



# PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60

## 600V N-Channel MOSFET

**Voltage**

**600 V**

**Current**

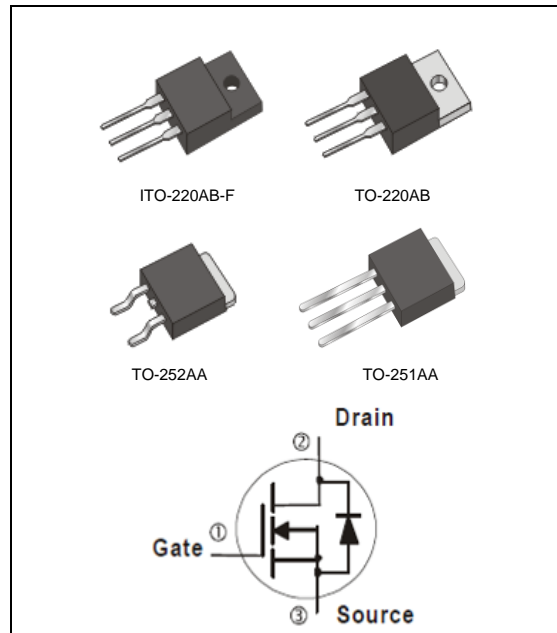
**4 A**

### Features

- $R_{DS(ON)}$ ,  $V_{GS}@10V, I_D@2A < 2.4\Omega$
- High switching speed
- Improved dv/dt capability
- Low Gate Charge
- Low reverse transfer capacitance
- Lead free in compliance with EU RoHS 2011/65/EU directive.
- Green molding compound as per IEC61249 Std.  
(Halogen Free)

### Mechanical Data

- Case: TO-251AA, TO-252AA, TO-220AB, ITO-220AB-F Package
- Terminals : Solderable per MIL-STD-750, Method 2026
- TO-251AA Approx. Weight : 0.0104 ounces, 0.297grams
- TO-252AA Approx. Weight : 0.0104 ounces, 0.297grams
- TO-220AB Approx. Weight : 0.067 ounces, 1.9 grams
- ITO-220AB-F Approx. Weight : 0.068 ounces, 2 grams



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

PARAMETER		SYMBOL	TO-251AA	TO-220AB	ITO-220AB-F	TO-252AA	UNITS
Drain-Source Voltage		$V_{DS}$	600				V
Gate-Source Voltage		$V_{GS}$	$\pm 30$				V
Continuous Drain Current		$I_D$	4				A
Pulsed Drain Current		$I_{DM}$	16				A
Single Pulse Avalanche Energy <sup>(Note 1)</sup>		$E_{AS}$	217				mJ
Power Dissipation	$T_C=25^\circ\text{C}$	$P_D$	77	100	33	77	W
	Derate above $25^\circ\text{C}$		0.62	0.8	0.26	0.62	W/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~150				$^\circ\text{C}$
Typical Thermal resistance							
- Junction to Case		$R_{\theta JC}$	1.62	1.25	3.79	1.62	$^\circ\text{C/W}$
- Junction to Ambient		$R_{\theta JA}$	110	62.5	120	110	

- Limited only By Maximum Junction Temperature



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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
<b>Static</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3.2	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$	-	1.92	2.4	$\Omega$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$	-	0.03	1.0	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	-	$\pm 10$	$\pm 100$	nA
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V$	-	0.86	1.4	V
<b>Dynamic</b> (Note 4)						
Total Gate Charge	$Q_g$	$V_{DS}=480V, I_D=4A,$ $V_{GS}=10V$ (Note 2,3)	-	11.1	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.3	-	
Gate-Drain Charge	$Q_{gd}$		-	4.2	-	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $f=1.0\text{MHz}$	-	450	-	pF
Output Capacitance	$C_{oss}$		-	67	-	
Reverse Transfer Capacitance	$C_{rss}$		-	0.7	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=300V, I_D=4A,$ $R_G=25\Omega$ (Note 2,3)	-	10	-	ns
Turn-On Rise Time	$t_r$		-	23	-	
Turn-Off Delay Time	$t_{d(off)}$		-	24	-	
Turn-Off Fall Time	$t_f$		-	24	-	
<b>Drain-Source Diode</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$	---	-	-	4	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$	---	-	-	16	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=4A$	-	400	-	ns
Reverse Recovery Charge	$Q_{rr}$	$di_F/dt=100A/\mu s$ (Note 2)	-	1.7	-	$\mu C$

NOTES :

1.  $L=30\text{mH}, I_{AS}=3.7A, V_{DD}=50V, R_G=25\text{ohm}$ , Starting  $T_J=25^\circ\text{C}$
2. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$
3. Essentially independent of operating temperature typical characteristics.
4. Guaranteed by design, not subject to production testing



# PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60

## TYPICAL CHARACTERISTIC CURVES

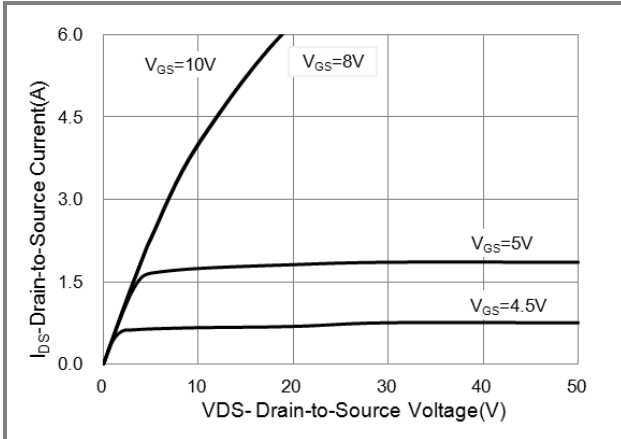


Fig.1 Output Characteristics

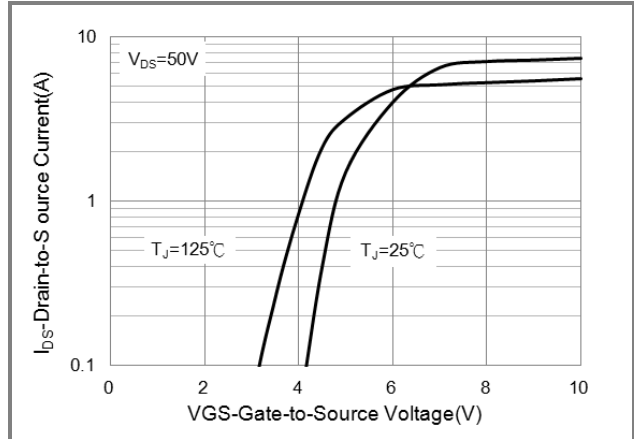


Fig.2 Transfer Characteristics

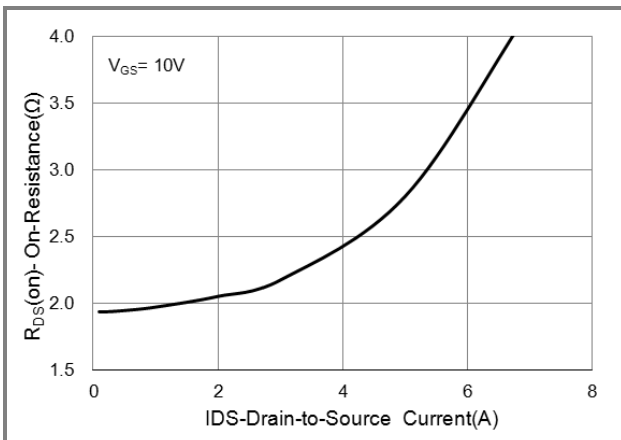


Fig.3 On-Resistance vs. Drain Current

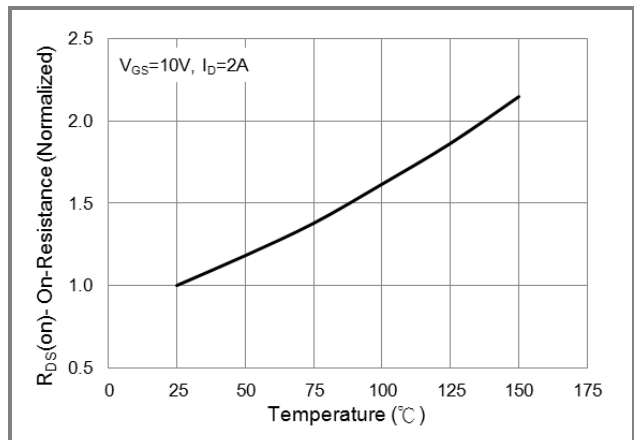


Fig.4 On-Resistance vs. Junction Temperature

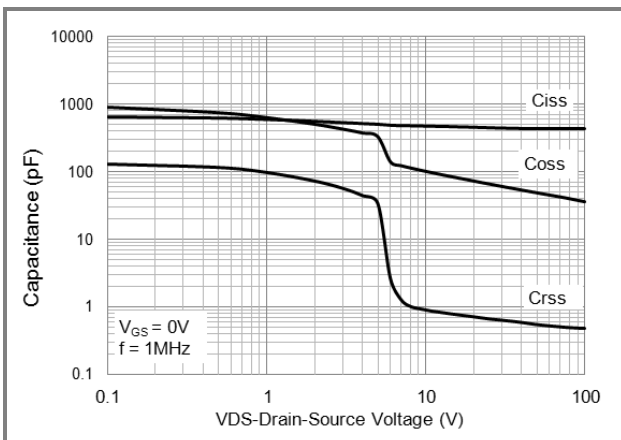


Fig.5 Capacitance vs. Drain-Source Voltage

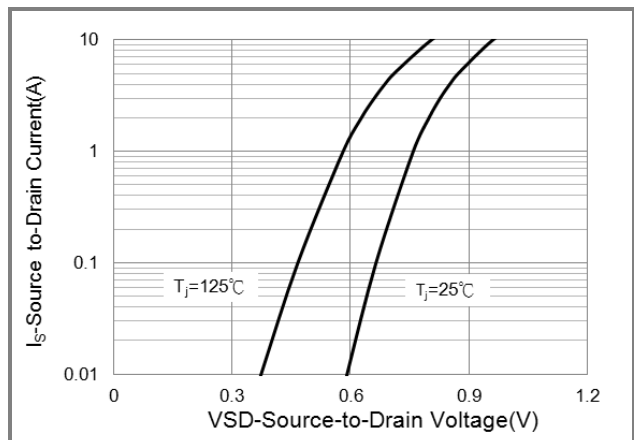


Fig.6 Source-Drain Diode Forward Voltage



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## TYPICAL CHARACTERISTIC CURVES

