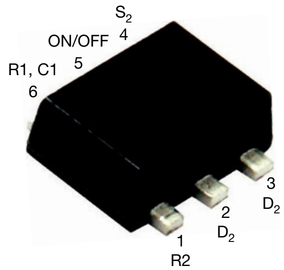
Load Switch with Level-Shift

SC-89 (6 leads)



Top View

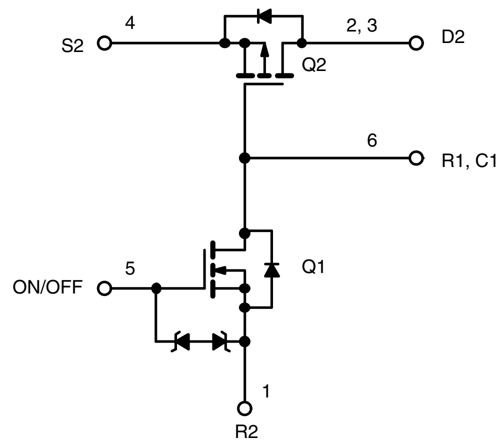
Marking code: P

FEATURES

- TrenchFET® power MOSFET
- 1.8 V to 8 V input
- 1.5 V to 8 V logic level control
- Smallest LITTLE FOOT® package: 1.6 mm x 1.6 mm
- 2000 V ESD protection on input switch, $V_{ON/OFF}$
- Adjustable slew-rate
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE

PRODUCT SUMMARY	
V_{DS2} (V)	8
$R_{DS(on)}$ max. (Ω) at V_{GS} = 4.5 V	0.625
$R_{DS(on)}$ max. (Ω) at V_{GS} = 2.5 V	0.890
$R_{DS(on)}$ max. (Ω) at V_{GS} = 1.8 V	1.250
I_D (A)	± 0.43
Configuration	Level-Shift

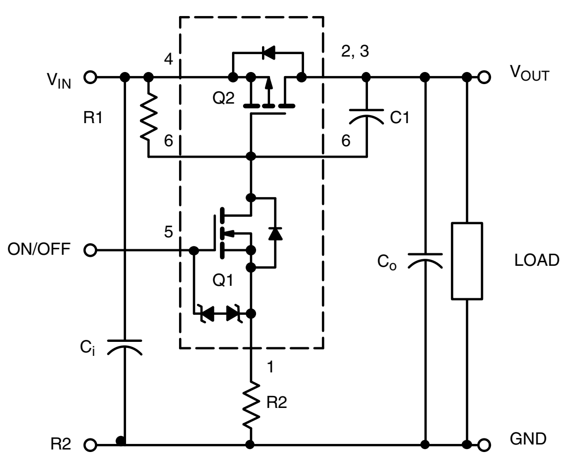


DESCRIPTION

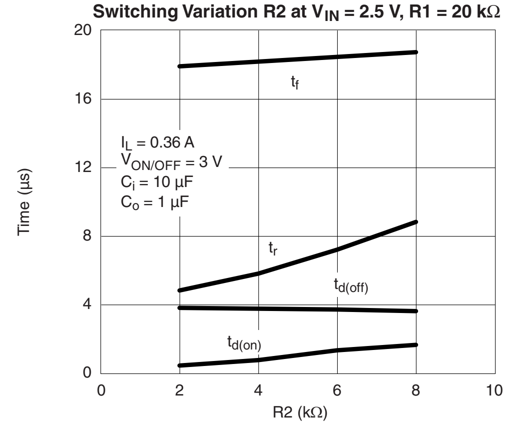
The Si1040X includes a p- and n-channel MOSFET in a single SC-89-6 package. The low on-resistance p-channel TrenchFET is tailored for use as a load switch. The n-channel, with an external resistor, can be used as a level-shift to drive the p-channel load-switch. The n-channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The Si1040X operates on supply lines from 1.8 V to 8 V, and can drive loads up to 0.43 A.

