

ECOSPARK® Ignition IGBT

300 mJ, 400 V, N-Channel Ignition IGBT

ISL9V3040x3ST-F085C

Features

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

Applications

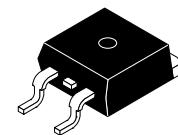
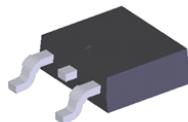
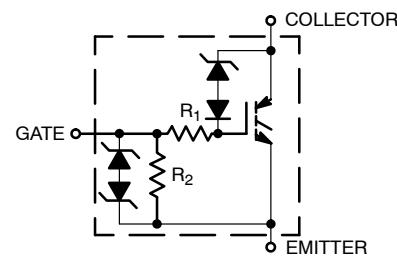
- Automotive Ignition Coil Driver Circuits
- High Current Ignition System
- Coil on Plug Application

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
BV_{CER}	Collector to Emitter Breakdown Voltage ($\text{IC} = 1 \text{ mA}$)	400	V
BV_{ECS}	Emitter to Collector Voltage – Reverse Battery Condition ($\text{IC} = 10 \text{ mA}$)	24	V
E_{SCIS25}	$\text{ISCIS} = 14.2 \text{ A}$, $L = 3.0 \text{ mHy}$, $\text{RGE} = 1 \text{ k}\Omega$, $T_C = 25^\circ\text{C}$ (Note 1)	300	mJ
E_{SCIS150}	$\text{ISCIS} = 10.6 \text{ A}$, $L = 3.0 \text{ mHy}$, $\text{RGE} = 1 \text{ k}\Omega$, $T_C = 150^\circ\text{C}$ (Note 2)	170	mJ
IC25	Collector Current Continuous at $\text{VGE} = 4.0 \text{ V}$, $T_C = 25^\circ\text{C}$	21	A
IC110	Collector Current Continuous at $\text{VGE} = 4.0 \text{ V}$, $T_C = 110^\circ\text{C}$	17	A
V_{GEM}	Gate to Emitter Voltage Continuous	± 10	V
PD	Power Dissipation Total, $T_C = 25^\circ\text{C}$	150	W
	Power Dissipation Derating, $T_C > 25^\circ\text{C}$	1	W/ $^\circ\text{C}$
T_J , T_{STG}	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$
T_L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	300	$^\circ\text{C}$
TPKG	Reflow Soldering according to JESD020C	260	$^\circ\text{C}$
ESD	HBM-Electrostatic Discharge Voltage at 100 pF, 1500 Ω	4	kV
	CDM-Electrostatic Discharge Voltage at 1 Ω	2	kV

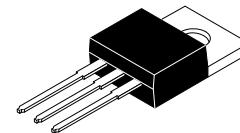
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Self clamped inductive Switching Energy (ESCIS25) of 300 mJ is based on the test conditions that is starting $T_J = 25^\circ\text{C}$, $L = 3 \text{ mHy}$, $\text{ISCIS} = 14.2 \text{ A}$, $\text{VCC} = 100 \text{ V}$ during inductor charging and $\text{VCC} = 0 \text{ V}$ during time in clamp.
2. Self Clamped inductive Switching Energy (ESCIS150) of 170 mJ is based on the test conditions that is starting $T_J = 150^\circ\text{C}$, $L = 3 \text{ mHy}$, $\text{ISCIS} = 10.6 \text{ A}$, $\text{VCC} = 100 \text{ V}$ during inductor charging and $\text{VCC} = 0 \text{ V}$ during time in clamp.



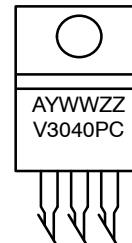
DPAK3
CASE 369AS

D2PAK-3
CASE 418AJ



TO-220-3LD
CASE 340AT

MARKING DIAGRAMS



A = Assembly Location
 Y = Year
 WW = Work Week
 XXXX = Device Code
 G = Pb-Free Package
 ZZ = Assembly Lot Number
 V3040PC = Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

ISL9V3040x3ST-F085C

THERMAL RESISTANCE RATINGS

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

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
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OFF CHARACTERISTICS

