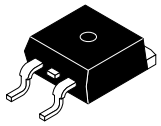
ECOSPARK® Ignition IGBT

500 mJ, 450 V, N-Channel Ignition IGBT

ISL9V5045S3ST-F085C



D²PAK–3
CASE 418AJ

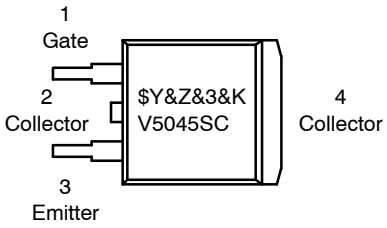
Features

- SCIS Energy = 500 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

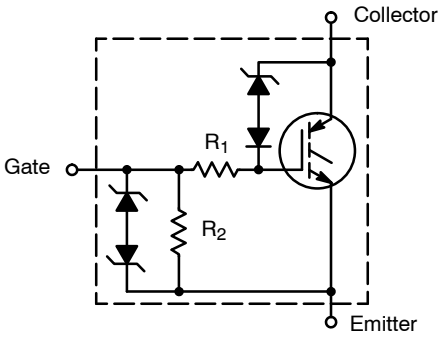
Applications

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

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Date Code (Week & Year)
&K	= Lot Code
V5045SC	= Specific Device Code



ORDERING INFORMATION

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

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

Parameter	Symbol	Value	Unit
Collector to Emitter Breakdown Voltage (I_C = 1 mA)	BV_{CER}	480	V
Emitter to Collector Voltage – Reverse Battery Condition (I_C = 10 mA)	BV_{ECS}	24	V
I_{SCIS} = 39.2 A, L = 650 μHy, R_{GE} = 1 kΩ, T_C = 25°C (Note 1)	E_{SCIS25}	500	mJ
I_{SCIS} = 31.1 A, L = 650 μHy, R_{GE} = 1 kΩ, T_C = 150°C (Note 2)	$E_{SCIS150}$	315	mJ
Collector Current Continuous, at V_{GE} = 4.0 V, T_C = 25°C	IC25	51	A
Collector Current Continuous, at V_{GE} = 4.0 V, T_C = 110°C	IC110	43	A
Gate to Emitter Voltage Continuous	V_{GEM}	±10	V
Power Dissipation Total, T_C = 25°C	PD	300	W
Power Dissipation Derating, T_C > 25°C	PD	2	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 500 mJ is based on the test conditions that is starting T_J = 25°C, L = 650 μHy, I_{SCIS} = 39.2 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 315 mJ is based on the test conditions that is starting T_J = 150°C, L = 650 μHy, I_{SCIS} = 31.1 A, V_{CC} = 100 V during inductor charging and V_{CC}=0 V during time in clamp.

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		420	450	480	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		445	475	505	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			–	100	–	Ω
Gate to Emitter Resistance	R_2			10	–	30	kΩ
ON CHARACTERISTICS							
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{CE} = 10 A, V_{GE} = 4.0 V, T_J = 25°C		–	1.25	1.6	V
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{CE} = 15 A, V_{GE} = 4.5 V, T_J = 150°C		–	1.47	1.8	V
DYNAMIC CHARACTERISTICS							
Gate Charge	$Q_{G(ON)}$	I_{CE} = 10 A, V_{CE} = 12 V, V_{GE} = 5 V		–	32	–	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		–	0.7	4	μs
Current Rise Time−Resistive	t_{rR}			–	2.1	7	
Current Turn−Off Delay Time−Inductive	$td_{(OFF)L}$	V_{CE} = 300 V, L = 650 μH, V_{GE} = 5 V, R_G = 1 kΩ, T_J = 25°C		–	10.8	15	
Current Fall Time−Inductive	t_{fL}			–	2.8	15	

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†
ISL9V5045S3ST−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

