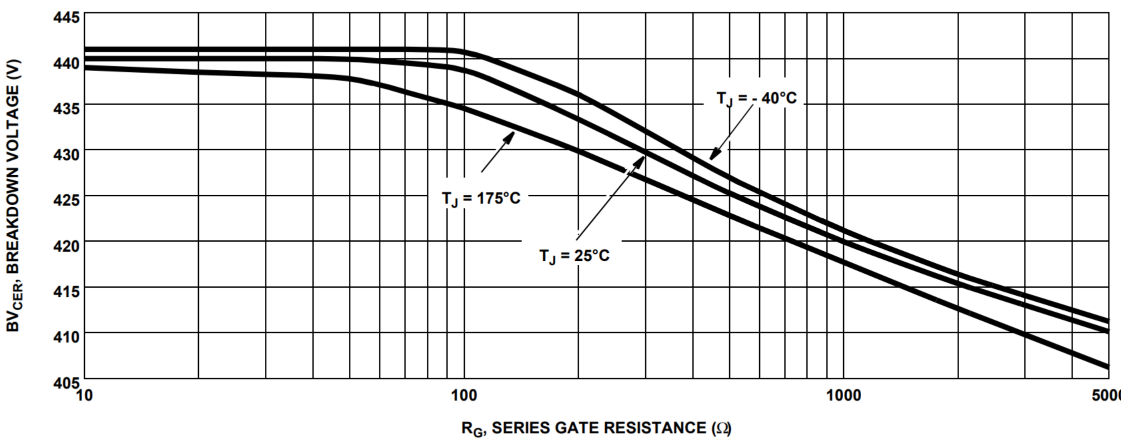


Figure 15. Break down Voltage vs. Series Resistance

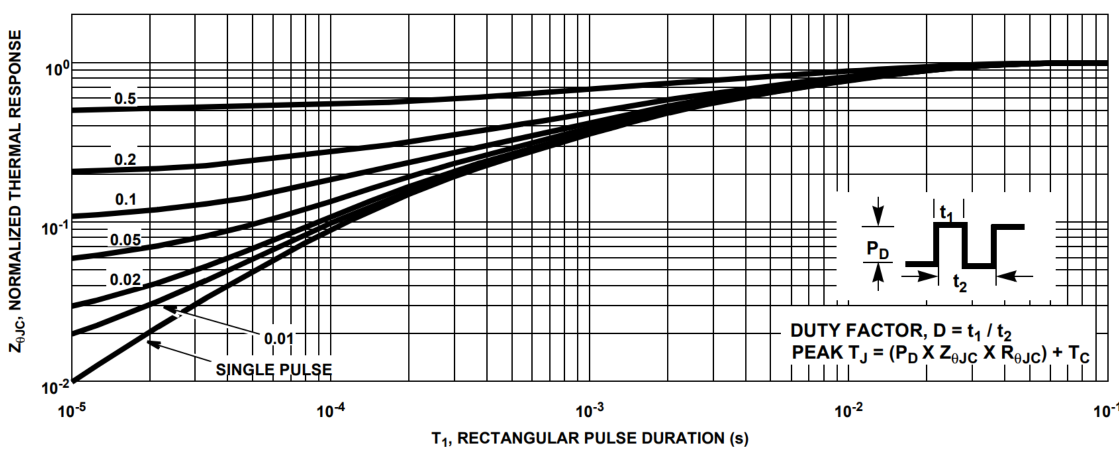


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

TEST CIRCUIT AND WAVEFORMS

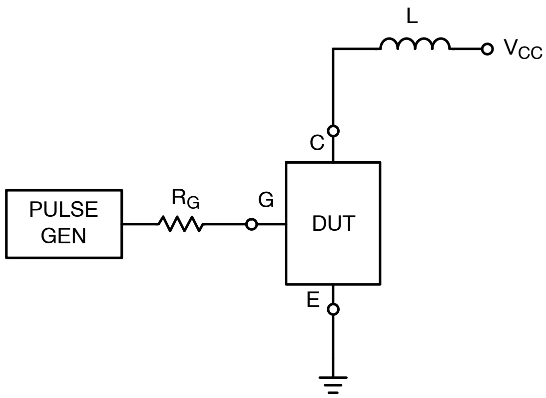


Figure 17. Inductive Switching Test Circuit

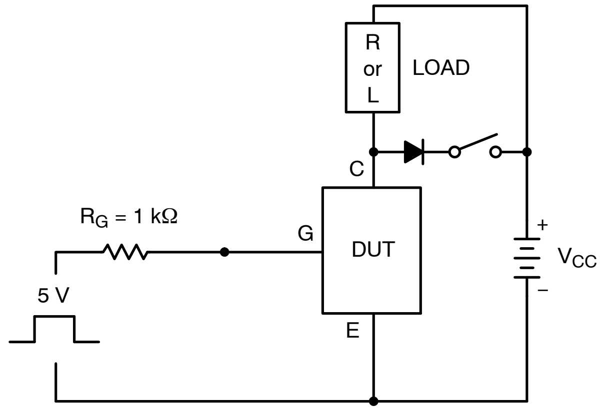


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

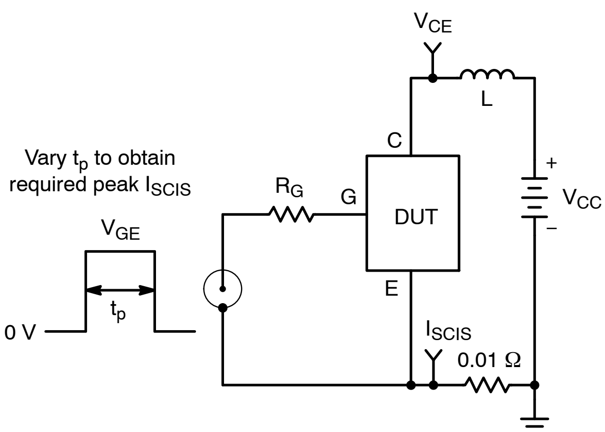


Figure 19. Energy Test Circuit

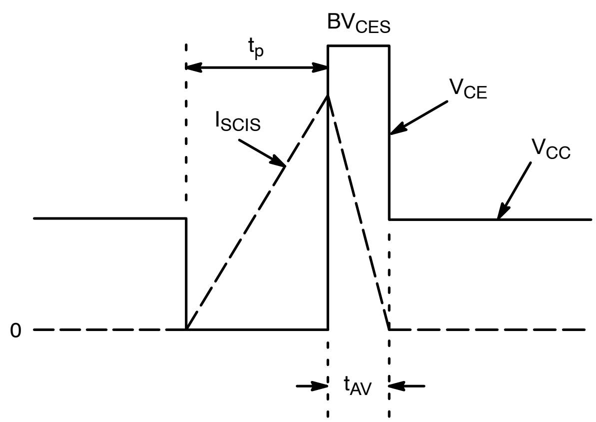
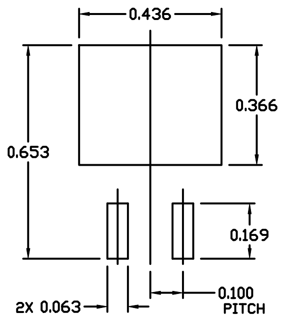


Figure 20. Energy Waveforms

PACKAGE DIMENSIONS