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

ON CHARACTERISTICS

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

DYNAMIC CHARACTERISTICS

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

SWITCHING CHARACTERISTICS

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

TYPICAL CHARACTERISTICS

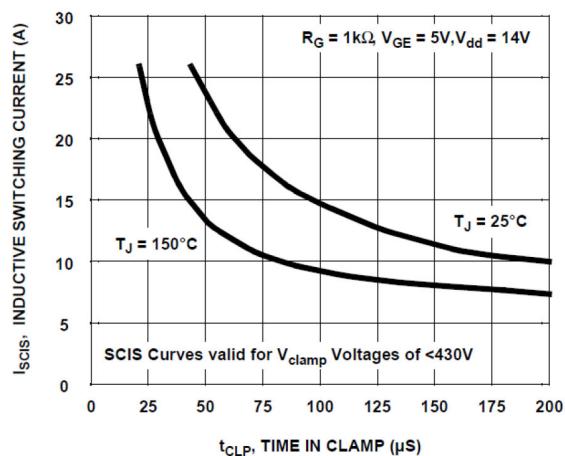


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

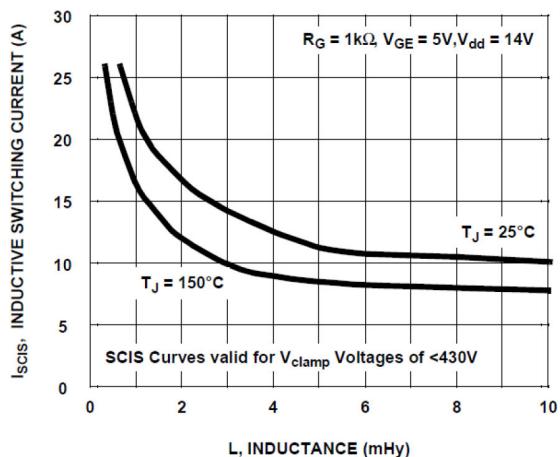


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

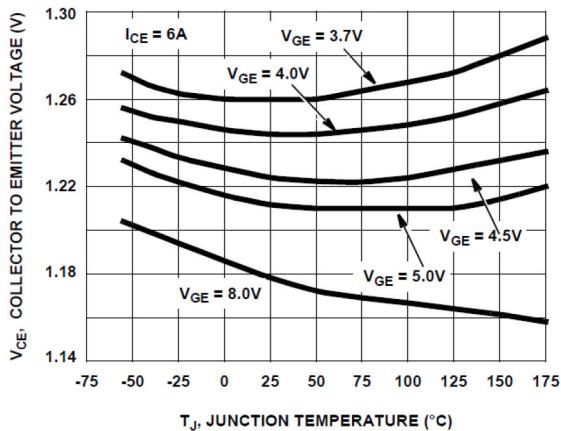


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

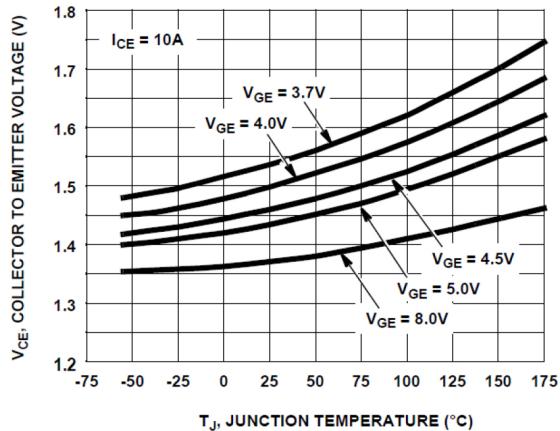


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

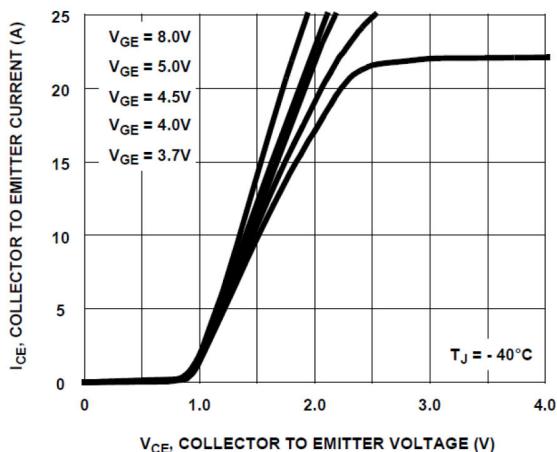


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

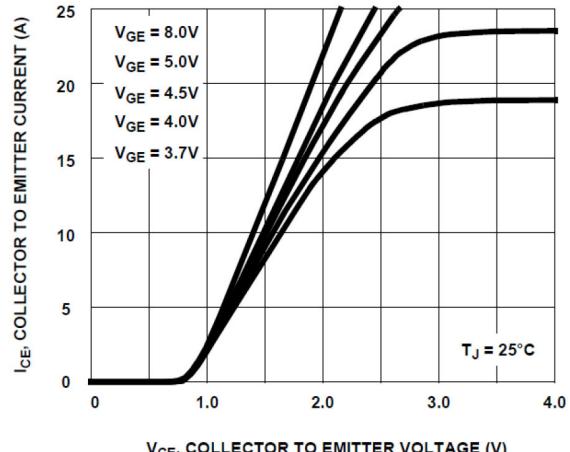


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS (continued)