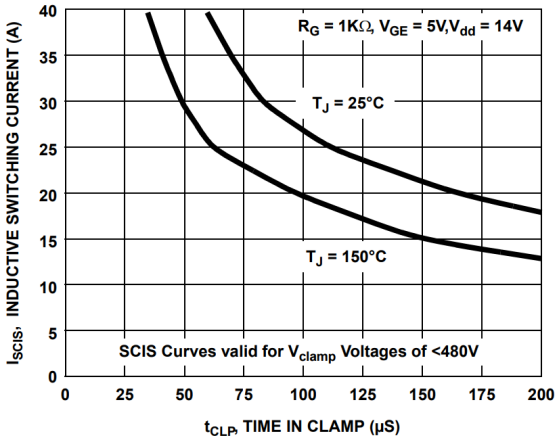


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

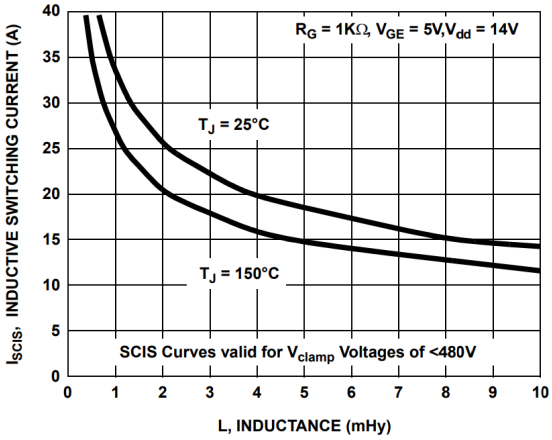


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

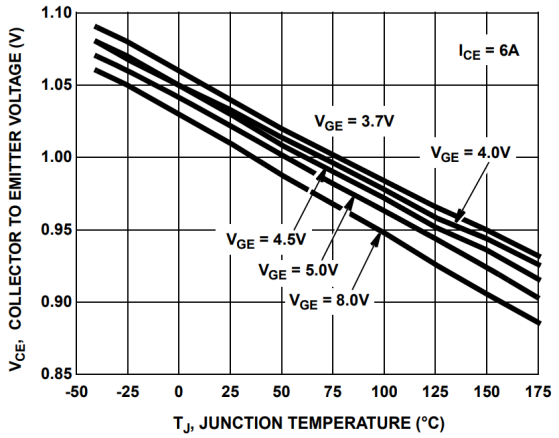


Figure 3. Collector to Emitter On−State Voltage vs. Junction Temperature

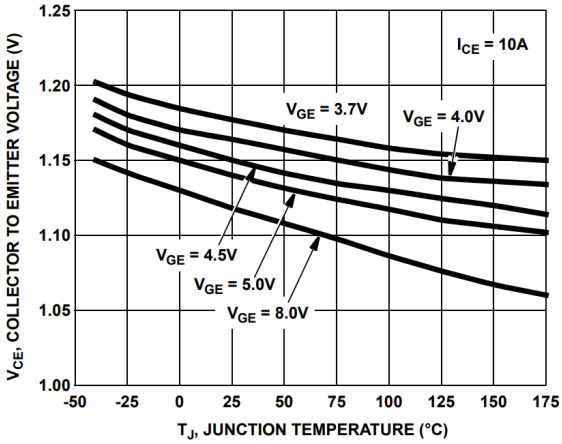


Figure 4. Collector to Emitter On−State Voltage vs. Junction Temperature

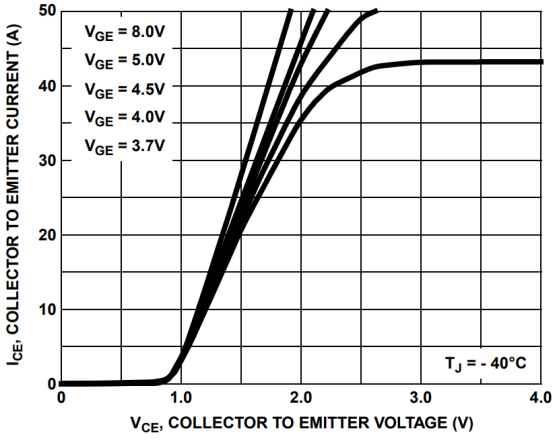


Figure 5. Collector to Emitter On−State Voltage vs. Collector Current

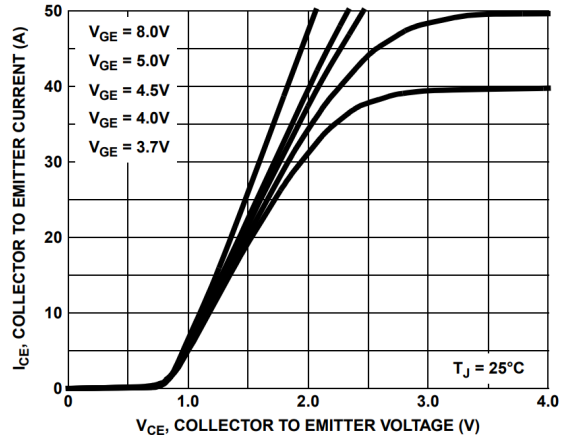


Figure 6. Collector to Emitter On− State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS (Continued)

