

40V 7mohm N-channel SGT MOSFET

Description:

This N channel SGT MOSFET has been designed to ultra-low on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, special for high efficiency power management applications.

Features:

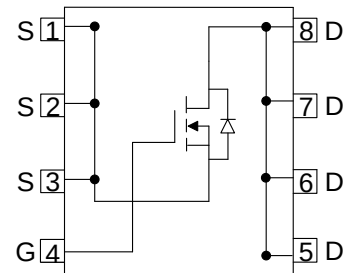
- N-channel, optimized for high-speed smooth switching
- Excellent Gate Charge $\times R_{DS(on)}$ (FOM)
- Ultra-low on-resistance
- RoHS compliant (Note 1)
- Halogen-free (Note 1)

Applications:

- DC-DC Converter
- Power Tools
- Load Switching

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(on), max} @V_{GS}=10V$	7	m Ω
I_D	54	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
4050M	PDFN3 X 3-8L	4050M AXXX	13 inches Reel	5000

Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	40	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	54	A
	Drain Current -Continuous ($T_C = 100^\circ\text{C}$)	34	A
I_{DM}	Drain Current - Pulsed (Note 1,2)	216	A
V_{GS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy (Note 3)	56	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	36.7	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	3.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Steady State (Note 4)	60.4	$^\circ\text{C/W}$