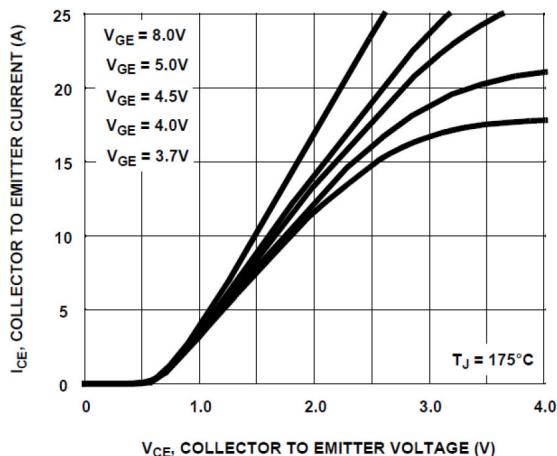


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

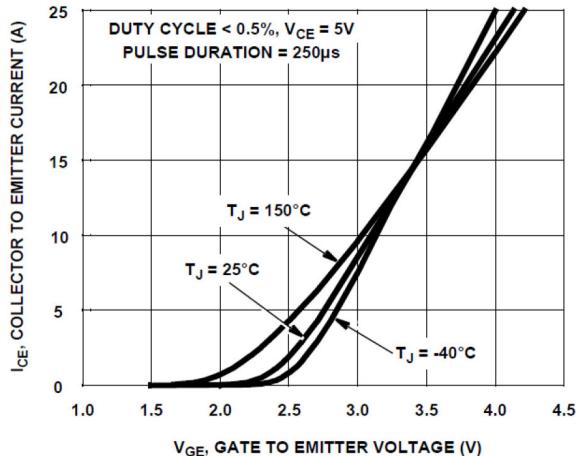


Figure 8. Transfer Characteristics

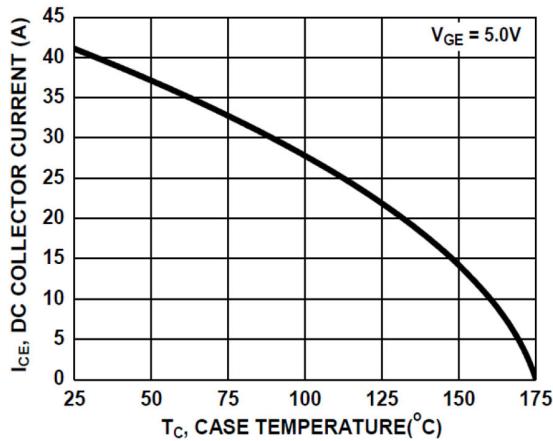


Figure 9. DC Collector Current vs. Case Temperature

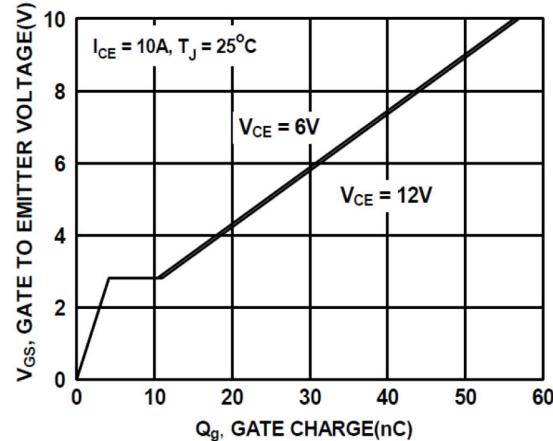


Figure 10. Gate Charge

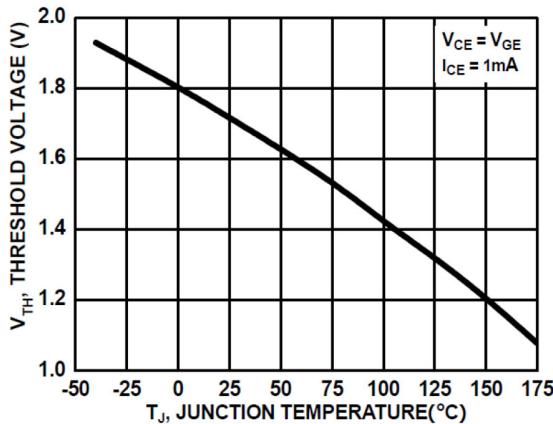


Figure 11. Threshold Voltage vs. Junction Temperature

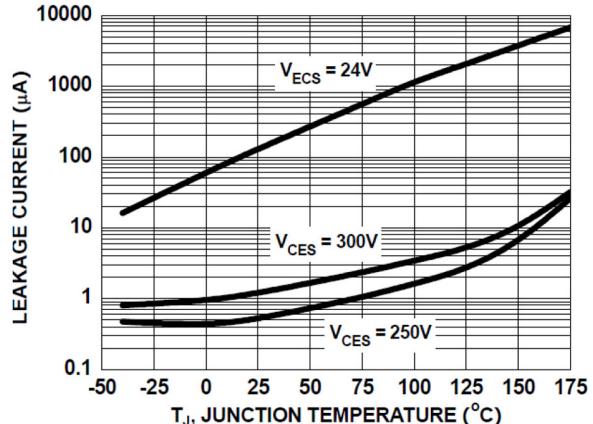
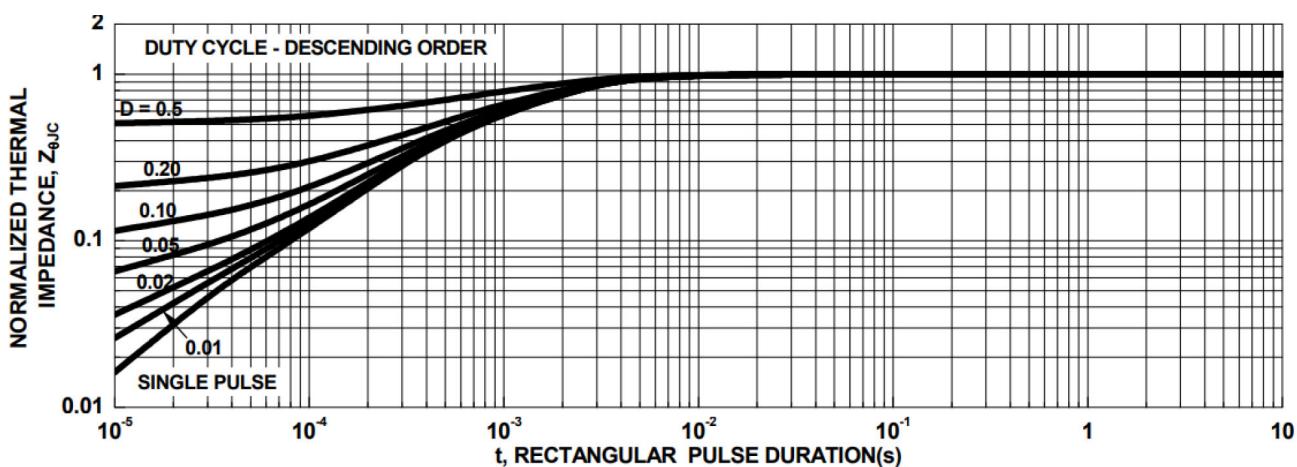
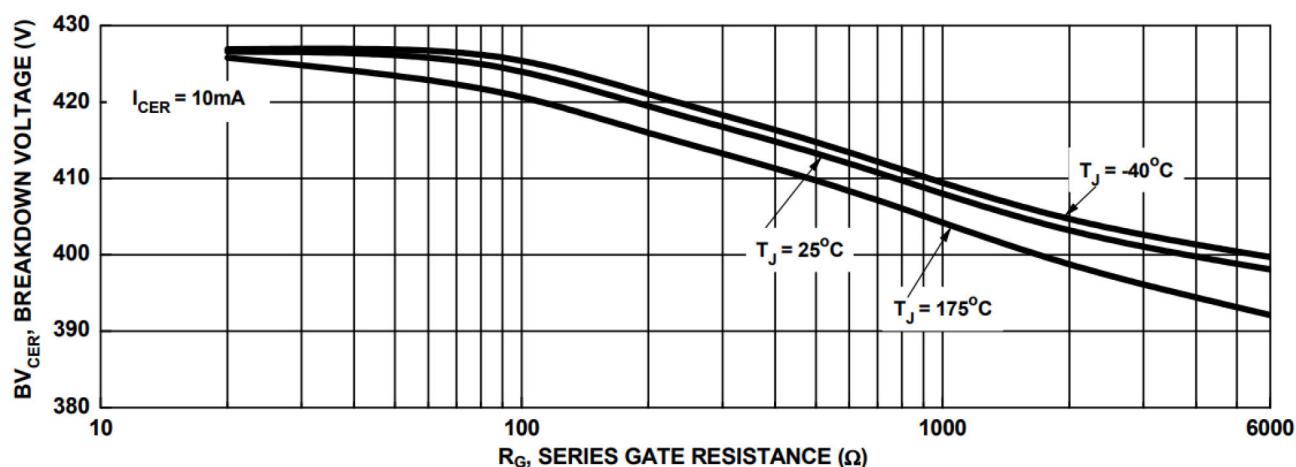
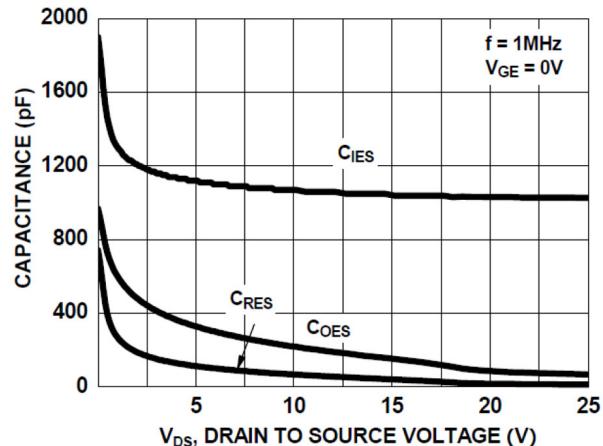
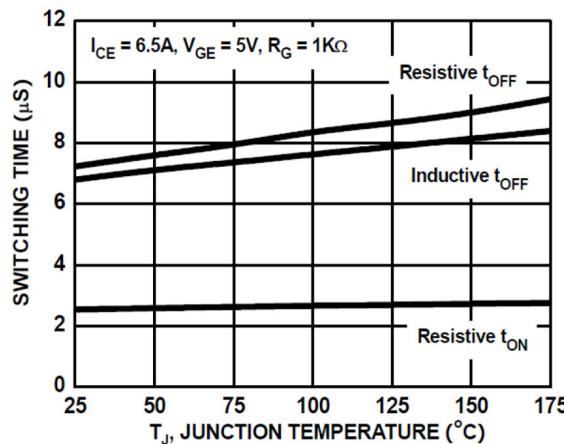