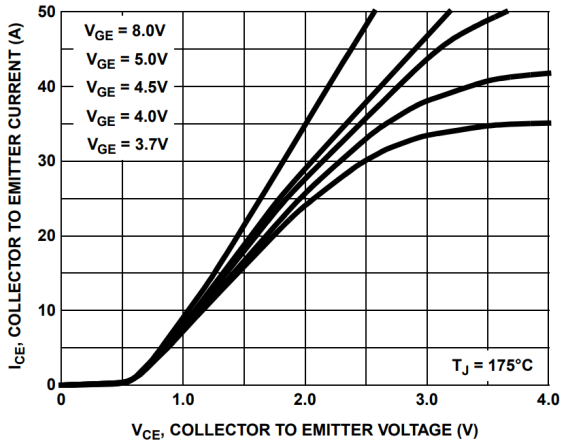


Figure 7. Collector to Emitter On−State Voltage vs. Collector Current

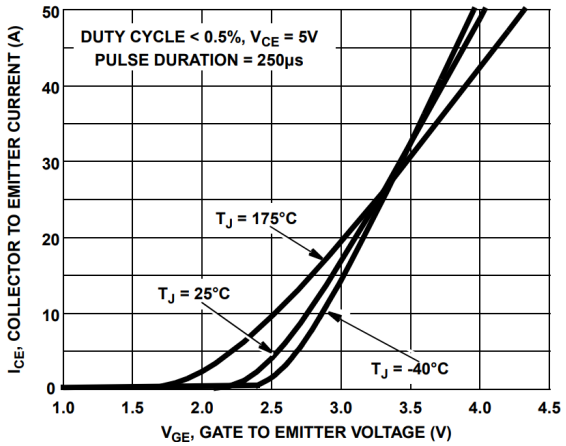


Figure 8. Transfer Characteristics

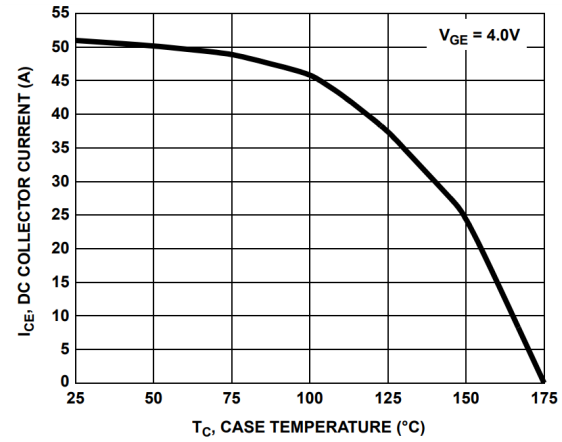


Figure 9. DC Collector Current vs. Case Temperature