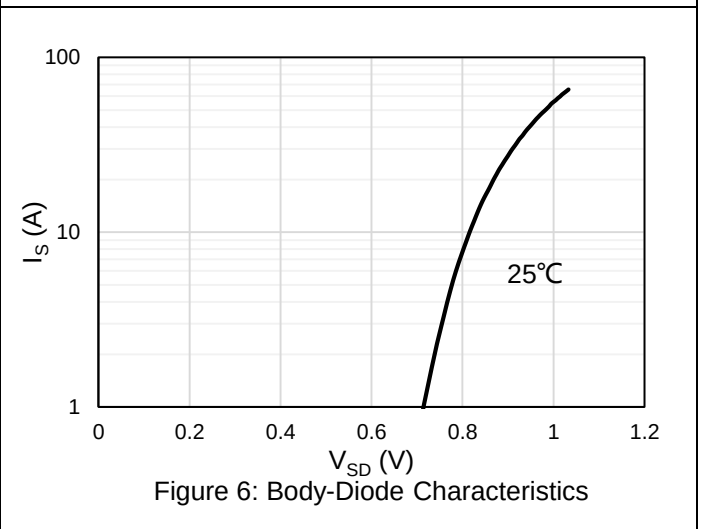
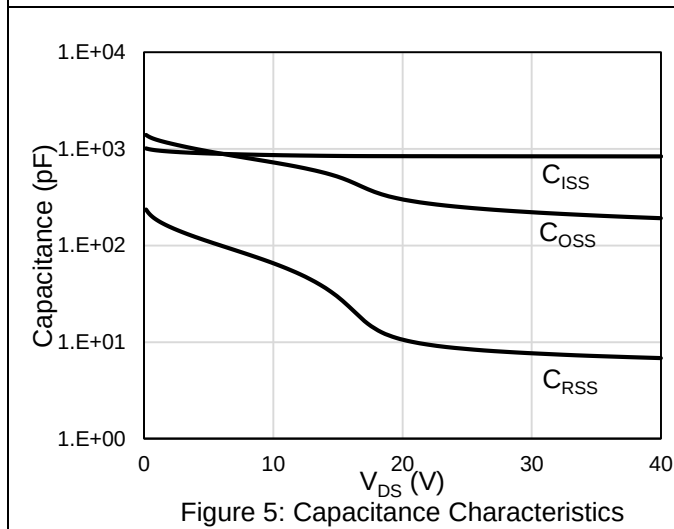
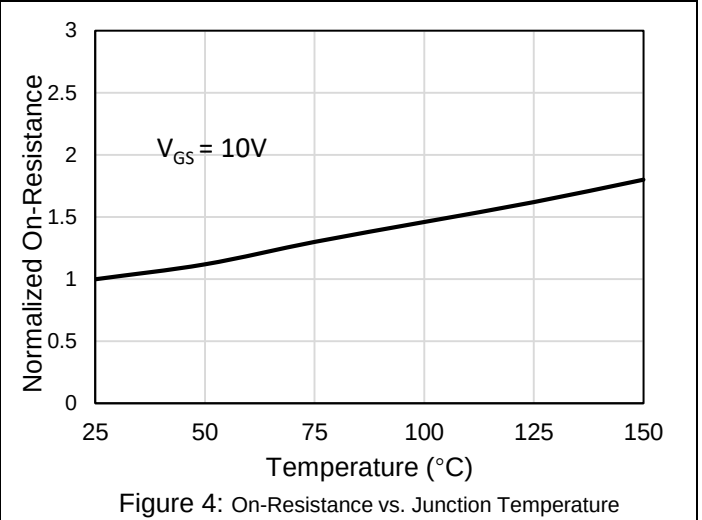
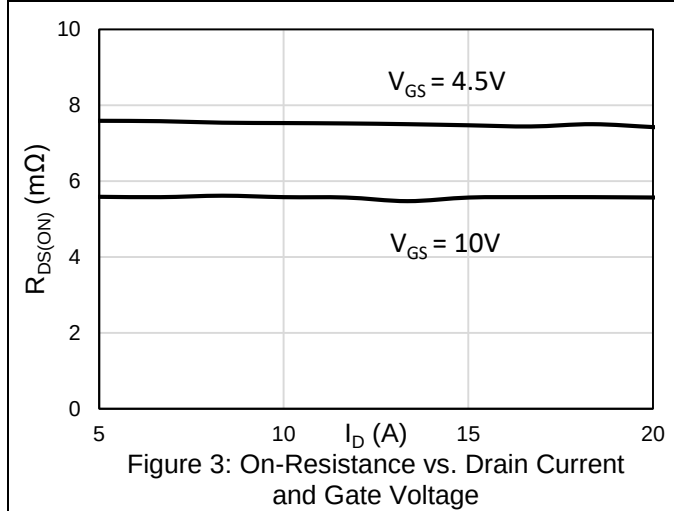
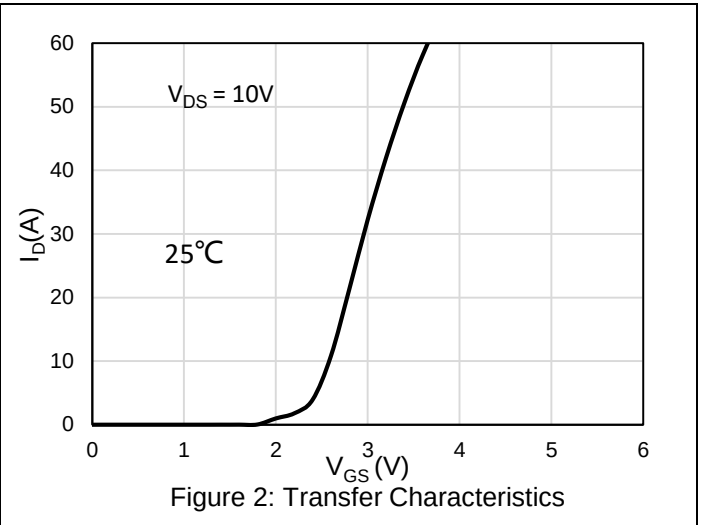
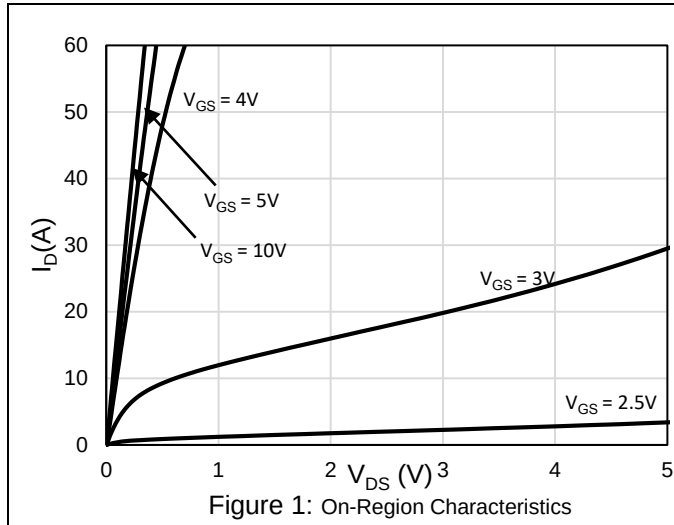
Notes:

1. The max drain current rating is package limited
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 0.5\text{ mH}$, $V_{DD} = 20\text{V}$, $I_{AS} = 14.7\text{A}$, $R_G = 25\ \Omega$, Starting $T_J = 25\ ^\circ\text{C}$
4. Mount on minimum PCB layout

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 40 V, V _{GS} = 0 V, T _J = 25°C			1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 150°C			250	
I _{GSS}	Gate Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA
V _{GS(TH)}	Gate Threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1.1	1.6	2.1	V
R _{DS(On)}	Drain-Source on-state resistance	V _{GS} = 10 V, I _D = 20A		5.7	7	mΩ
		V _{GS} = 4.5 V, I _D = 15A		8	10	
Dynamic Characteristics						
C _{ISS}	Input capacitance	V _{DS} = 20 V, V _{GS} = 0 V, f = 1.0 MHZ		850		pF
C _{OSS}	Output capacitance			254		pF
C _{RSS}	Reverse transfer capacitance			8		pF
R _G	Gate resistance	f = 1MHZ		26		Ω
Switching Characteristics						
T _{D(ON)}	Turn On Delay Time	V _{DS} = 20 V, I _D = 20 A, V _{GS} = 10 V, R _{GEN} = 10 Ω (Note 5)		7		ns
T _R	Rising Time			52.5		ns
T _{D(OFF)}	Turn Off Delay Time			44.5		ns
T _F	Fall Time			93.5		ns
Q _G	Total Gate Charge	V _{DS} = 20 V, I _D = 20 A, V _{GS} = 10 V		13.1		nC
Q _{GS}	Gate-Source Charge			2.2		nC
Q _{GD}	Gate-Drain Charge			2.6		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Body-Diode Forward Current				54	A
I _{SM}	Maximum Pulsed Body-Diode Forward Current (NOTE 1)				216	A
V _{SD}	Diode Forward Voltage	V _{GS} = 0 V, I _S = 20 A		0.84		V
T _{RR}	Reverse recovery time	I _F = 40 A, di/dt = 100 A/μS		24.5		ns
Q _{RR}	Reverse recovery charge			14		nC

Electrical Characteristics Diagrams



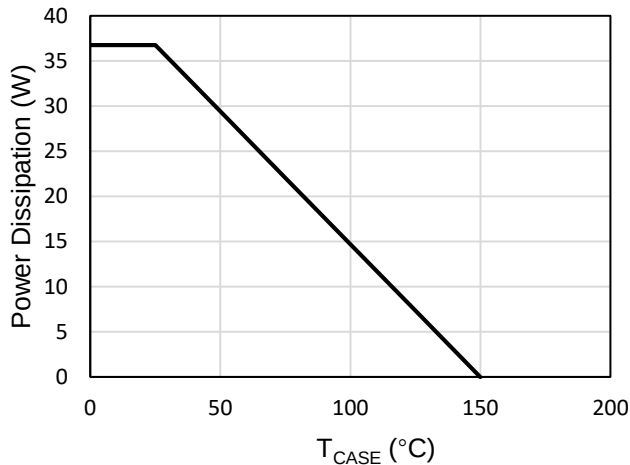


Figure 7: Power De-rating

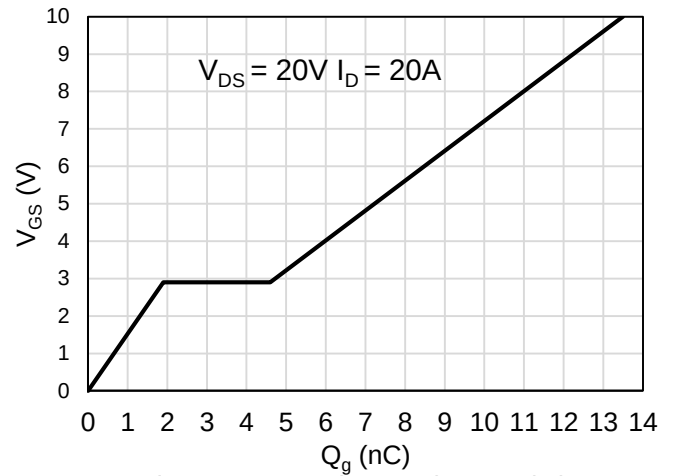


Figure 8: Gate-Charge Characteristics

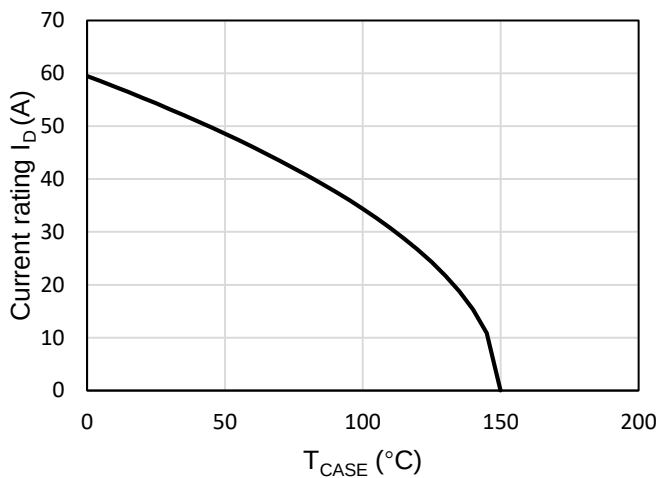


Figure 9: Current De-rating

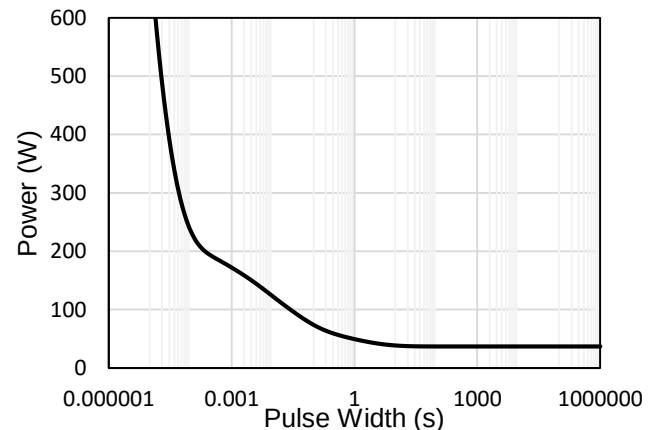


Figure 10: Single Pulse Power Rating Junction-to-Case

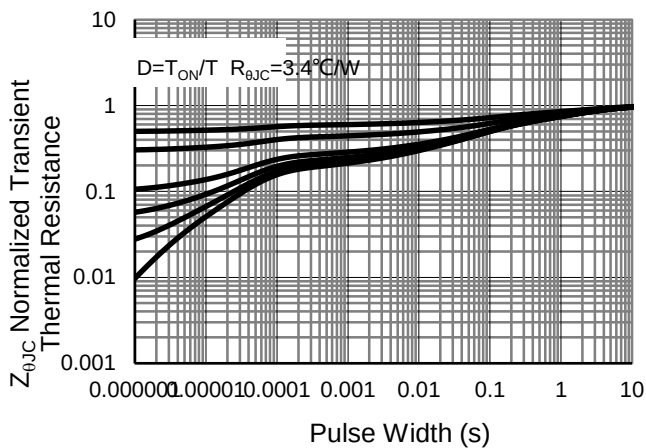


Figure 11: Normalized Maximum Transient Thermal Impedance

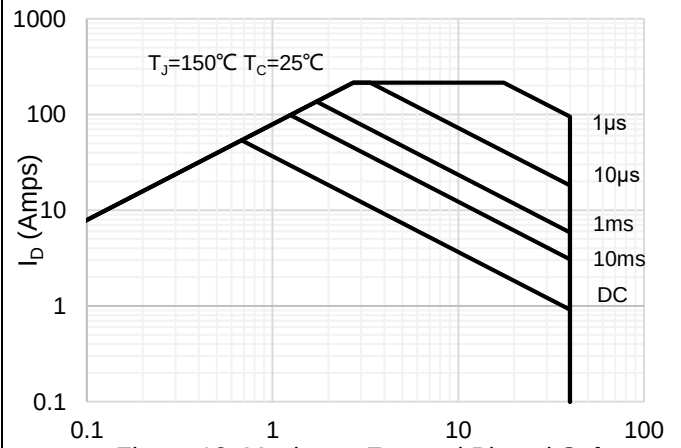


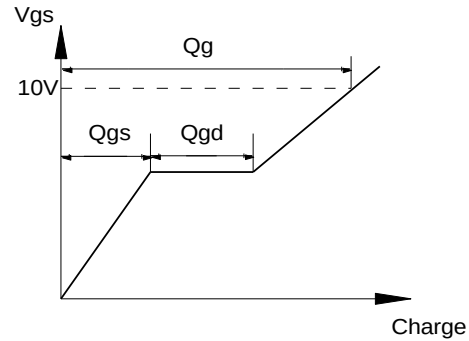
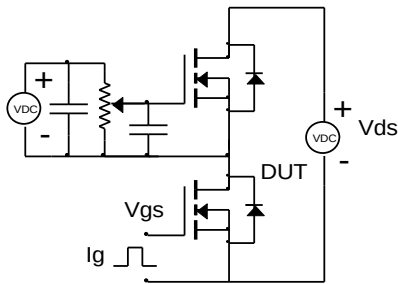
Figure 12: Maximum Forward Biased Safe Operating Area

Notes:

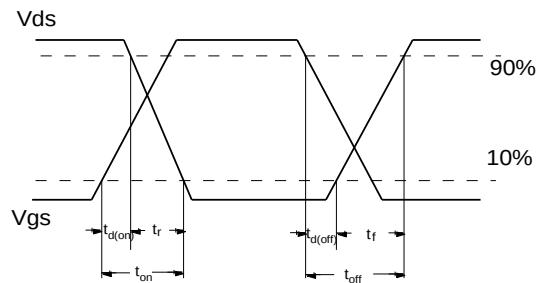
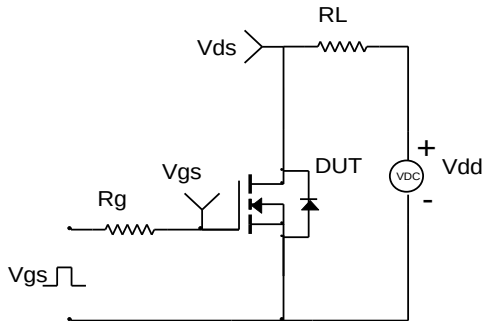
1. Pulse Test: Pulse width $\leq 300 \mu s$, Duty cycle $\leq 2\%$
2. Essentially independent of operating temperature

Test Circuit and Waveform

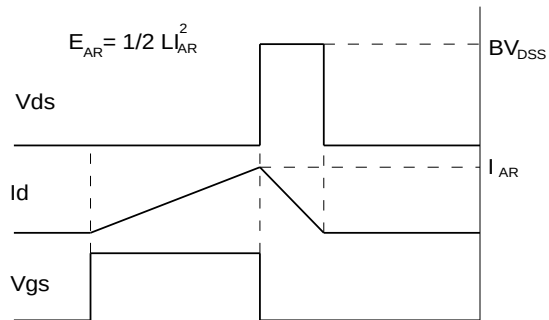
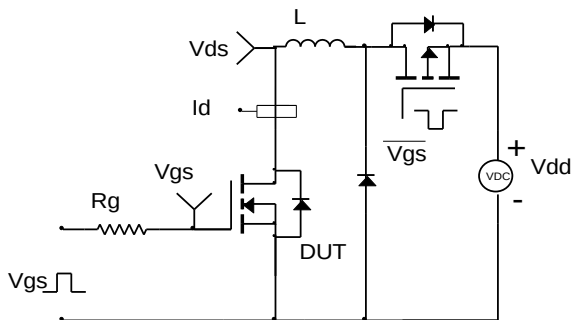
Gate Charge Test Circuit & Waveform



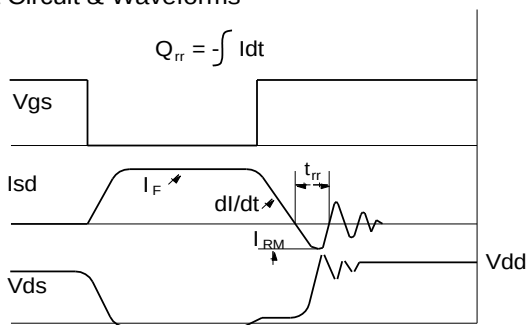
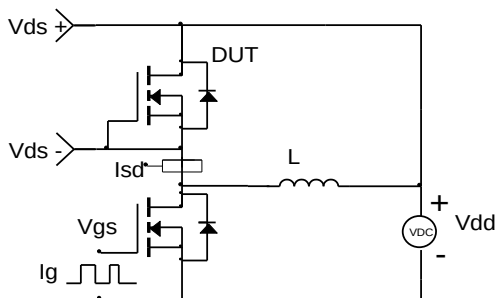
Resistive Switching Test Circuit & Waveforms



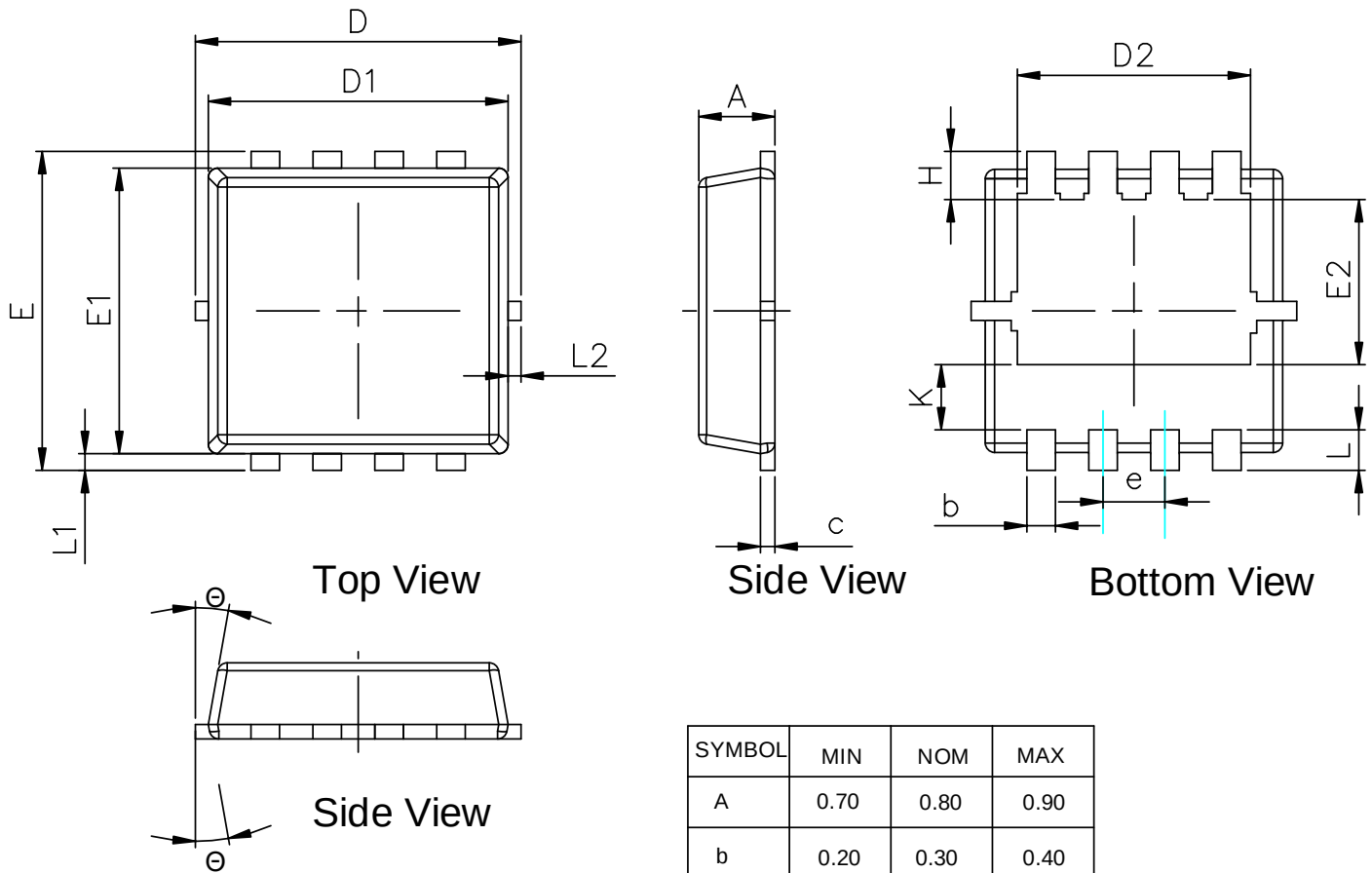
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



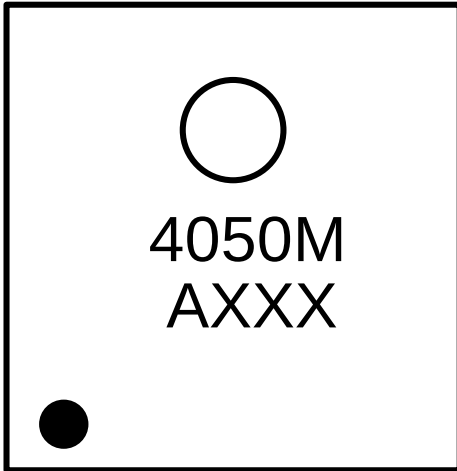
Package Outlines



SYMBOL	MIN	NOM	MAX
A	0.70	0.80	0.90
b	0.20	0.30	0.40
c	0.14	0.15	0.25
D	3.20	3.30	3.40
D1	3.00	3.15	3.30
D2	2.35	2.45	2.55
e	0.65 BSC		
E	3.25	3.35	3.45
E1	2.85	3.00	3.15
E2	1.635	1.735	1.835
H	0.41	0.56	0.71
K	0.585	0.685	0.785
L	0.30	0.40	0.50
L1	0.05	0.15	0.25
L2	—	—	0.15
Θ	8°	10°	12°

COMMON DIMENSIONS
(UNITS OF MEASURE = MILLIMETER)

Marking Information



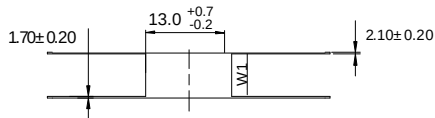
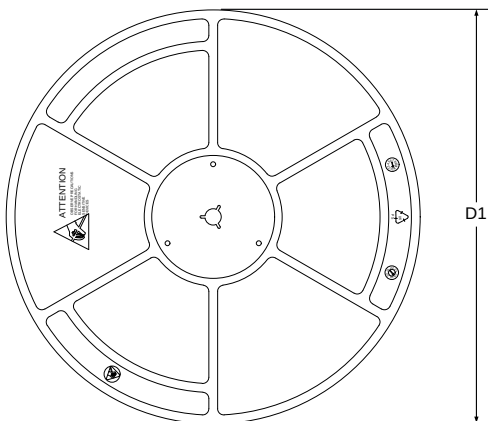
Note:

4050M=Product Name Code

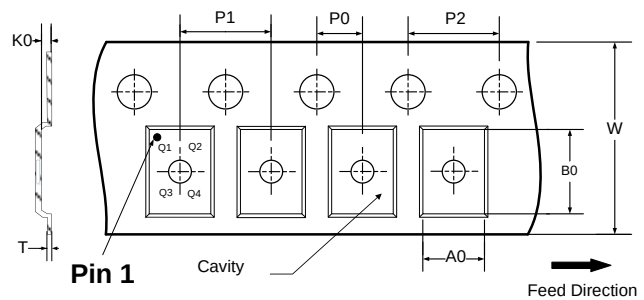
AXXX =Date code

Reel and Tube Information

REEL DIMENSIONS



TAPE DIMENSIONS



- A0: Dimension designed to accommodate the component width
- B0: Dimension designed to accommodate the component length
- K0: Dimension designed to accommodate the component thickness
- W: Overall width of the carrier tape
- P0: Pitch between successive cavity centers and sprocket hole
- P1: Pitch between successive cavity centers
- P2: Pitch between sprocket hole
- T: Tape material thickness
- D1: Reel Diameter
- W1: Reel Width

DIMENSIONS										(Unit: mm)
Reel	D1	W1								Material
	330	12.5								Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
	4	8	2	12	6.3	5.3	1.2	0.25	Q1	PC

All dimensions are nominal