Figure 12. Leakage Current vs. Junction Temperature

TYPICAL CHARACTERISTICS (continued)



TEST CIRCUIT AND WAVEFORMS

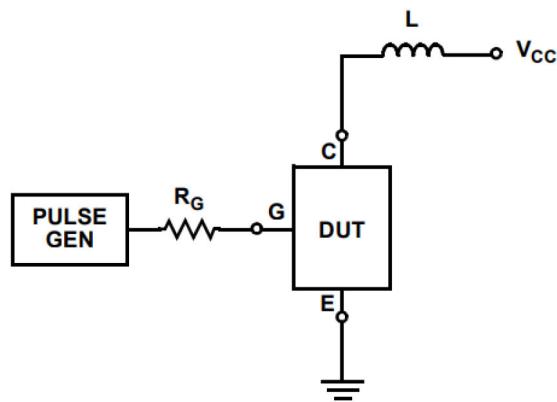


Figure 17. Inductive Switching Test Circuit

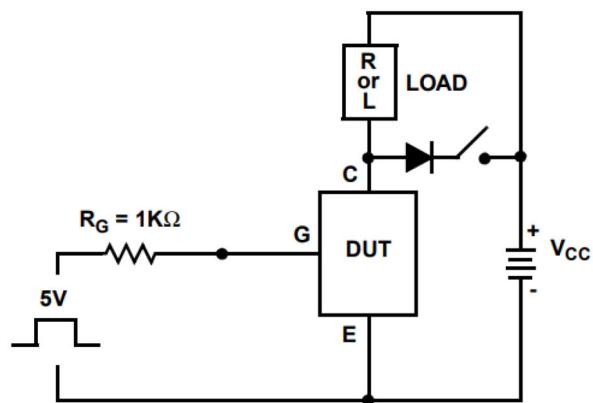


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

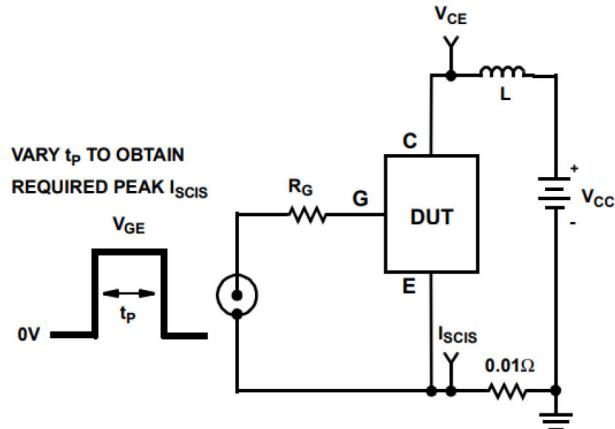


Figure 19. Energy Test Circuit

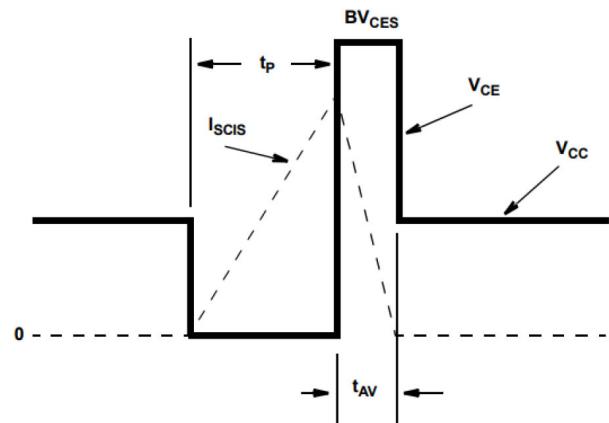


Figure 20. Energy Waveforms

ISL9V3040x3ST-F085C

PACKAGE MARKING AND ORDERING INFORMATION

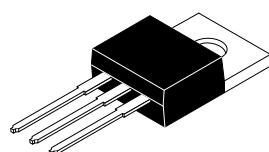
Device	Package	Shipping [†]
ISL9V3040D3ST-F085C	DPAK (Pb-Free)	2500 Units/Tape & Reel
ISL9V3040S3ST-F085C	D2PAK (Pb-Free)	800 Units/Tape & Reel
ISL9V3040P3-F085C	TO220 (Pb-Free)	50 Units/Tube

[†]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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