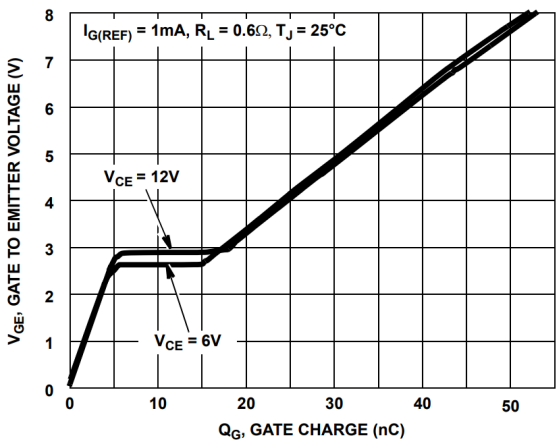


Figure 10. Gate Charge

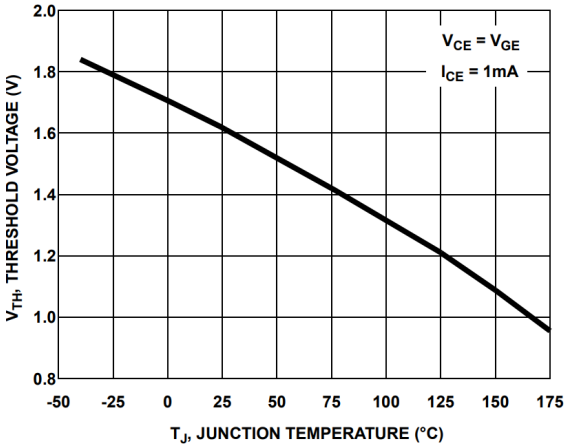


Figure 11. Threshold Voltage vs. Junction Temperature

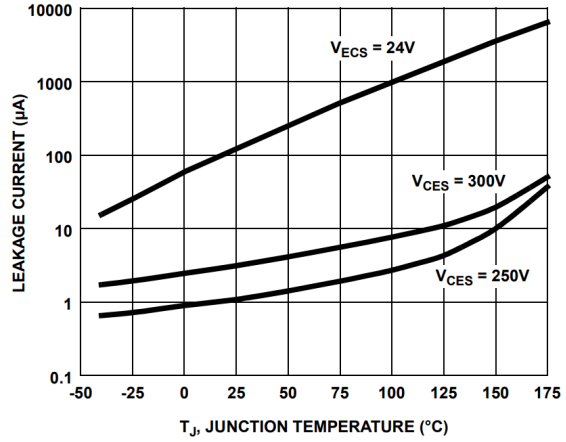


Figure 12. Leakage Current vs. Junction Temperature

TYPICAL CHARACTERISTICS (Continued)