ORDERING INFORMATION	
Package	SC-89
Lead (Pb)-free and halogen-free	Si1040X-T1-GE3

TYPICAL APPLICATION CIRCUIT



Switching Variation R2 at V_{IN} = 2.5 V, R1 = 20 kΩ



Note: For R2 switching variations with other V_{IN}/R1 combinations See Typical Characteristics

COMPONENTS		
R1	Pull-up resistor	Typical 10 kΩ to 1 mΩ [a]
R2	Optional slew-rate control	Typical 0 to 100 kΩ [a]
C1	Optional slew-rate control	Typical 1000 pF

Note

a. Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on

The Si1040X is ideally suited for high side load switching in portable applications. The integrated n-channel level-shift device saves space by reducing external components. The slew rate is set externally so that rise-times can be tailored to different load types.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Input voltage		V_{IN}	8	V
ON/OFF voltage		$V_{ON/OFF}$	8	
Load current	Continuous [a, b]	I_L	± 0.43	A
	Pulsed [b, c]		± 1	
Continuous intrinsic diode conduction [a]		I_S	-0.15	
Maximum power dissipation [a]		P_D	0.174	W
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
ESD rating, MIL-STD-883D human body model (100 pF, 1500 Ω)		ESD	2	kV

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient (continuous current) [a]	R_{thJA}	600	720	°C/W
Maximum junction-to-foot (Q2)	R_{thJC}	450	540	

Note

a. Surface mounted on 1" x 1" FR4 board

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
OFF Characteristics						
Reverse leakage current	I_{FL}	V_{IN} = 8 V, $V_{ON/OFF}$ = 0 V	-	-	1	µA
Diode forward voltage	V_{SD}	I_S = -0.15 A	-	0.85	1.2	V
ON Characteristics						
Input voltage range	V_{IN}		1.8	-	8	V
On-resistance (p-channel) at 1 A	$R_{DS(on)}$	$V_{ON/OFF}$ = 1.5 V, V_{IN} = 4.5 V, I_D = 0.43 A	-	0.500	0.625	Ω
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 2.5 V, I_D = 0.36 A	-	0.710	0.890	
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 1.8 V, I_D = 0.3 A	-	1	1.25	
On-state (p-channel) drain current	$I_{D(on)}$	$V_{IN-OUT} \leq$ 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 1.5 V	1	-	-	A
		$V_{IN-OUT} \leq$ 0.3 V, V_{IN} = 3 V, $V_{ON/OFF}$ = 1.5 V	0.8	-	-	

Notes

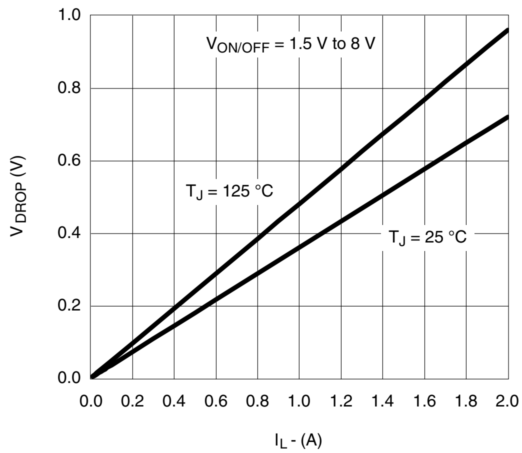
a. Surface mounted on FR4 board

b. V_{IN} = 8 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C

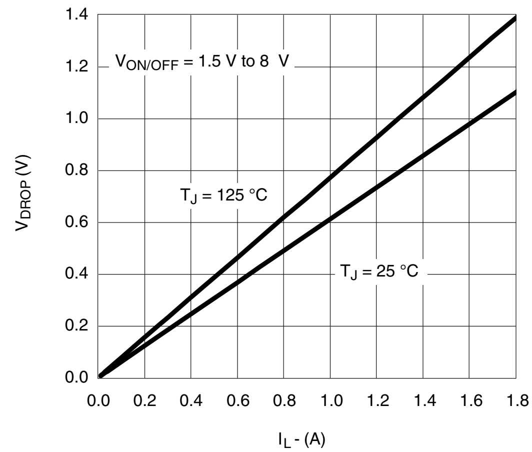
c. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

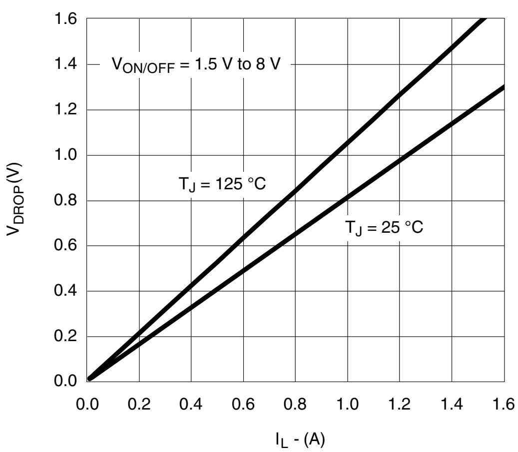
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