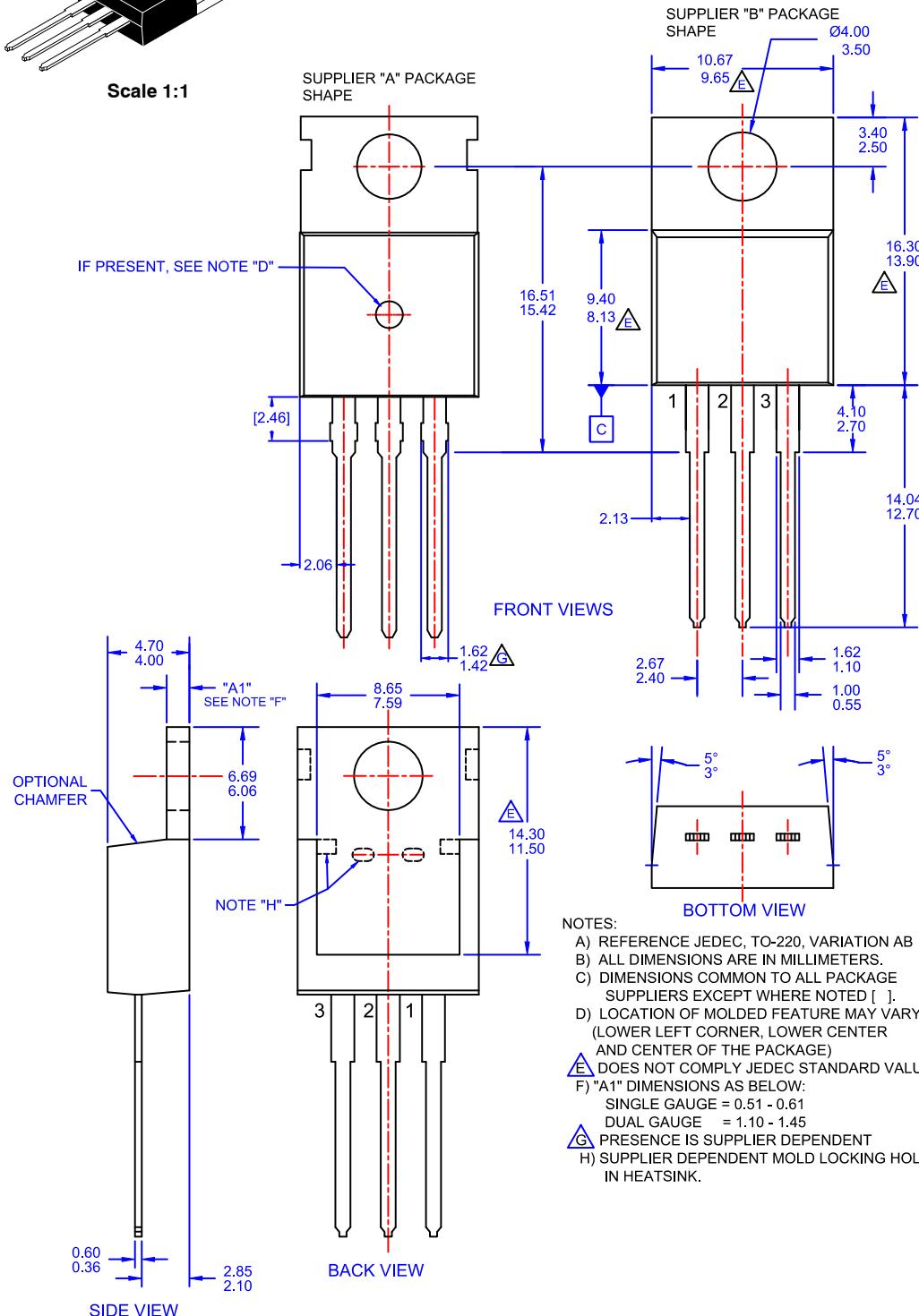
ON Semiconductor®



Scale 1:1

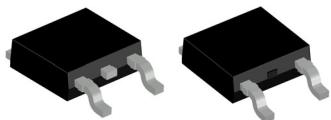
TO-220-3LD
CASE 340AT
ISSUE A

DATE 03 OCT 2017



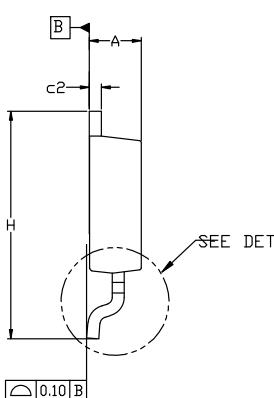
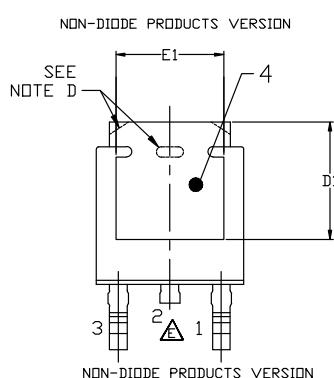