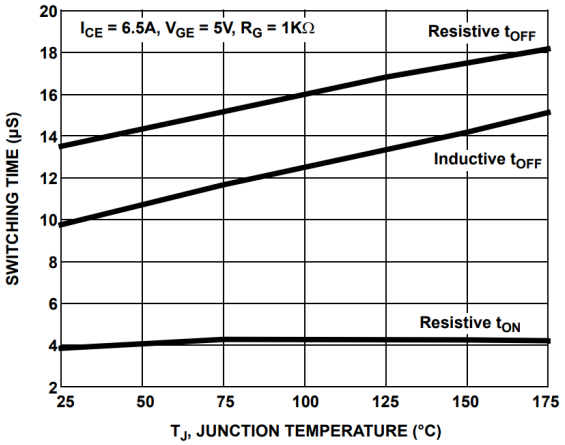


Figure 13. Switching Time vs. Junction Temperature

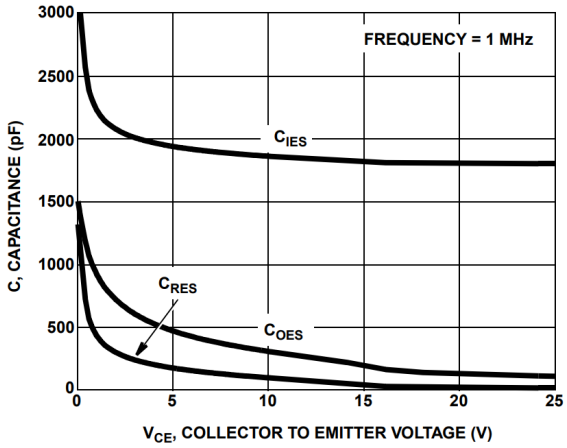


Figure 14. Capacitance vs. Collector to Emitter Voltage

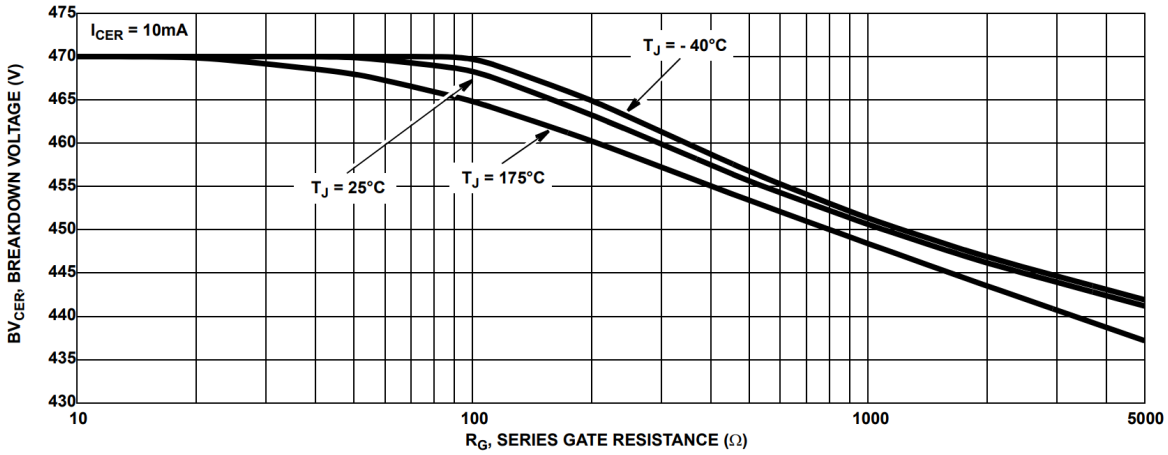


Figure 15. Break down Voltage vs. Series Resistance

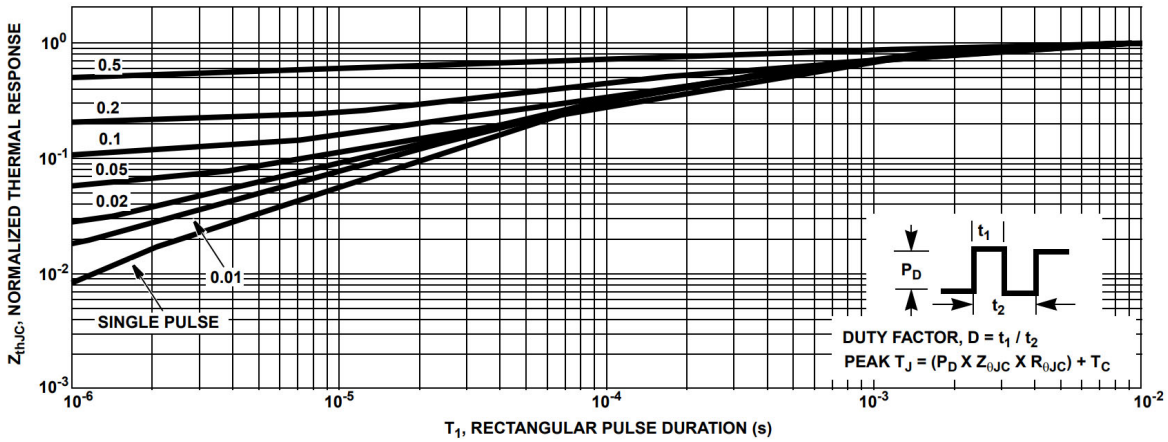


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