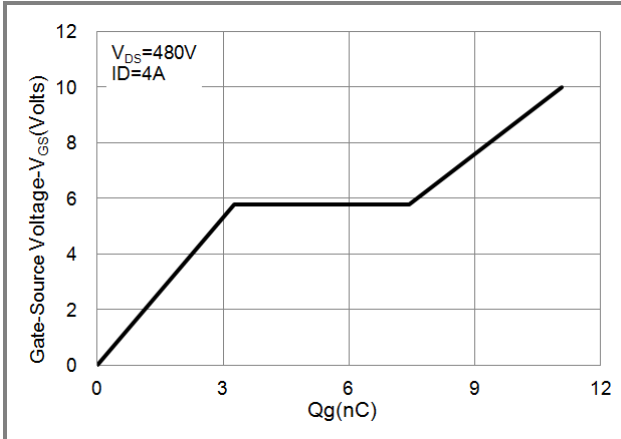


Fig.7 Gate Charge

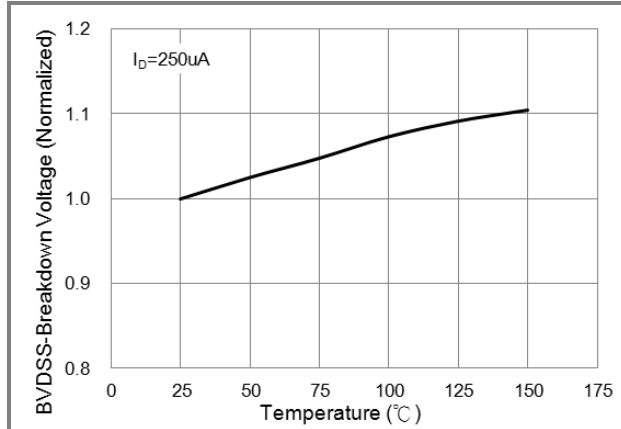


Fig.8  $BV_{DSS}$  vs. Junction Temperature

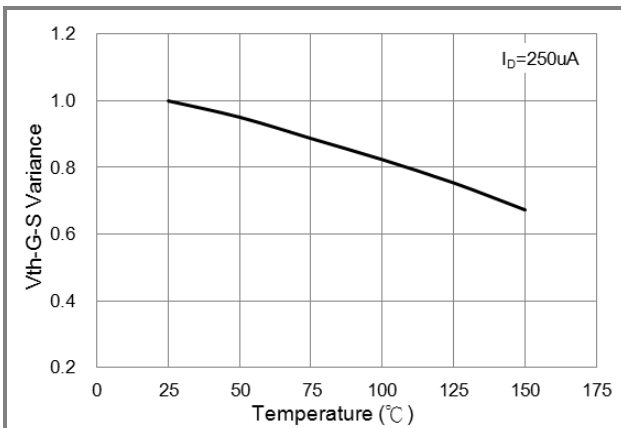


Fig.9 Threshold Voltage Variation with Temperature

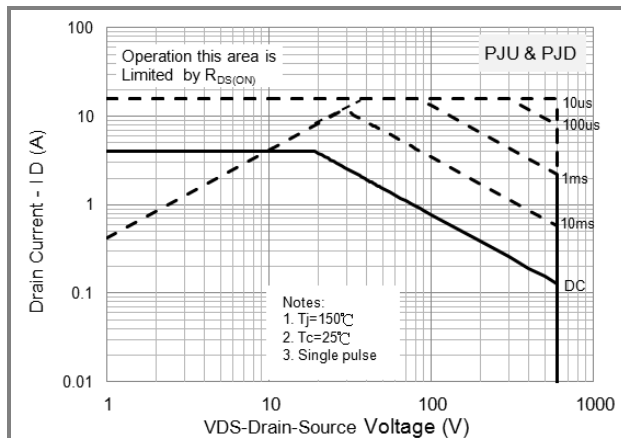


Fig.10 Maximum Safe Operating Area

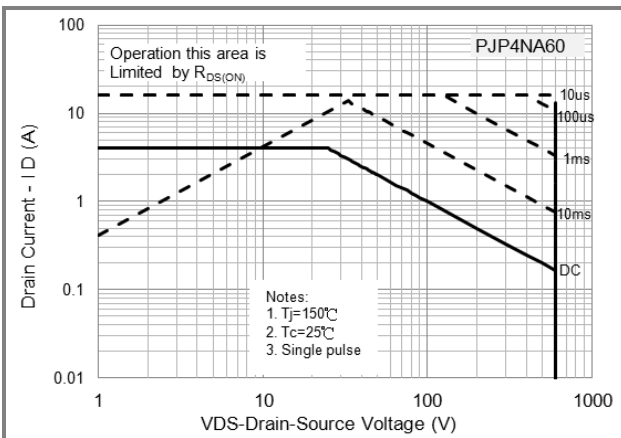


Fig.11 Maximum Safe Operating Area

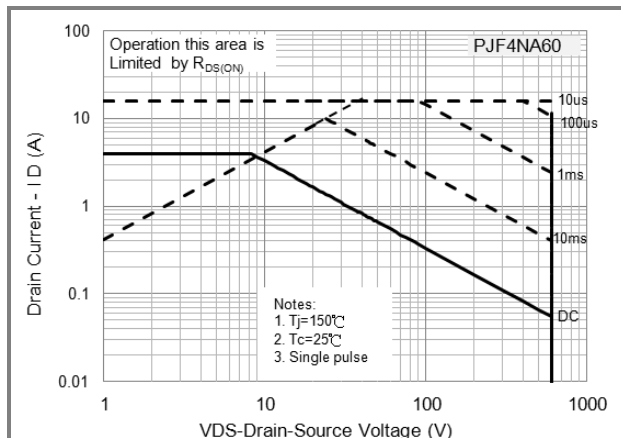


Fig.12 Maximum Safe Operating Area



# PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60

## TYPICAL CHARACTERISTIC CURVES

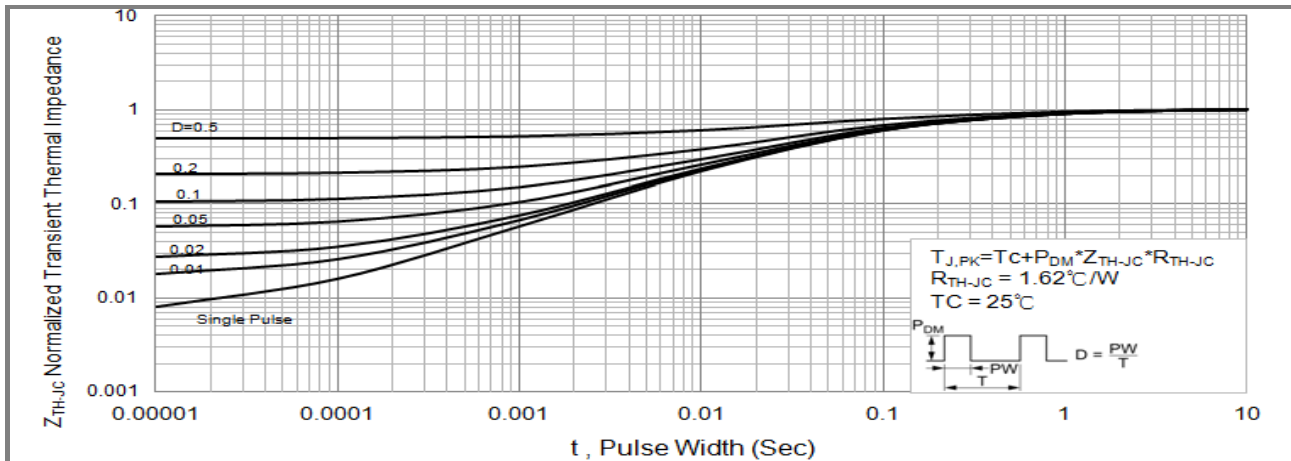


Fig.13 PJU/PJD Normalized Transient Thermal Impedance vs. Pulse Width

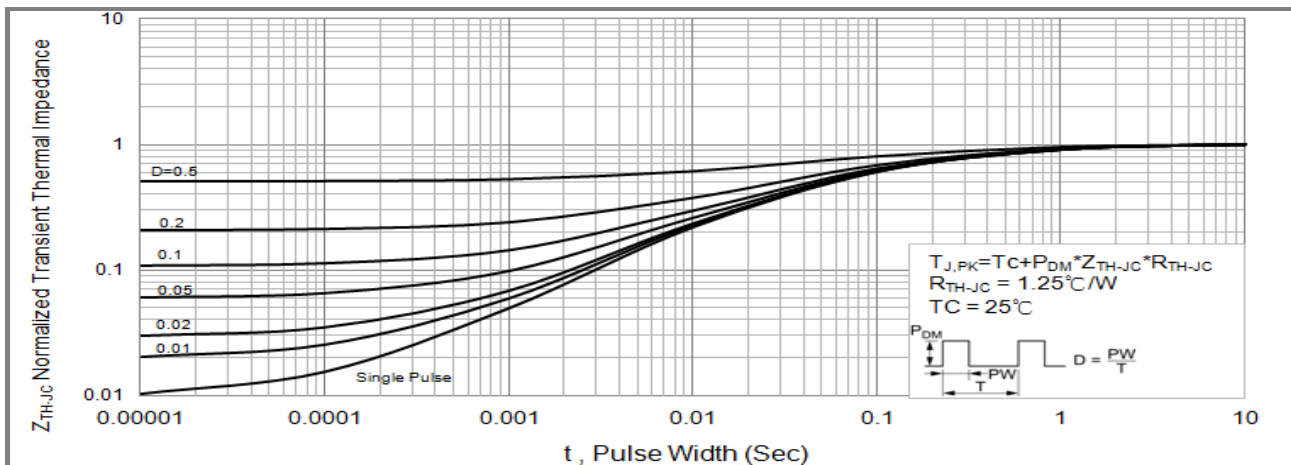


Fig.14 PJP4NA60 Normalized Transient Thermal Impedance vs. Pulse Width

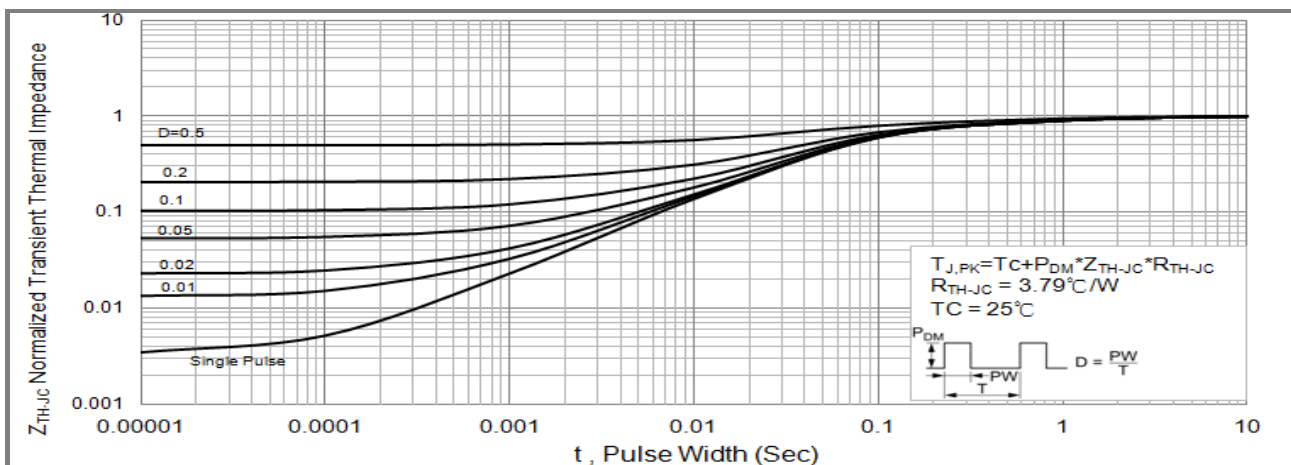
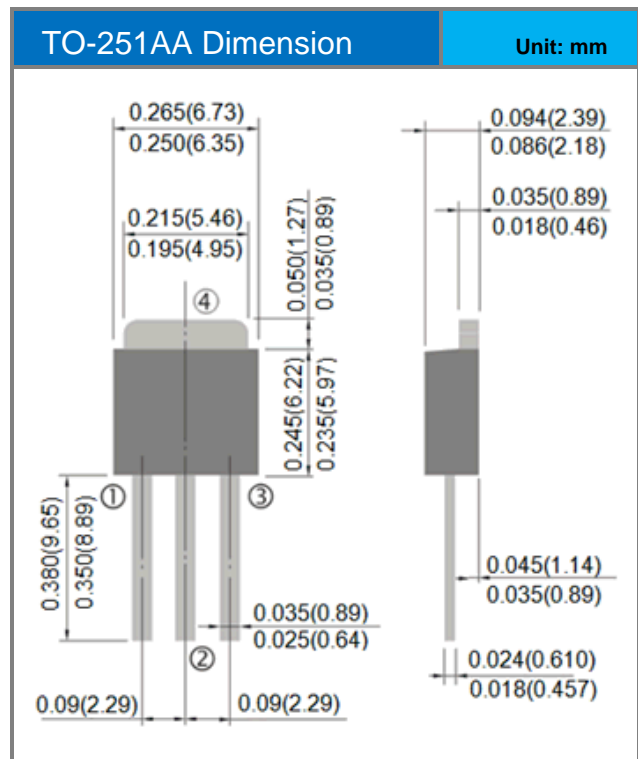
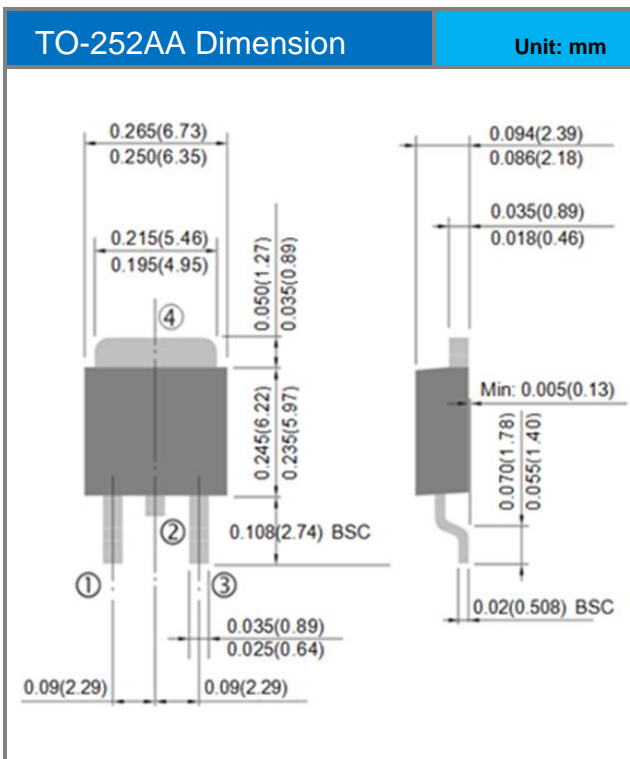
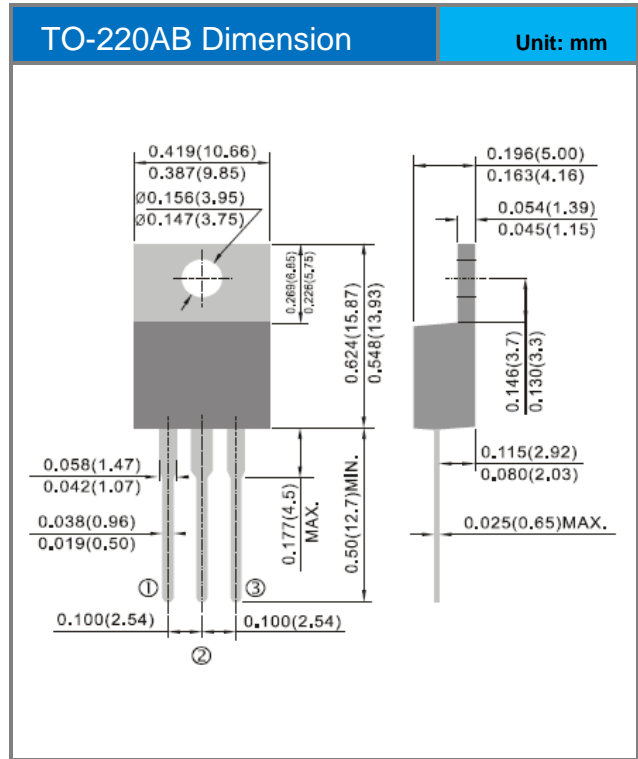
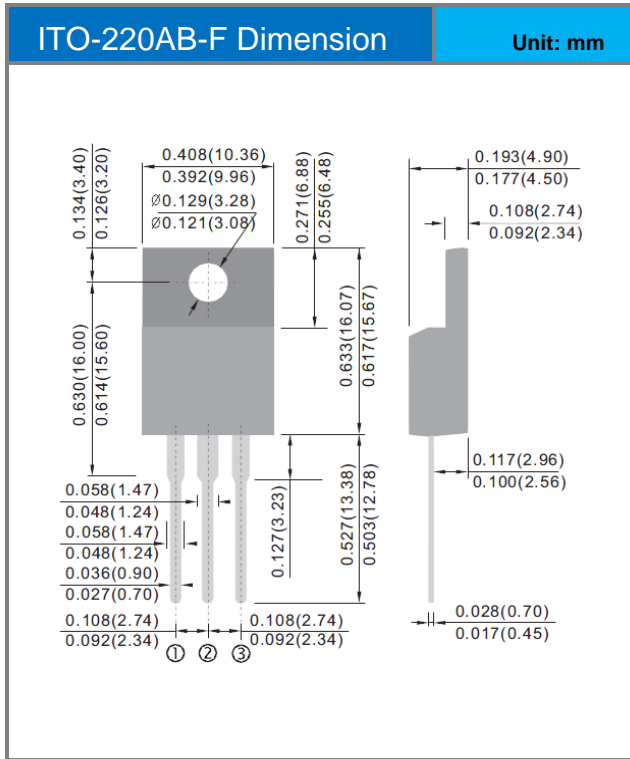


Fig.15 PJF4NA60 Normalized Transient Thermal Impedance vs. Pulse Width



# PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60

## Packaging Information





## PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60

### PART NO PACKING CODE VERSION

Part No Packing Code	Package Type	Packing type	Marking	Version
PJU4NA60_T0_00001	TO-251AA	80pcs / Tube	U4NA60	Halogen free
PJD4NA60_L2_00001	TO-252AA	3,000pcs / 13" reel	D4NA60	Halogen free
PJP4NA60_T0_00001	TO-220AB	50pcs / Tube	P4NA60	Halogen free
PJF4NA60_T0_00001	ITO-220AB-F	50pcs / Tube	F4NA60	Halogen free



## **PJU4NA60 / PJD4NA60 / PJP4NA60 / PJF4NA60**

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