

## Features

- 650V Enhancement Mode GaN Transistor
- Normal-off Design
- Ultra-low Qg
- No Qrr
- Low Inductance

## Applications

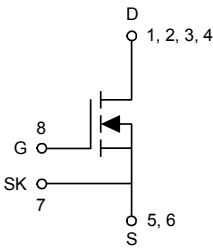
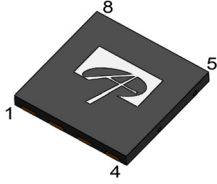
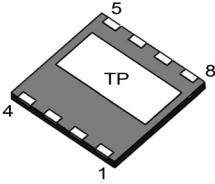
- Server Power Supplies
- High-Frequency Converters
- Resonant Topologies

## Product Summary

$V_{DS}$ @ $T_J$ , max	650V
$I_{DM}$	45A
$R_{DS(ON)}$	70mΩ
$Q_g$ , typ	6.9nC
$E_{OSS}$ @ 400V	6μJ



## Pin Configuration and Pin Names

DFN 8x8		Pin Names		
		Gate	8	
		Drain	1, 2, 3, 4	
		Kelvin Source	7	
		Source	5, 6	
		Thermal Pad (Connected to Source)	TP	

## Absolute Maximum Ratings

Exceeding the Absolute Maximum Ratings may damage the device.  $T_A = 25^\circ\text{C}$ , unless otherwise stated.

Symbol	Parameter		Maximum	Units
$V_{DS}$	Drain-Source Voltage		650 (DC) 720 (AC)	V
$V_{GS}$	Gate-Source Voltage		+6 / -4 (DC) +10 / -10 (AC)	V
$I_D$	Continuous Drain Current		$T_A = 25^\circ\text{C}$ : 16 <sup>(1)</sup> $T_A = 100^\circ\text{C}$ : 12 <sup>(1)</sup>	A
$P_D$	Power Dissipation <sup>(2)</sup>		Derate above $25^\circ\text{C}$ : 125	W
$T_J, T_{STG}$	Junction and Storage Temperature Range		-55 to 150	$^\circ\text{C}$
$T_L$	Maximum Lead and Temperature for Soldering		260	$^\circ\text{C}$

## Thermal Characteristics

Symbol	Parameter	Maximum	Units
$R_{JC\theta}$	Maximum Junction-to-Case	1	$^\circ\text{C}/\text{W}$
$R_{JA0}$	Maximum Junction-to-Ambient <sup>(3)</sup>	65	$^\circ\text{C}/\text{W}$

## Electrical Characteristics

$T_A = 25^\circ\text{C}$ ,  $V_{IN} = V$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>STATIC</b>							
$V_{DS(max)}$	Drain-Source Voltage	DC static $V_{DS(max)}$			650	V	
		AC transient $v_{DS(max)}$			720		
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$ $T_J=150^\circ\text{C}$		0.5		$\mu\text{A}$	
				5			
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS}=0V, V_{GS}=6V$		100		$\mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=5V, I_D=5\text{mA}$	1.1	1.8	2.3	V	
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=6V, I_D=6A$ $T_J = 150^\circ\text{C}$		70	90	m $\Omega$	
				165			
$V_{SD}$	Diode Forward Voltage	$I_S=10A, V_{GS}=0V$		2.3		V	
<b>DYNAMIC</b>							
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=400V, f=1\text{MHz}$		203		pF	
$C_{oss}$	Output Capacitance				58		pF
$C_{o(er)}$	Effective Output Capacitance, Energy Related <sup>(4)</sup>	$V_{GS}=0V, V_{DS}=0 \text{ to } 400V, f=1\text{MHz}$		74		pF	
$C_{o(tr)}$	Effective Output Capacitance, Time Related <sup>(5)</sup>				105		pF
$C_{rss}$	Reverse Transfer Capacitance	$V_{GS}=0V, V_{DS}=400V, f=1\text{MHz}$		1.5		pF	
$R_g$	Gate Resistance	$f=1\text{MHz}$		10		$\Omega$	
<b>SWITCHING</b>							
$Q_g$	Total Gate Charge	$V_{GS}=6V, V_{DS}=400V, I_D=6A$		6.9		nC	
$Q_{gs}$	Gate Source Charge				2		nC
$Q_{gd}$	Gate Drain Charge				1.4		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-3V/+6V, V_{DS}=400V, I_D=6A,$ $R_{G,ON}=4.7\Omega, R_{G,OFF}=1\Omega$		2.4		ns	
$t_r$	Turn-On Rise Time				5.4		ns
$t_{D(off)}$	Turn-Off DelayTime				6.2		ns
$t_f$	Turn-Off Fall Time				14.2		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=6A, di/dt=100A/ms, V_{DS}=400V$		0		nC	
$Q_{oss}$	Body Diode Reverse Recovery Charge	$I_F=6A, di/dt=100A/ms, V_{DS}=400V$		42		nC	

### Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ , Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .
2. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
3. The value of  $R_{\theta JA}$  is measured with the device in a still air environment with  $T_A=25^\circ\text{C}$ .
4.  $C_{o(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{(BR)DSS}$ .
5.  $C_{o(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{(BR)DSS}$ .
6. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)}=150^\circ\text{C}$ .
7. The static characteristics in Figures 1 to 7 are obtained using <300ms pulses, duty cycle 0.5% max.

## Typical Characteristics

$T_A = 25^\circ\text{C}$ ,  $V_{IN} = V$ , unless otherwise specified

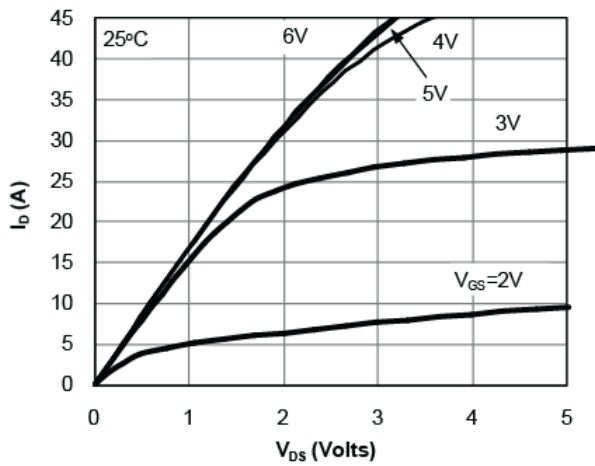


Figure 1. On-Region Characteristics

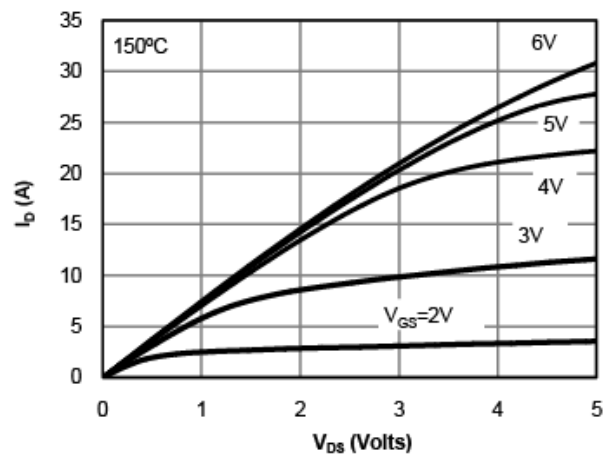


Figure 2. High Temperature On-Region

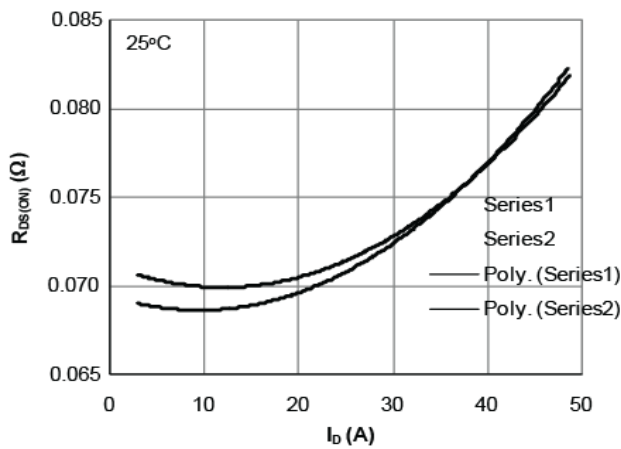


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

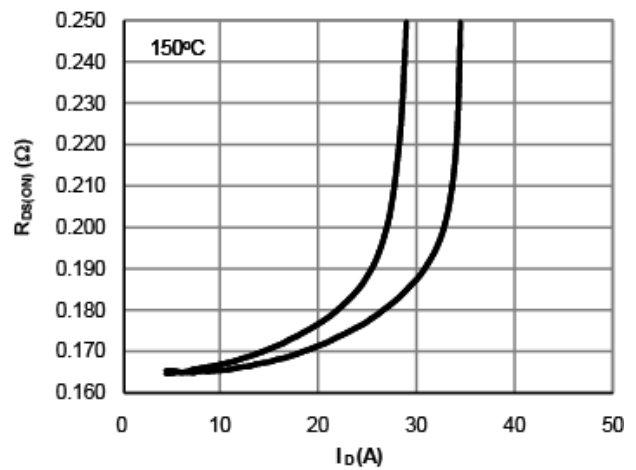


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

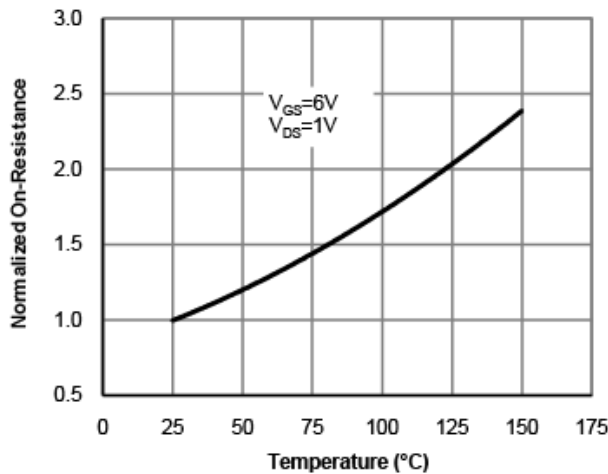


Figure 5. On-Resistance vs. Junction Temperature

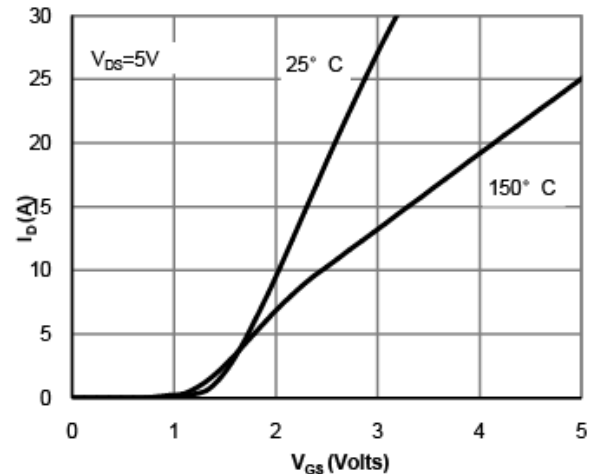


Figure 6. Transfer Characteristics

## Typical Characteristics

$T_A = 25^\circ\text{C}$ ,  $V_{IN} = V$ , unless otherwise specified

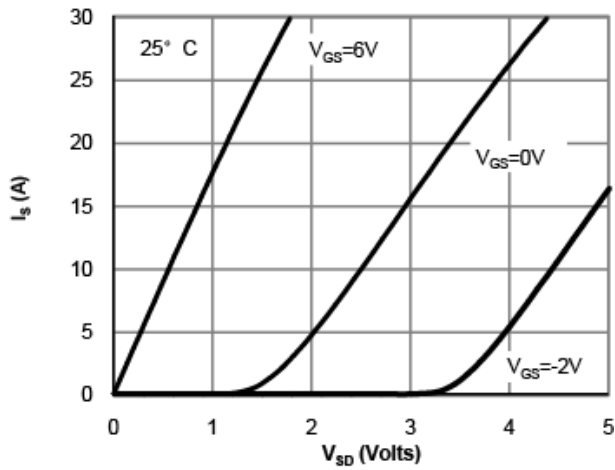


Figure 7. Body-Diode Characteristics

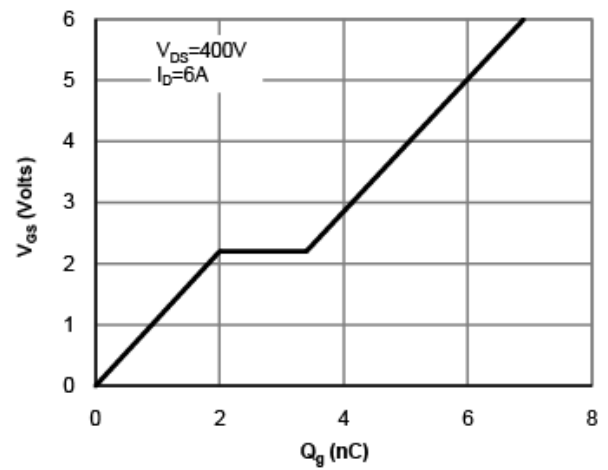


Figure 8. Gate-Charge Characteristics

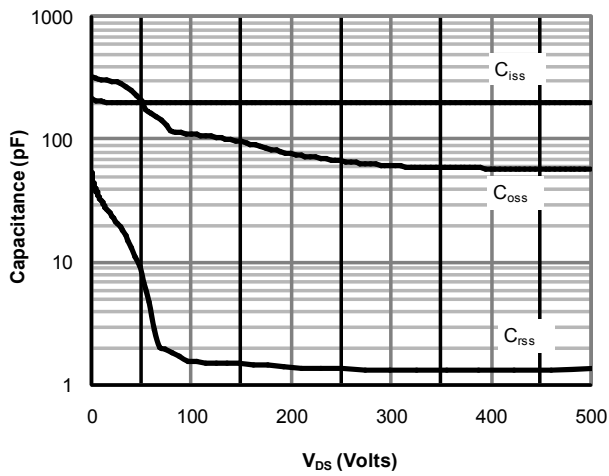


Figure 9. Capacitance Characteristics

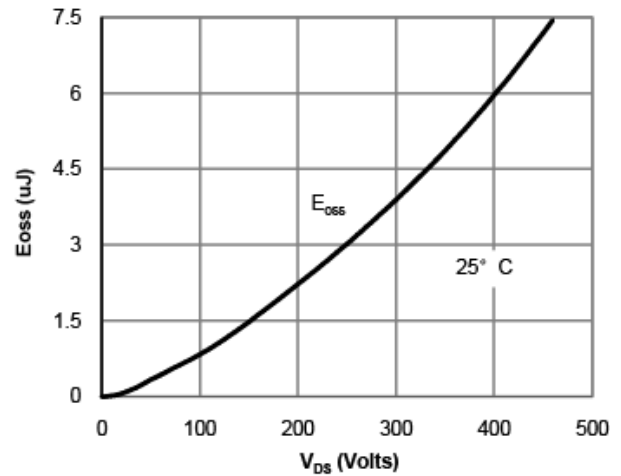


Figure 10. Coss Stored Energy

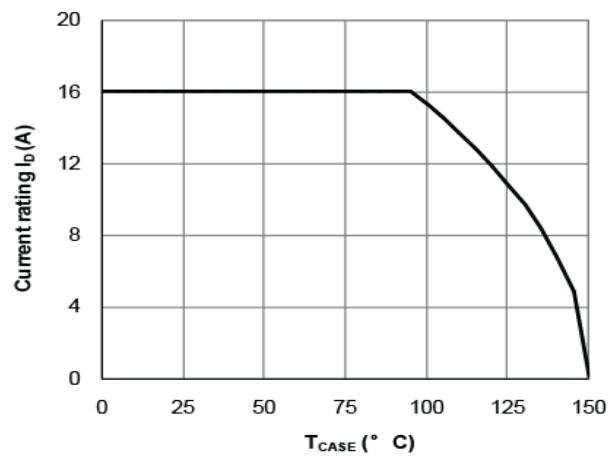


Figure 11. Current De-rating (Note 6)

### Typical Characteristics

$T_A = 25\text{ }^\circ\text{C}$ ,  $V_{IN} = V$ , unless otherwise specified

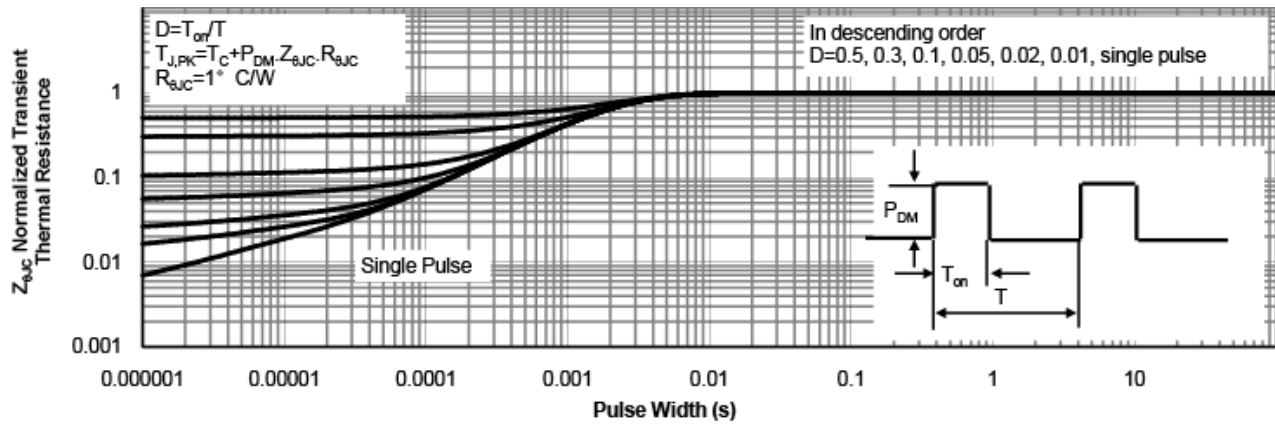
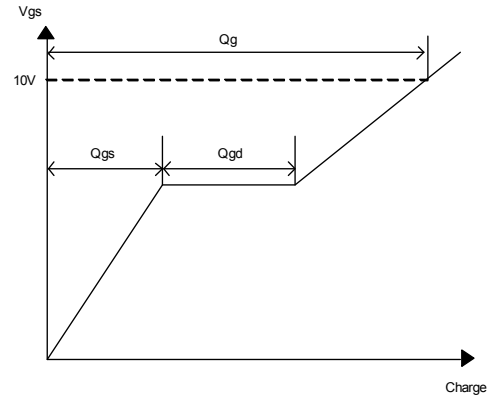
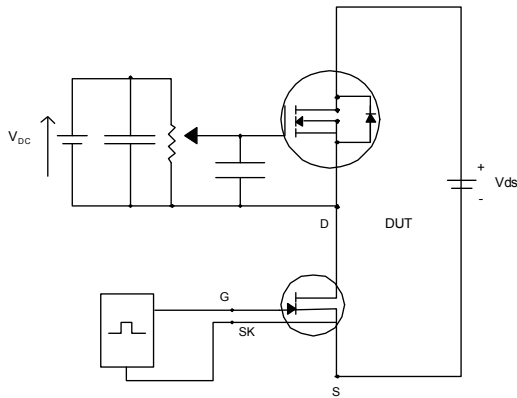


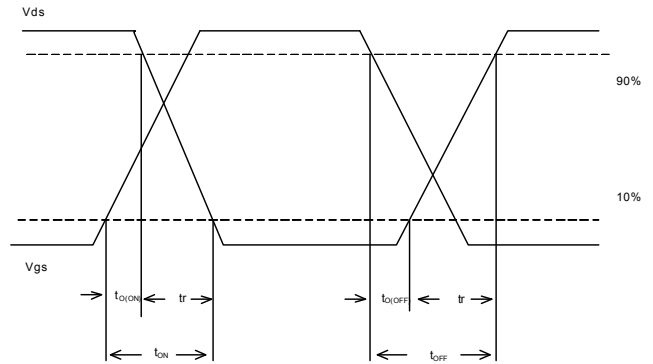
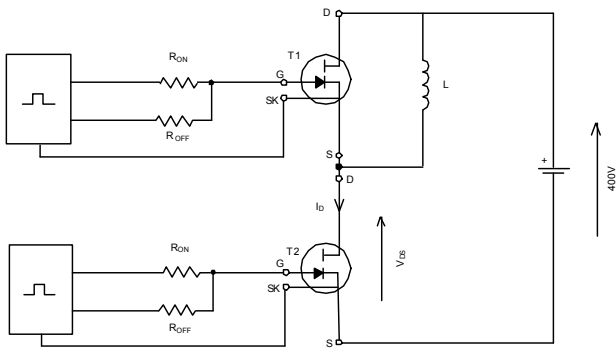
Figure 12. Normalized Maximum Transient Thermal Impedance for TO-220F Pb Free (Note 6)

## Test Circuits and Waveforms

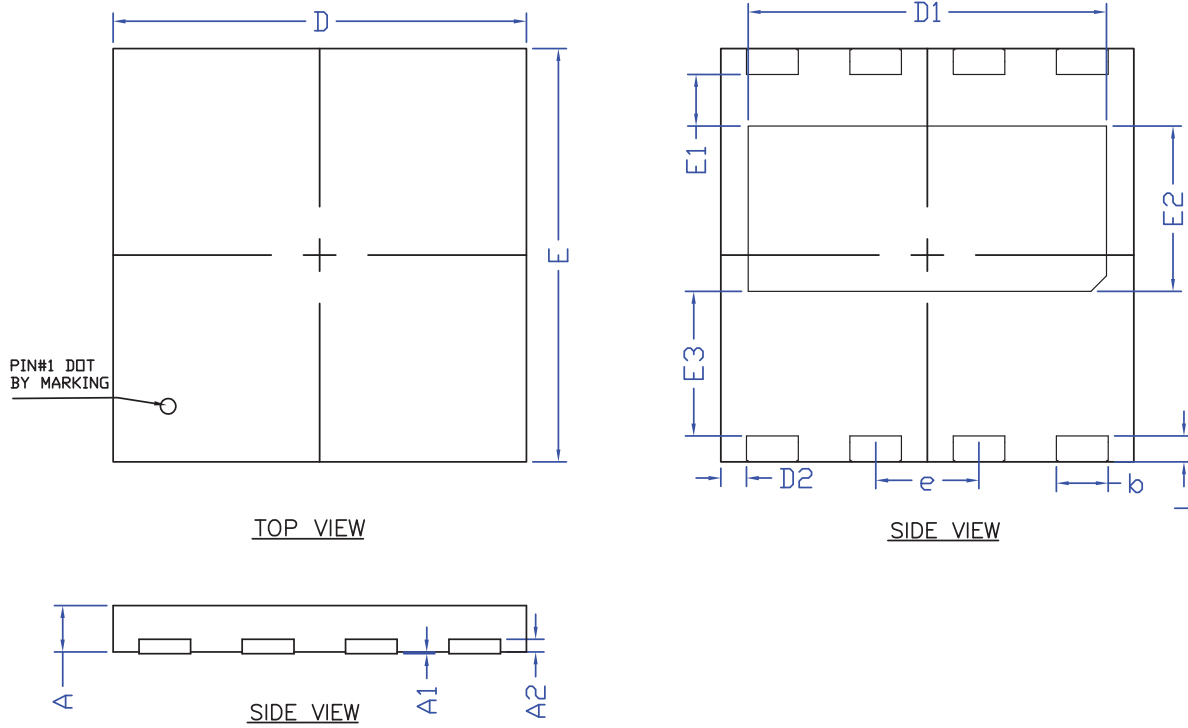
### Gate Charge Test Circuit & Waveforms



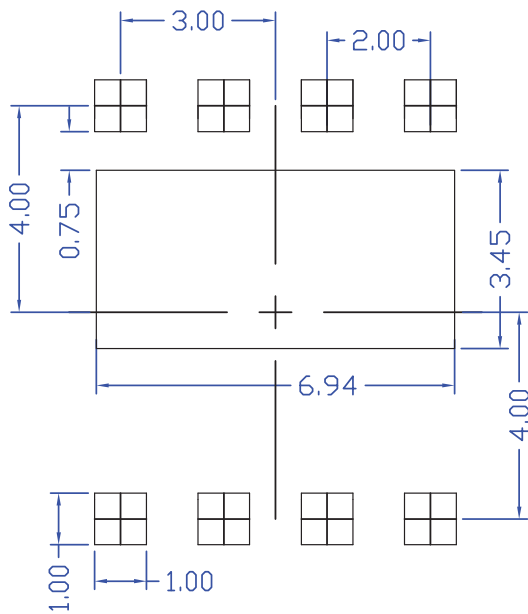
### Resistive Switching Test Circuit & Waveforms



**Package Dimensions, DFN8x8-8L**



**RECOMMENDED LAND PATTERN**



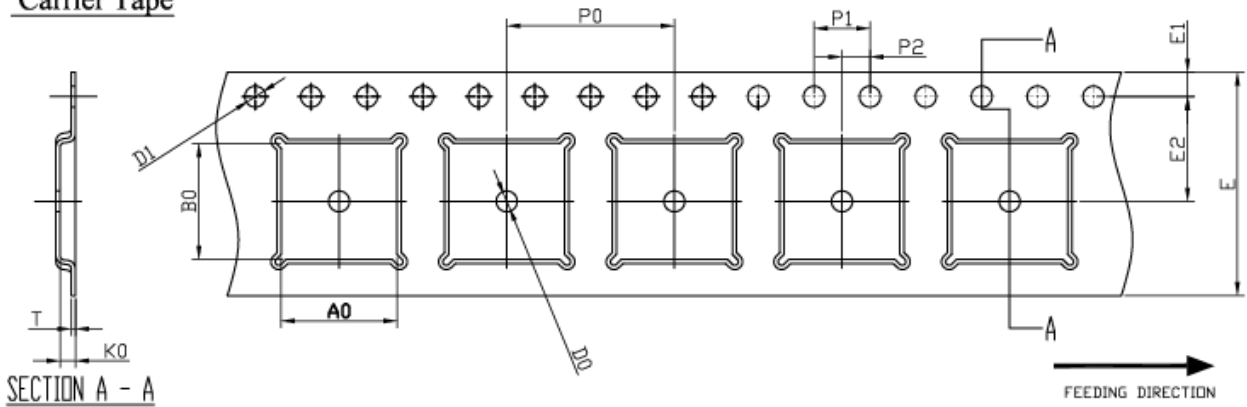
UNIT: mm

NOTE  
CONTROLLING DIMENSION IS MILLIMETER.  
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	MON	MAX
A	0.800		1.100	0.031		0.043
A1	0.000		0.050	0.000		0.002
A2	0.150	0.250	0.350	0.006	0.010	0.014
b	0.900	1.000	1.100	0.035	0.039	0.043
D	7.900	8.000	8.100	0.311	0.315	0.319
D1	6.840	6.940	7.040	0.269	0.273	0.277
D2	0.400	0.500	0.600	0.016	0.020	0.024
E	7.900	8.000	8.100	0.311	0.315	0.319
E1	0.900	1.000	1.100	0.035	0.039	0.043
E2	3.100	3.200	3.300	0.122	0.126	0.130
E3	2.700	2.800	2.900	0.106	0.110	0.114
e	2.00 B.S.C.			0.079 B.S.C.		
L	0.400	0.500	0.600	0.016	0.020	0.024

Tape and Reel, DFN8x8-8L

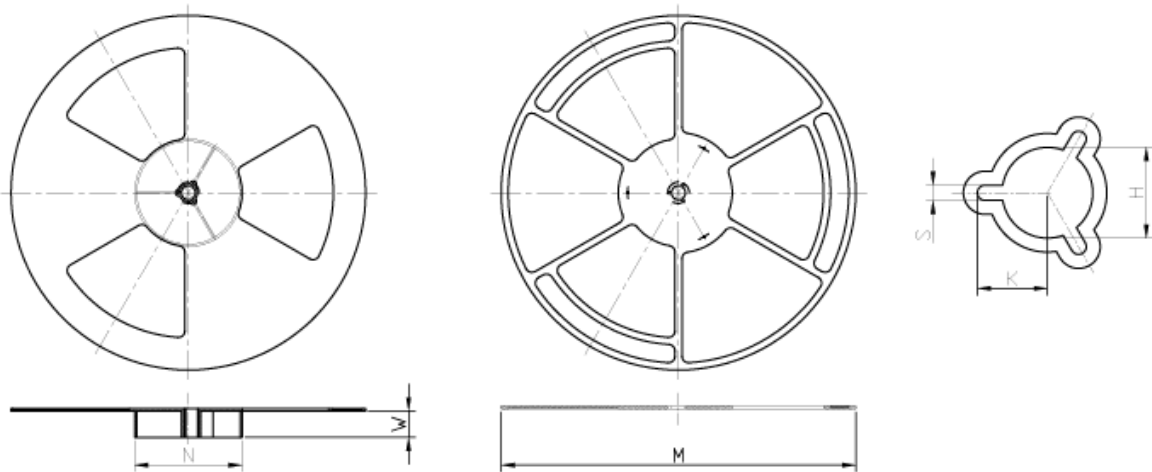
Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
DFN8x8 (16 mm)	8.30 ±0.10	8.30 ±0.10	1.10 ±0.10	1.50 MIN.	1.50 $+0.10$ $-0.00$	16.00 ±0.30	1.75 ±0.10	7.50 ±0.10	12.00 ±0.10	4.00 ±0.10	2.00 ±0.10	0.30 ±0.10

Reel

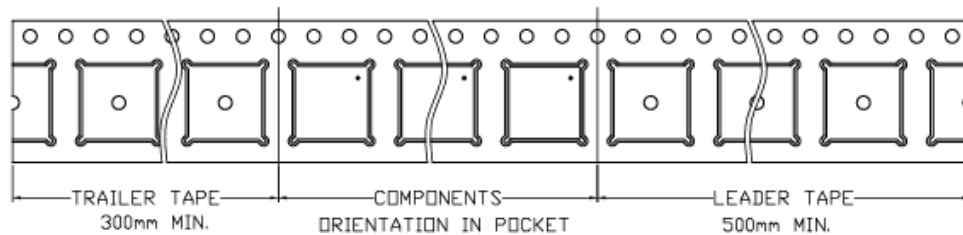


UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	H	K	S
16 mm	φ330	φ330.00 MAX.	φ100.00 MIN.	16.4 +2.0 -0.0	φ13.0 +0.5 -0.2	10.1 MIN.	1.5 MIN.

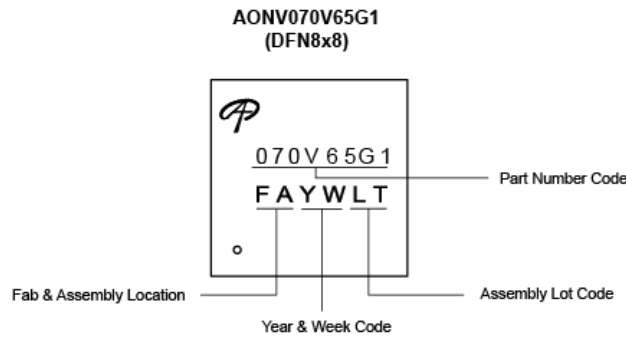
Tape

Leader / Trailer  
& Orientation





**Part Marking**



PART NO.	DESCRIPTION	CODE
AONV070V65G1	Green product	070V65G1

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