TEST CIRCUIT AND WAVEFORMS

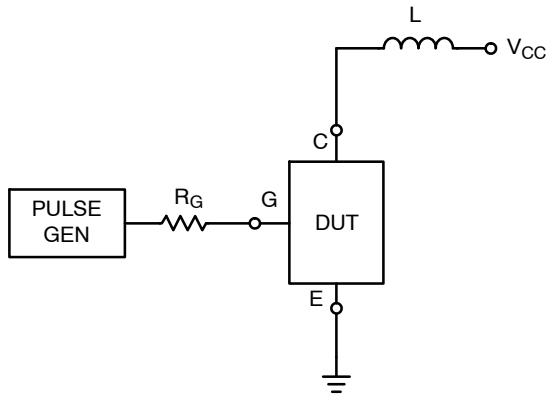


Figure 17. Inductive Switching Test Circuit

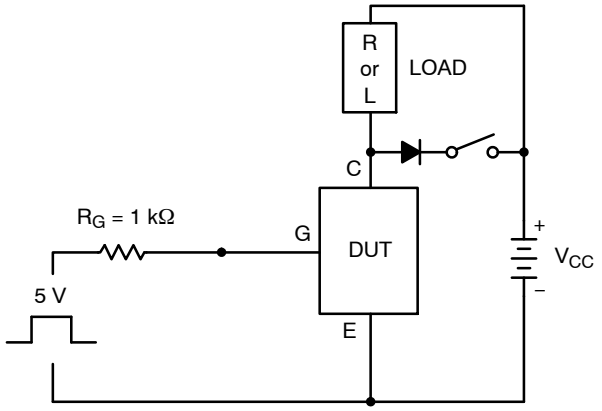


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

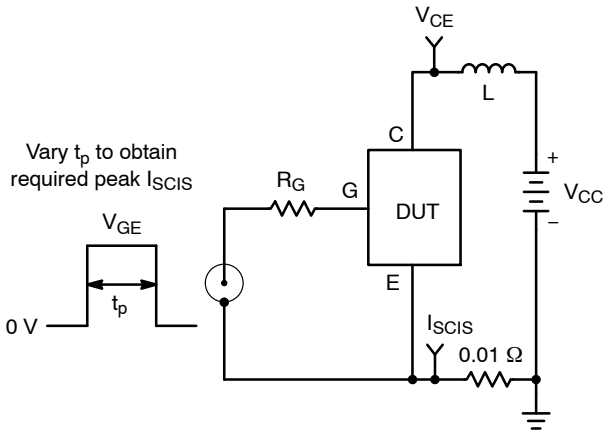


Figure 19. Energy Test Circuit

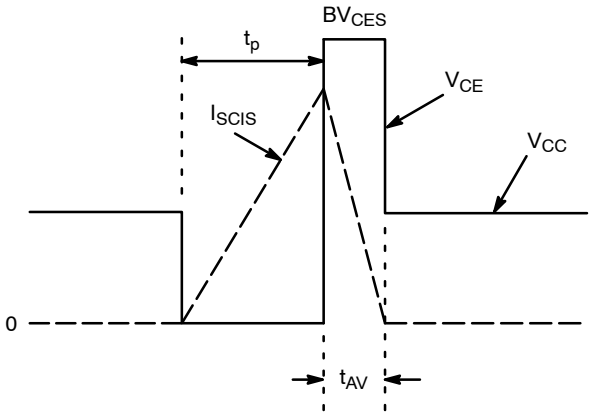
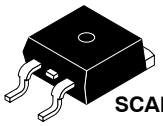


Figure 20. Energy Waveforms

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

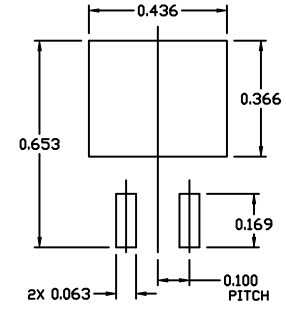
ON Semiconductor®



SCALE 1:1

D²PAK–3 (TO–263, 3–LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021



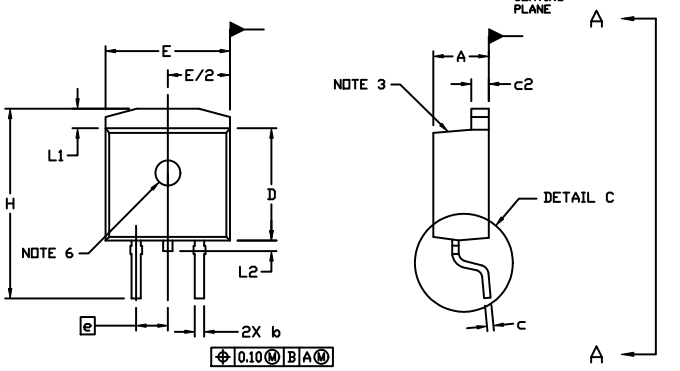
RECOMMENDED
MOUNTING FOOTPRINT

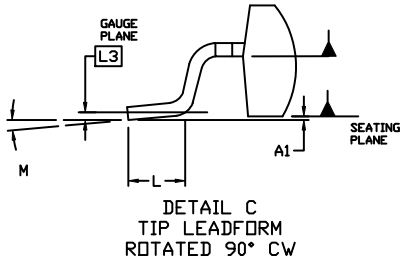
* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

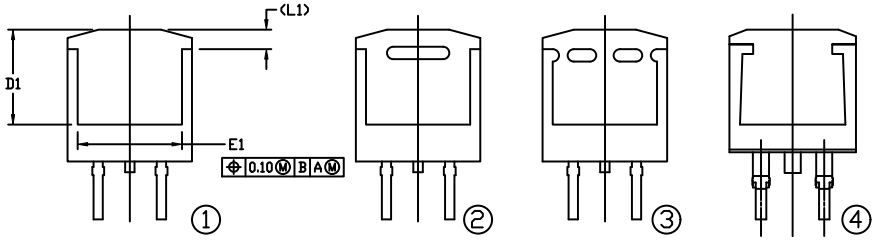
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL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

	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	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	0°	8°	0°	8°





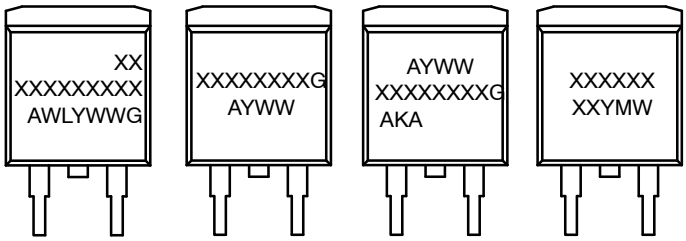
DETAIL C
TIP LEADFORM
ROTATED 90° CW



VIEW A–A

VIEW A–A
OPTIONAL CONSTRUCTIONS

GENERIC MARKING DIAGRAMS*



IC | Standard | Rectifier | SSG

XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
G = Pb–Free Package
AKA = Polarity Indicator

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, “G” or microdot “ ▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**D²PAK–3 (TO–263, 3–LEAD)**	**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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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

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