D2PAK−3 (TO−263, 3−LEAD)
CASE 418AJ
ISSUE E

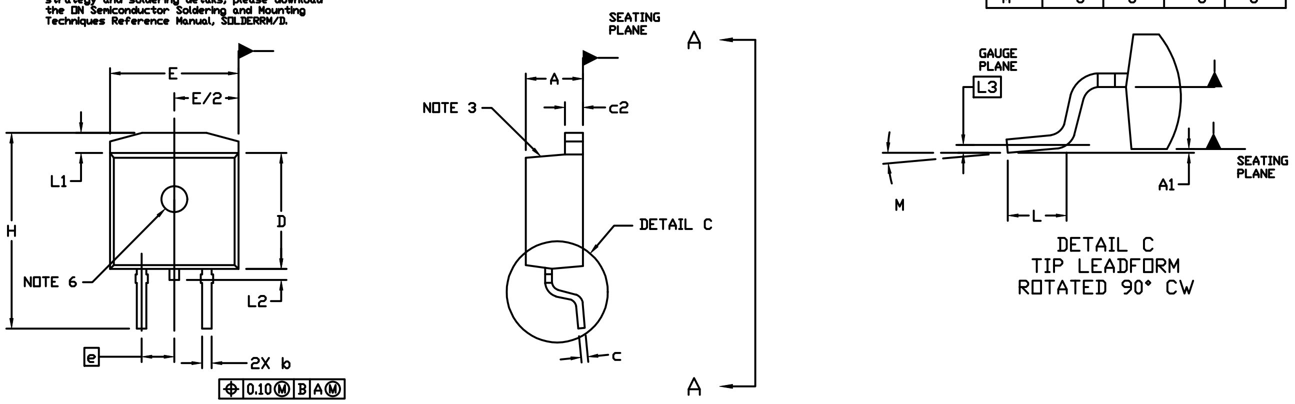


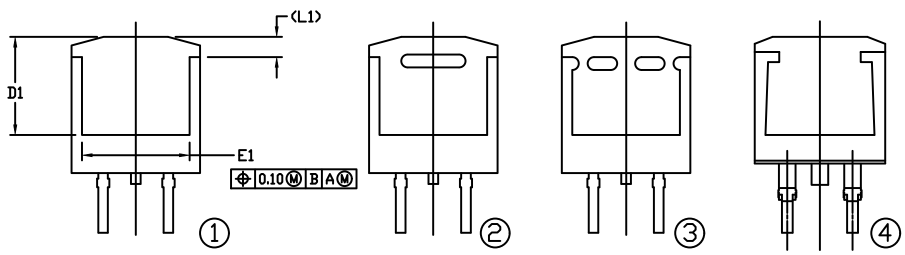
RECOMMENDED MOUNTING FOOTPRINT

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

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ①, ② ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

DIM	INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100 BSC		2.54 BSC	
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010 BSC		0.25 BSC	
M	−8°	8°	−8°	8°





VIEW A−A

VIEW A−A
OPTIONAL CONSTRUCTIONS

ECOSPARK is a registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative