

## 650V N-Channel Super Junction MOSFET

<b>Voltage</b>	<b>650 V</b>	<b>Rdson</b>	<b>180 mΩ</b>
<b>Current</b>	<b>19.7 A</b>	<b>Qg</b>	<b>34.3 nC</b>

### Feature:

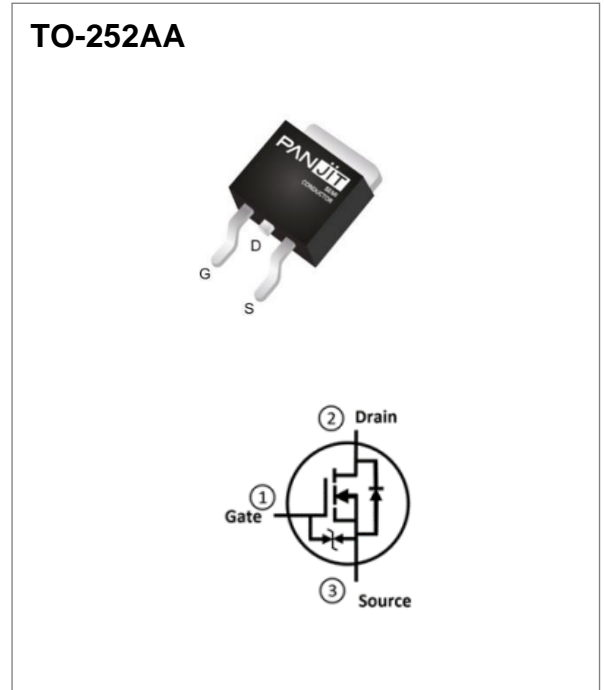
- $R_{DS(ON) Max, V_{GS}@10V}$  : 180mΩ
- Body diode with fast recovery characteristics
- With ESD protection, HBM> 2kV
- 100% Avalanche Tested
- 100% Rg Tested
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### Mechanical Data

- Case: TO-252AA package
- Terminals: Solderable per MIL-STD-750, Method 2026
- Approx. Weight: 0.3217 grams

### Application

- TV Power, PC Power, PD Charger, Adapter, UPS



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

PARAMETER		SYMBOL	LIMIT	UNITS
Drain-Source Voltage @ $T_{jmax}$		$V_{DS}$	700	V
Drain-Source Voltage		$V_{DS}$	650	
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current	$T_C=25^\circ\text{C}$	$I_D$	19.7	A
	$T_C=100^\circ\text{C}$		12.5	
Pulsed Drain Current	$T_C=25^\circ\text{C}$	$I_{DM}$	47	A
Single Pulse Avalanche Energy (Note 6)		$E_{AS}$	80	mJ
MOSFET dv/dt ruggedness		dv/dt	120	V/ns
Diode dv/dt		dv/dt	70	V/ns
Power Dissipation	$T_C=25^\circ\text{C}$	$P_D$	168.8	W
	$T_C=100^\circ\text{C}$		67.5	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~150	$^\circ\text{C}$

### Thermal Characteristics

PARAMETER	SYMBOL	VALUES			UNITS	
		MIN.	TYP.	MAX.		
Thermal Resistance	Junction-to-Case (Bottom)	$R_{\theta JC}$	-	0.53	0.74	$^\circ\text{C/W}$
	Junction-to-Ambient (Note 3)	$R_{\theta JA}$	-	-	60	$^\circ\text{C/W}$

**Electrical Characteristics** ( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
<b>Static</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.3	4.0	4.7	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=7A$ (Note 1)	-	156	180	m $\Omega$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	-	-	10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 1$	$\mu A$
<b>Dynamic</b> (Note 5)						
Total Gate Charge	$Q_g$	$V_{DS}=400V, I_D=14A,$ $V_{GS}=10V$	-	34.3	-	nC
Gate-Source Charge	$Q_{gs}$		-	9.7	-	
Gate-Drain Charge	$Q_{gd}$		-	14.6	-	
Input Capacitance	$C_{iss}$	$V_{DS}=400V, V_{GS}=0V,$ $f=250kHz$	-	1492	-	pF
Output Capacitance	$C_{oss}$		-	22.8	-	
Reverse Transfer Capacitance	$C_{rss}$		-	3	-	
Effective Output Capacitance Energy Related	$C_{o(er)}$	$V_{DS}=0V$ to 400V, $V_{GS}=0V$ (Note 4)	-	44.1	-	pF
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=14A,$ $V_{GS}=10V, R_G=25\Omega$ (Note 2)	-	37.7	-	ns
Turn-On Rise Time	$t_r$		-	73.1	-	
Turn-Off Delay Time	$t_{d(off)}$		-	118.9	-	
Turn-Off Fall Time	$t_f$		-	45.7	-	
Gate Resistance	$R_g$	$f=1.0MHz$	-	9.2	-	$\Omega$
<b>Drain-Source Diode</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	19.7	A
Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V$	-	0.90	1.5	V
Reverse Recovery Charge	$Q_{rr}$	$I_S=14A$	-	0.7	-	$\mu C$
Reverse Recovery Time	$T_{rr}$	$di/dt=100A/\mu s$	-	129	-	ns