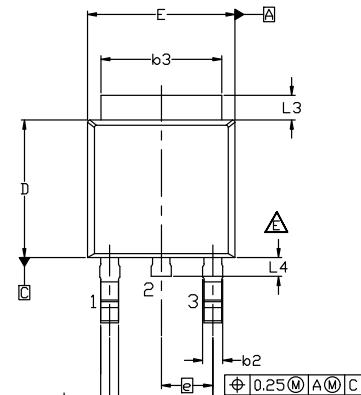
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DESCRIPTION:	TO-220-3LD	PAGE 1 OF 1

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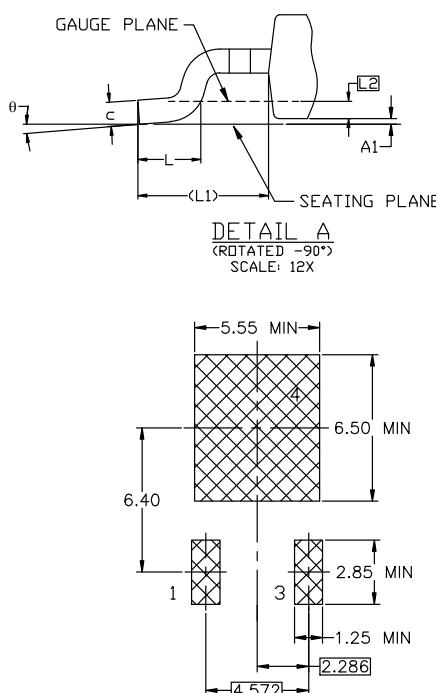