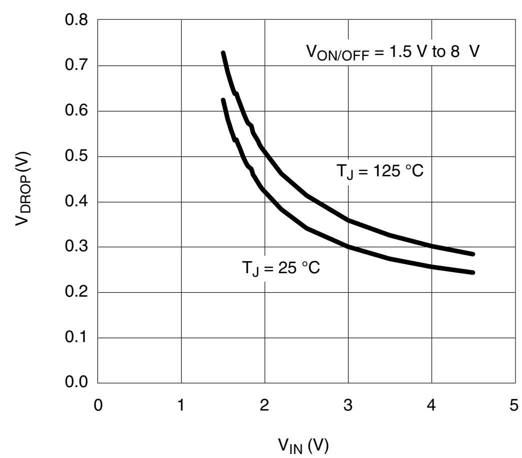
V_{DROP} vs. I_L at V_{IN} = 4.5 V



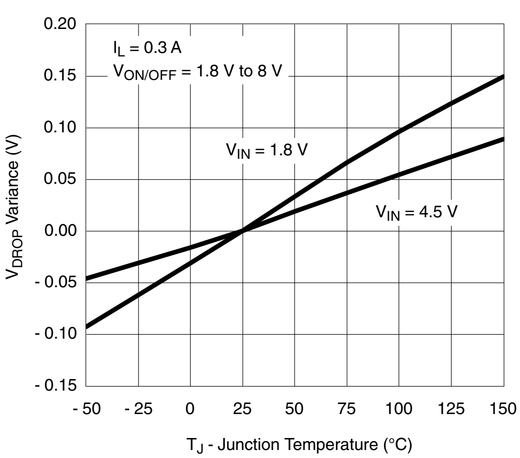
V_{DROP} vs. I_L at V_{IN} = 2.5 V



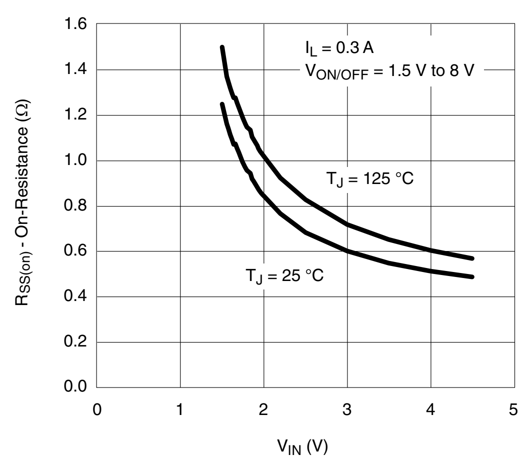
V_{DROP} vs. I_L at V_{IN} = 1.8 V



V_{DROP} vs. I_L at V_{IN} = 0.5 V

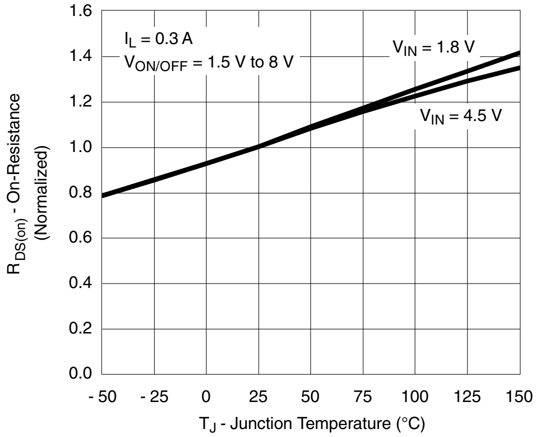


V_{DROP} Variance vs. Junction Temperature

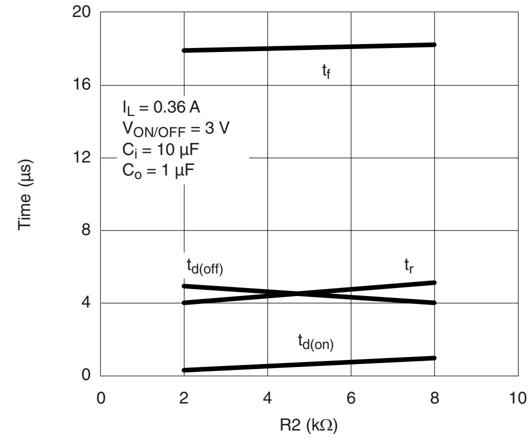