NOTES :

1. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .
2. Essentially independent of operating temperature typical characteristics.
3.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance.
4.  $C_{o(er)}$  is a capacitance that gives the same stored energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0V to 400V.
5. Guaranteed by design, not subject to production testing.
6.  $E_{AS}$  is calculated based on the condition of  $L = 10\text{ mH}$ ,  $I_{AS} = 4\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $V_{GS} = 10\text{ V}$ , however by  $0.1\text{ mH}$ ,  $I_{AS} = 5.5\text{ A}$  100% test in production.

TYPICAL CHARACTERISTIC CURVES

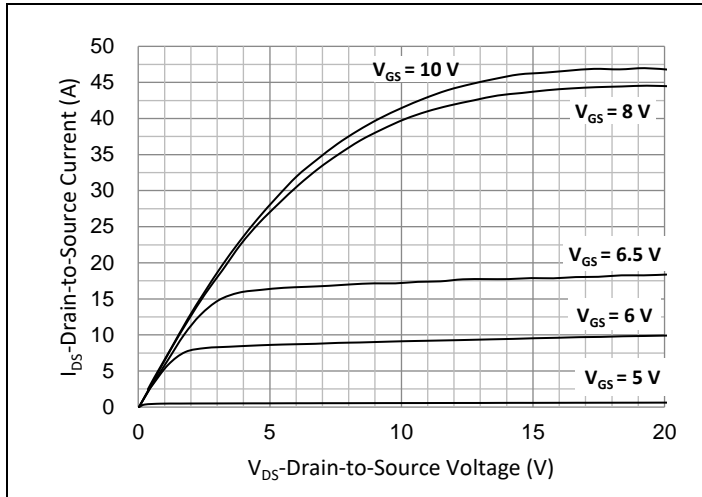


Fig.1 Output Characteristics

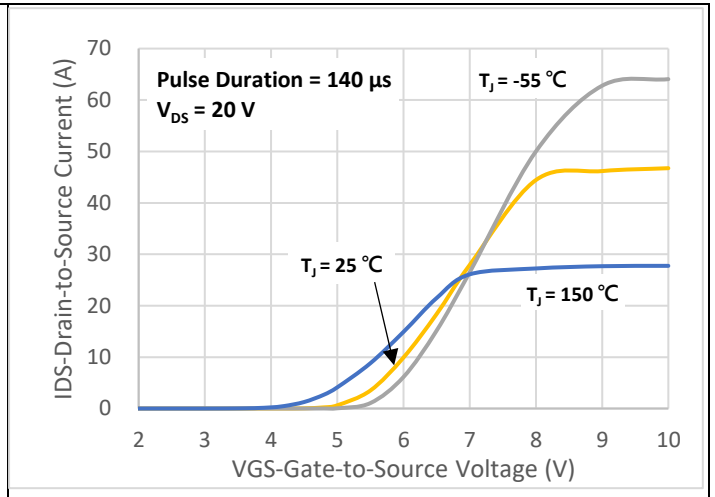


Fig.2 Transfer Characteristics

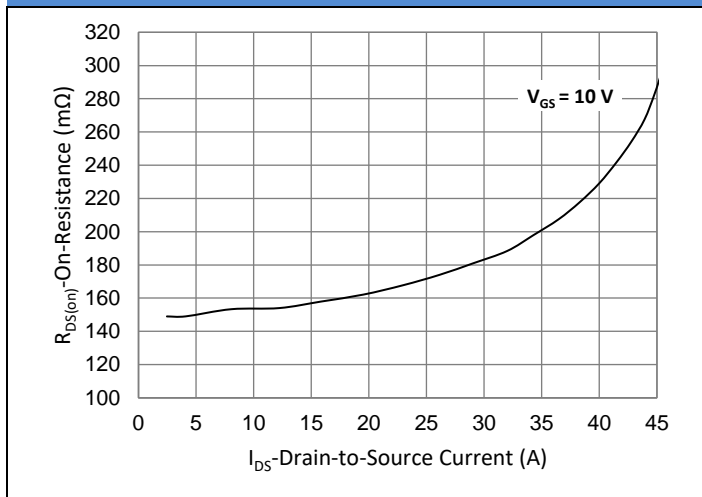


Fig.3 On-Resistance vs. Drain Current

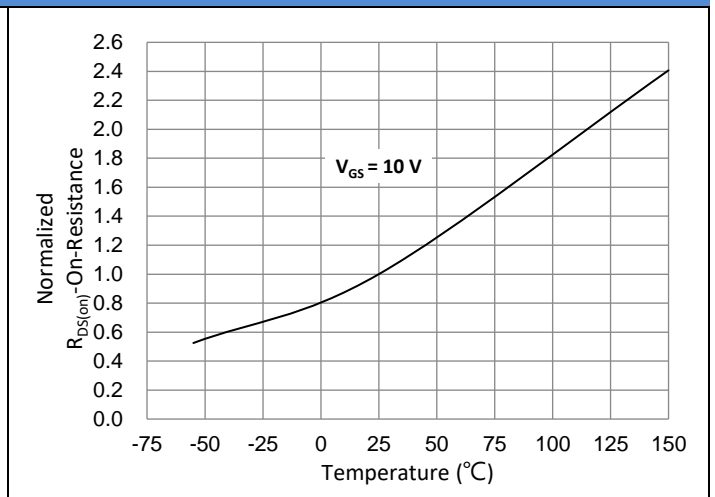


Fig.4 On-Resistance vs. Junction Temperature

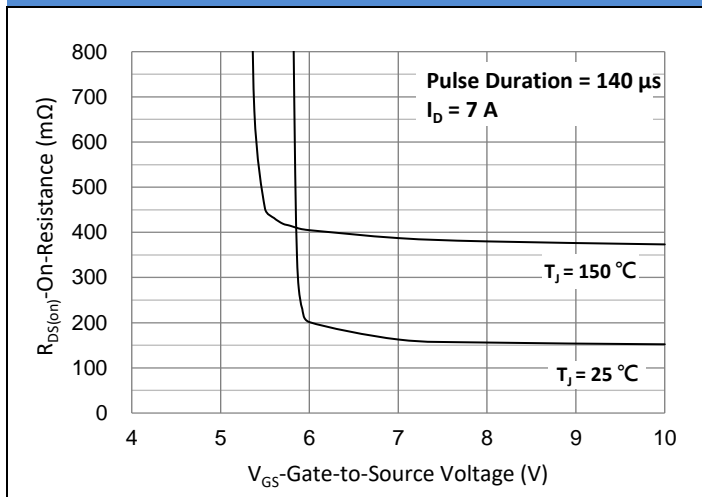


Fig.5 Capacitance vs. Drain-Source Voltage

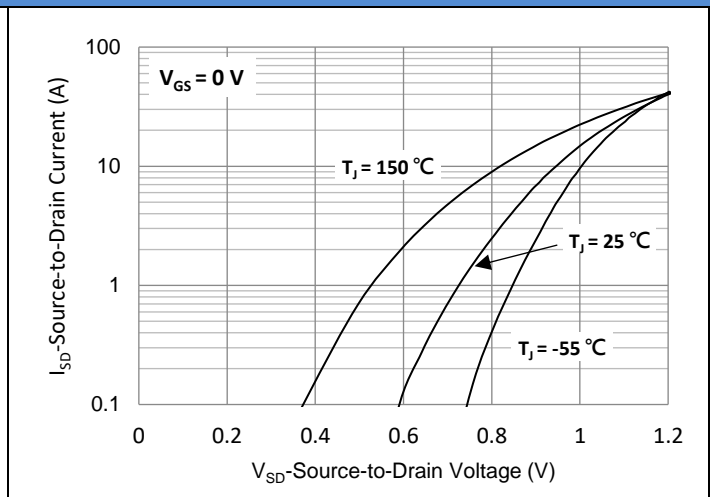


Fig.6 Source-Drain Diode Forward Voltage

TYPICAL CHARACTERISTIC CURVES

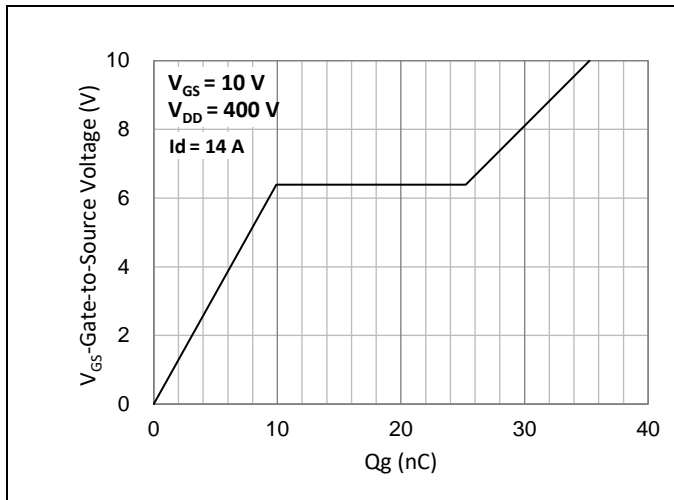


Fig.7 Gate-Charge Characteristics

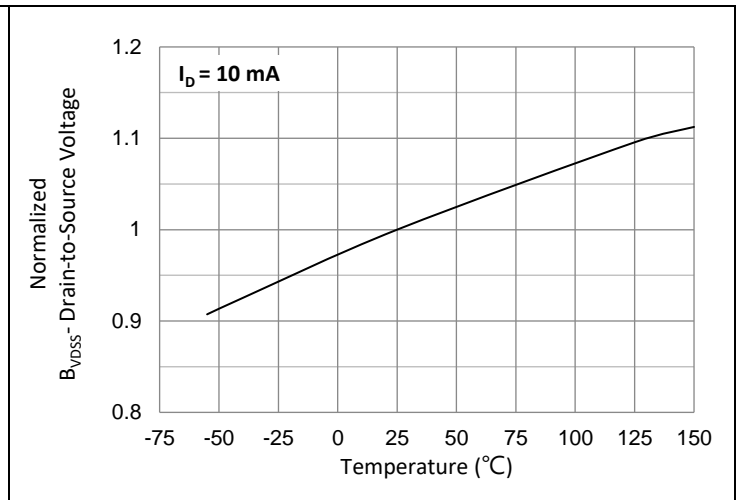


Fig.8 Breakdown Voltage Variation vs. Temperature

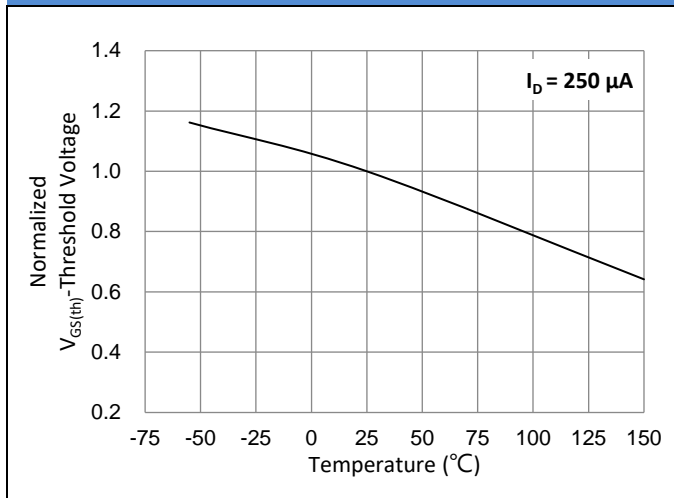


Fig.9 Threshold Voltage Variation with Temperature

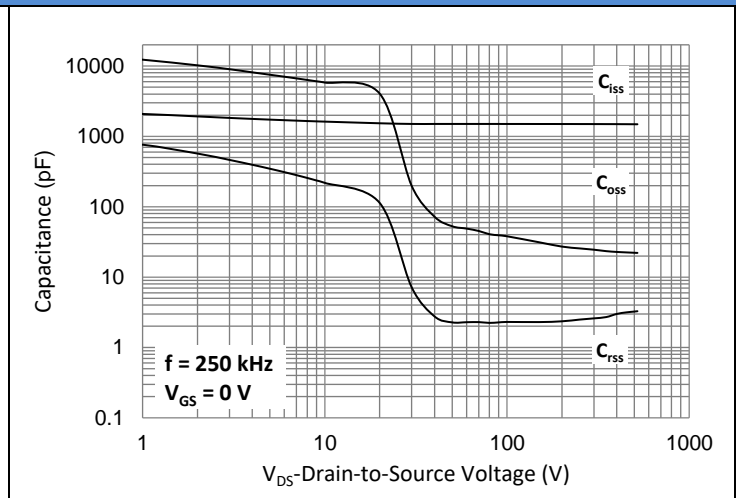


Fig.10 Drain Current vs. Case Temperature

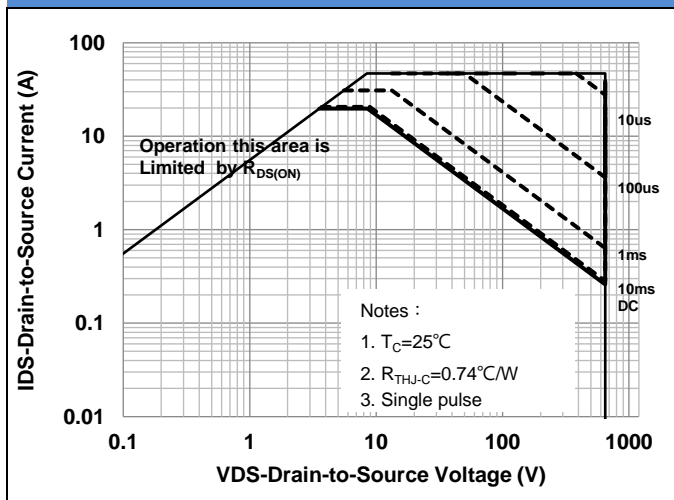


Fig.11 Maximum Safe Operating Area

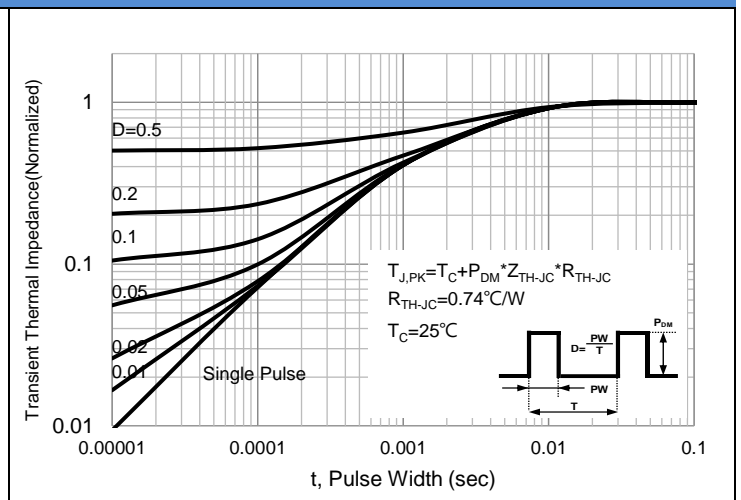


Fig.12 Normalized Transient Thermal Impedance

TYPICAL CHARACTERISTIC CURVES

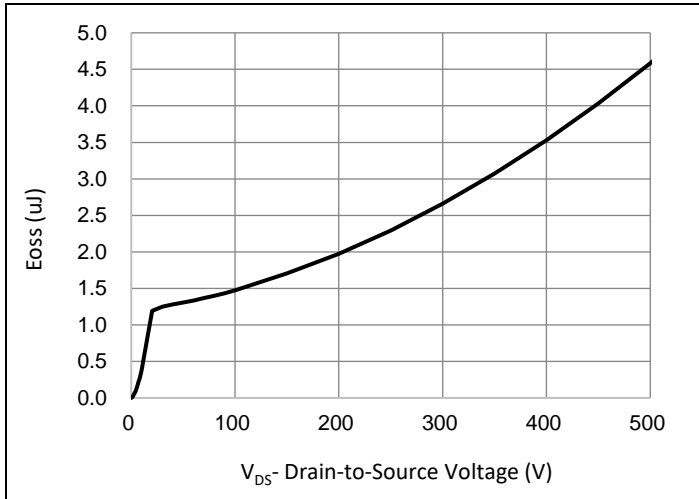
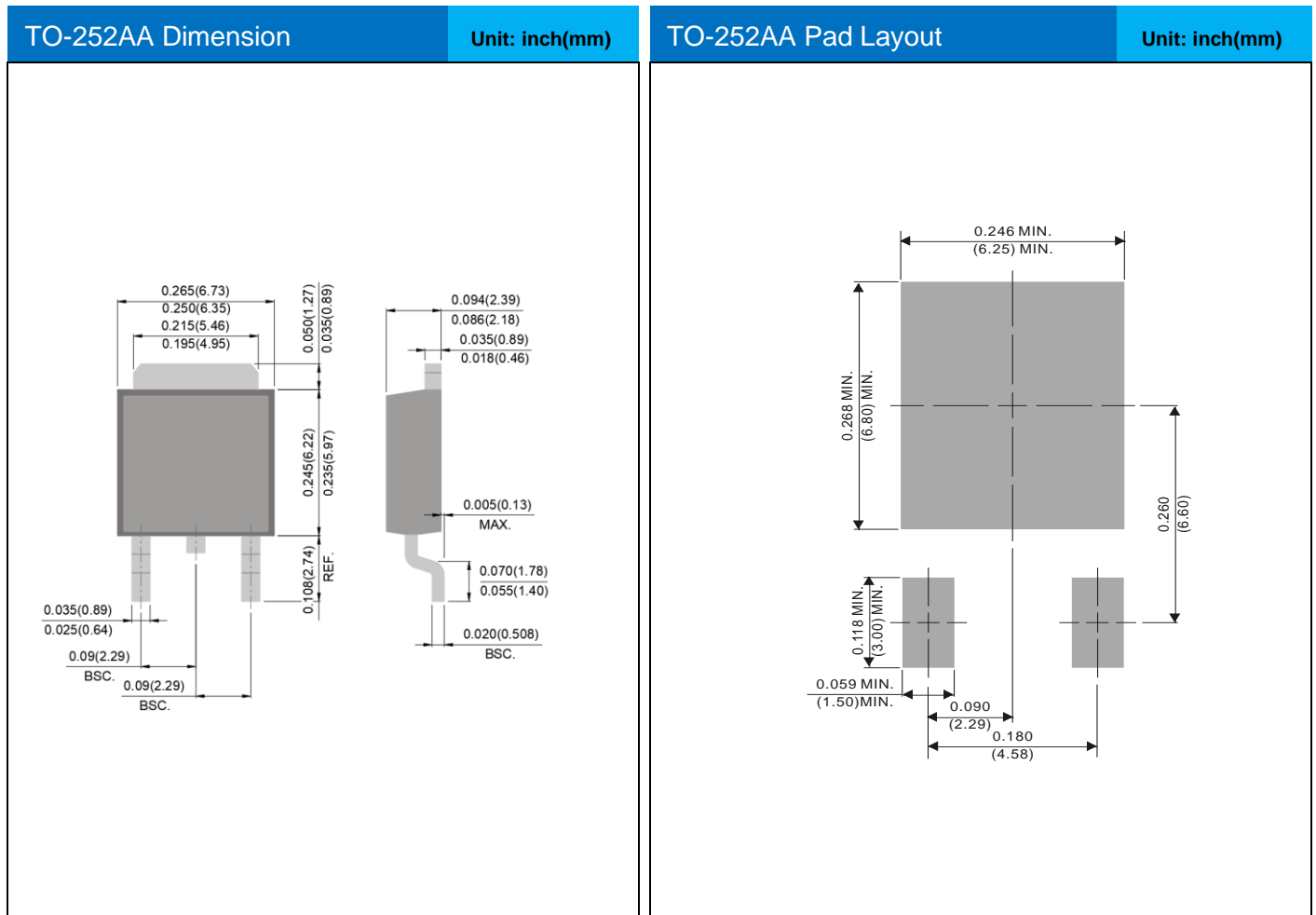


Fig.13 Typ. Coss Stored Energy

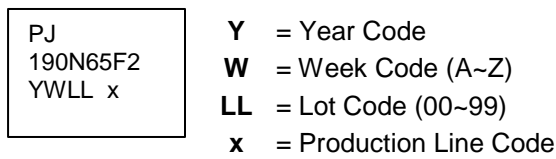
**Product and Packing Information**

Part No.	Package Type	Packing Type	Marking
PJMD190N65FR2	TO-252AA	3,000 pcs / 13" reel	190N65F2

**Packaging Information**



**Marking Diagram**



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