DPAK3 6.10x6.54x2.29, 4.57P
CASE 369AS
ISSUE B

DATE 20 DEC 2023



NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE CONFORMS TO JEDEC, TD-252,
 ISSUE F, VARIATION AA.
 B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONING AND TOLERANCING PER
 ASME Y14.5M-2018.
 D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED
 CORNERS OR EDGE PROTRUSION.
 A) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX PLASTIC BODY
 STUB WITHOUT CENTER LEAD.
 F) DIMENSIONS ARE EXCLUSIVE OF BURRS,
 MOLD FLASH AND TIE BAR EXTRUSIONS.
 G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD
 TD228P991X239-3N.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	—	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	—	—
E	6.35	6.54	6.73
E1	4.32	—	—
e	2.286	BSC	
e1	4.572	BSC	
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90	REF	
L2	0.51	BSC	
L3	0.89	1.08	1.27
L4	—	—	1.02
θ	0°	—	10°

LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR
 Pb-FREE STRATEGY AND SOLDERING DETAILS,
 PLEASE DOWNLOAD THE ON SEMICONDUCTOR
 SOLDERING AND MOUNTING TECHNIQUES
 REFERENCE MANUAL, SOLDERRM/D.

**GENERIC
MARKING DIAGRAM***



XXXX = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week
 ZZ = Assembly Lot Code

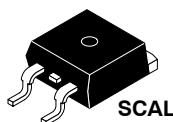
DOCUMENT NUMBER:	98AON13810G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DPAK3 6.10x6.54x2.29, 4.57P	PAGE 1 OF 1

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

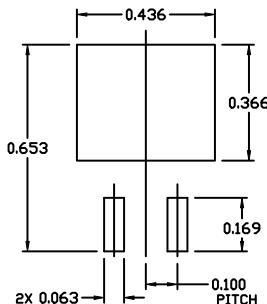
ON Semiconductor®



SCALE 1:1

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

DATE 11 MAR 2021



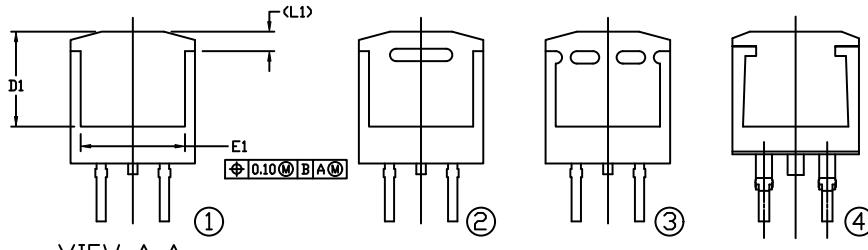
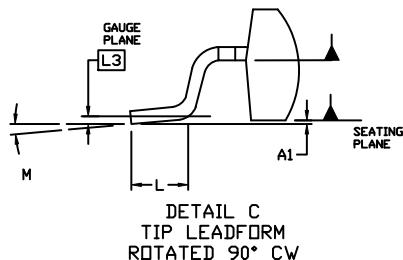
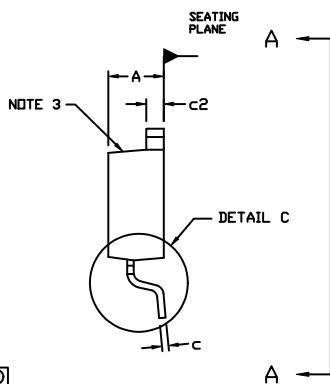
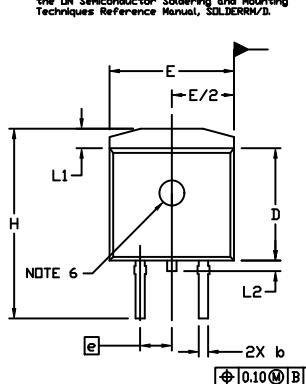
RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free Soldering and Mounting Process, download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM.0.

NOTES:

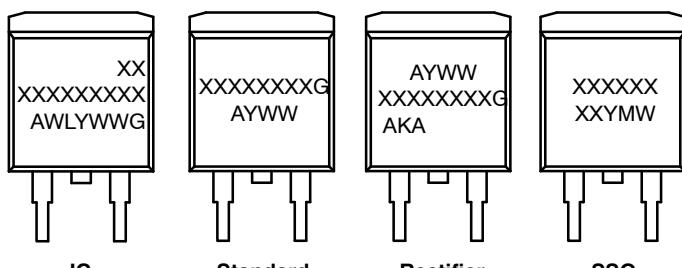
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL 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		MILLIMETERS	
	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°



VIEW A-A OPTIONAL CONSTRUCTIONS

GENERIC MARKING DIAGRAMS*



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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