On-Resistance vs. Input Voltage

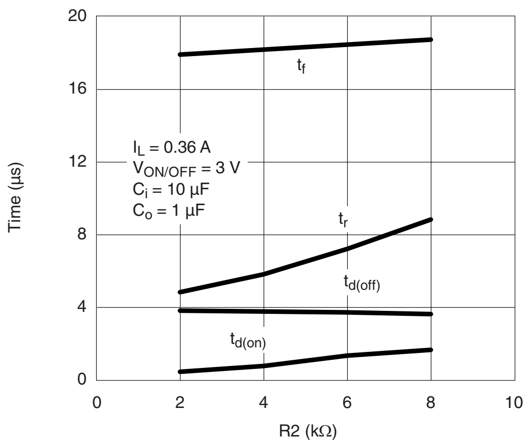
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



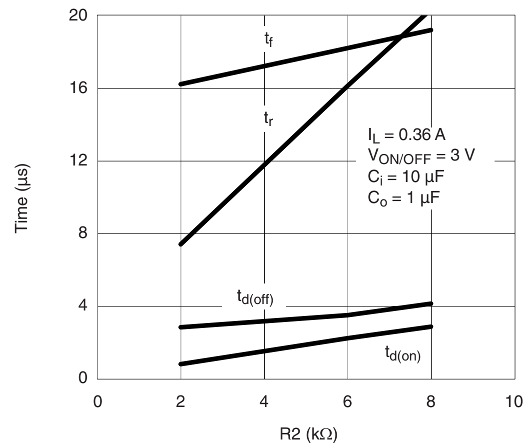
Normalized On-Resistance vs. Junction Temperature



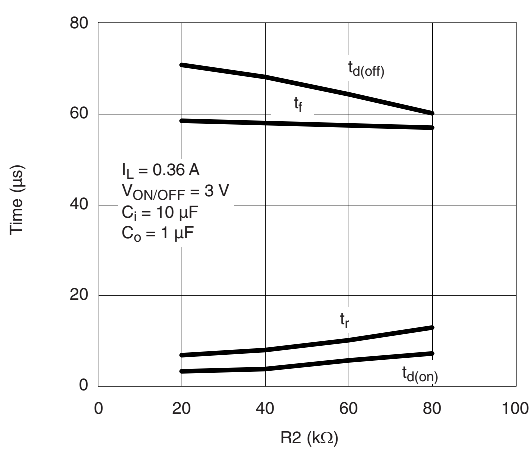
Switching Variation R2 at V_{IN} = 4.5 V, R1 = 20 kΩ



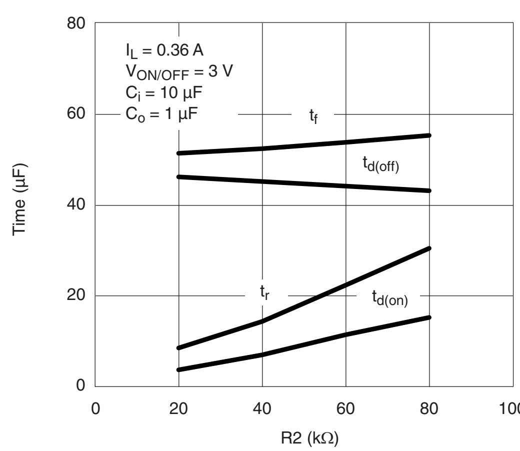
Switching Variation R2 at V_{IN} = 2.5 V, R1 = 20 kΩ



Switching Variation R2 at V_{IN} = 1.8 V, R1 = 20 kΩ

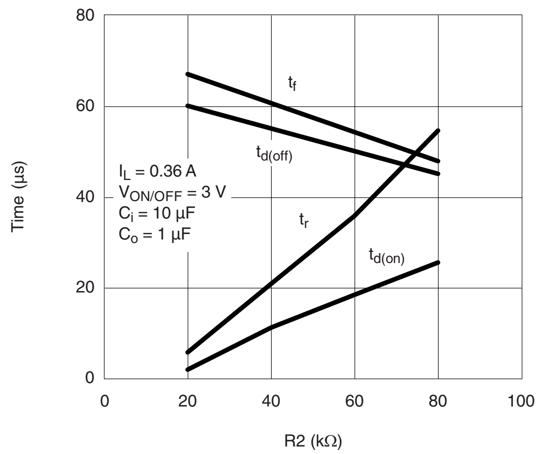


Switching Variation R2 at V_{IN} = 4.5 V, R1 = 300 kΩ

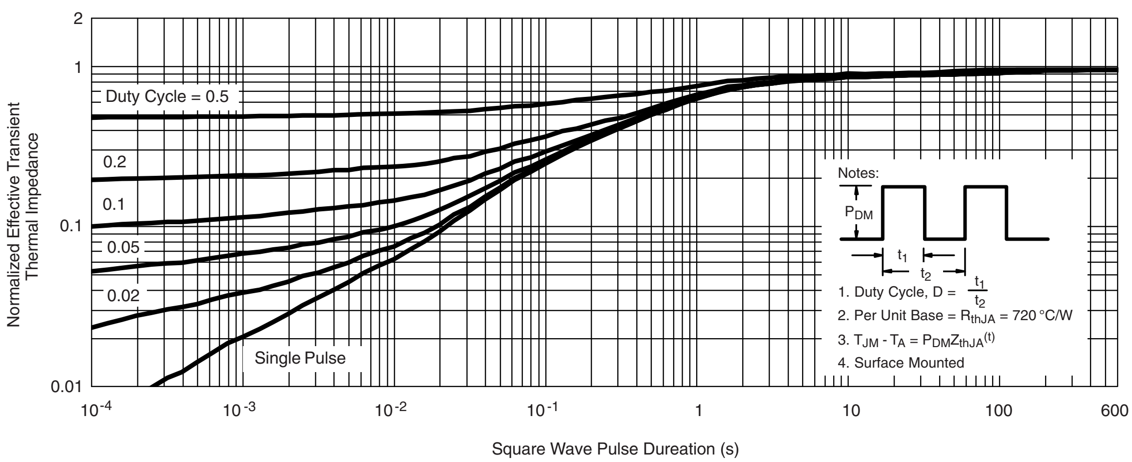


Switching Variation R2 at V_{IN} = 2.5 V, R1 = 300 kΩ

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 300 kΩ



Normalized Thermal Transient Impedance, Junction-to-Ambient

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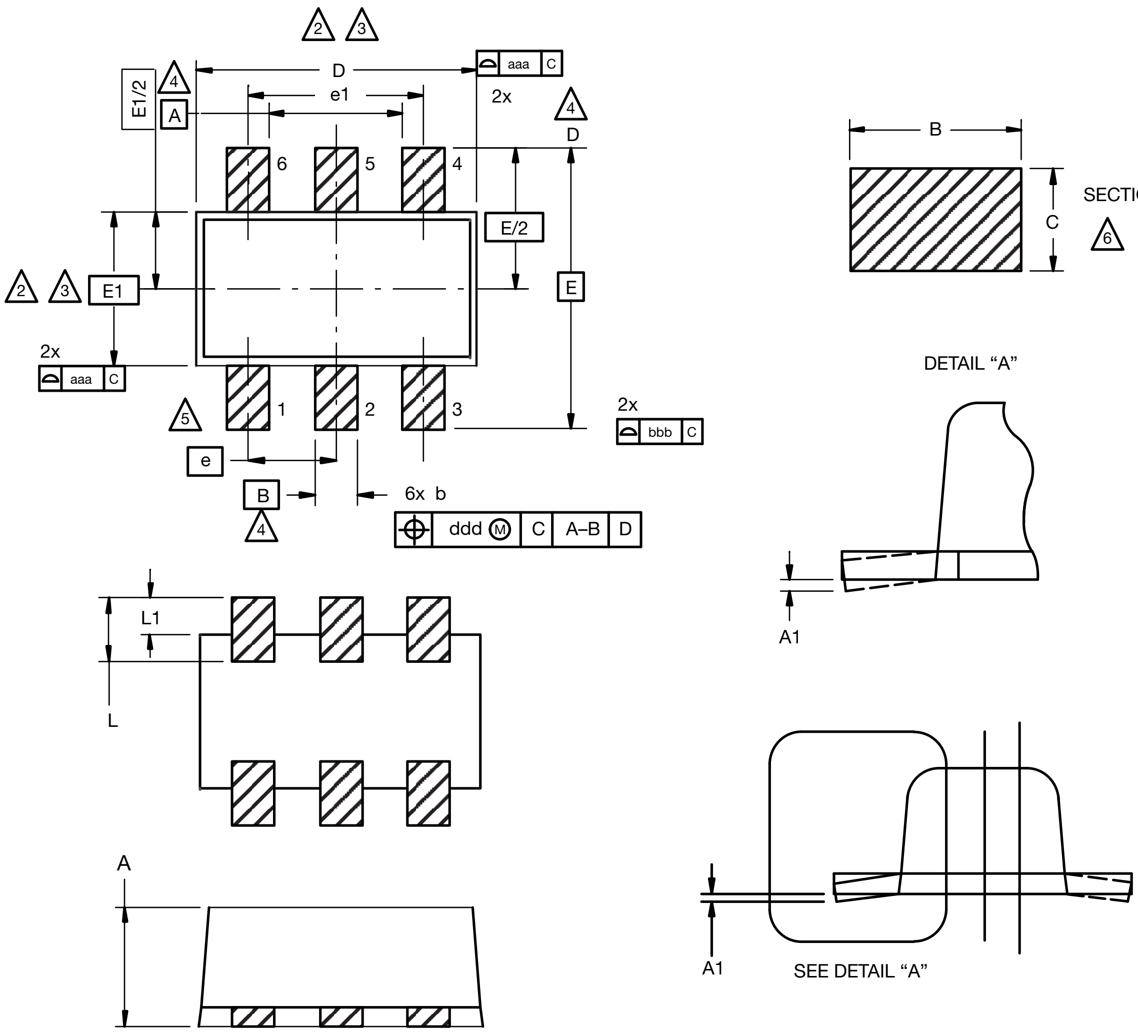
SC-89 6-Leads (SOT-563F)



Notes

1. Dimensions in millimeters.

2. Dimension D does not include mold flash, protrusions or gate burrs. Mold flush, protrusions or gate burrs shall not exceed 0.15 mm per dimension E1 does not include interlead flash or protrusion, interlead flash or protrusion shall not exceed 0.15 mm per side.

3. Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, the bar burrs, gate burrs and interlead flash, but including any mismatch between the top and the bottom of the plastic body.

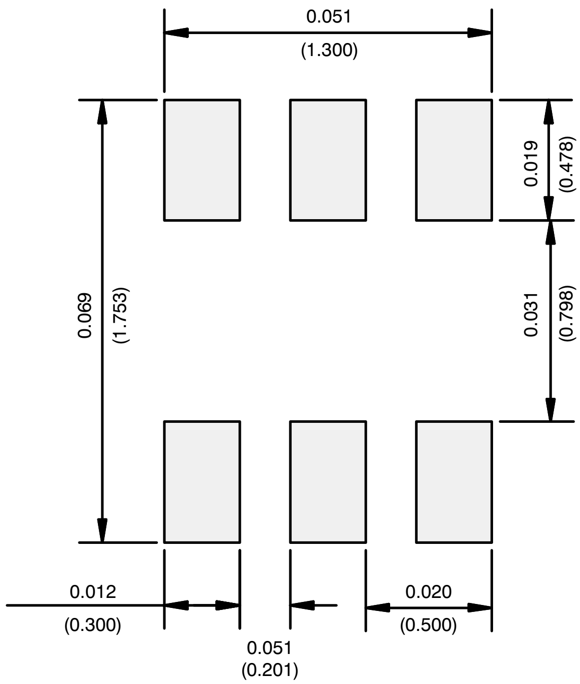
4. Datums A, B and D to be determined 0.10 mm from the lead tip.

5. Terminal numbers are shown for reference only.

6. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.56	0.58	0.60
A1	0	0.02	0.10
b	0.15	0.22	0.30
c	0.10	0.14	0.18
D	1.50	1.60	1.70
E	1.50	1.60	1.70
E1	1.15	1.20	1.25
e	0.45	0.50	0.55
e1	0.95	1.00	1.05
L	0.25	0.35	0.50
L1	0.10	0.20	0.30
C14-0439-Rev. C, 11-Aug-14 DWG: 5880			

RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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