

## Features

- AEC-Q101 Qualified
- Excellent Package For Heat Dissipation
- High Density Cell Design For Low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device<sup>(Note1)</sup>
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant<sup>(Note2)</sup> ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

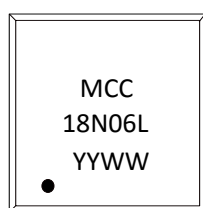
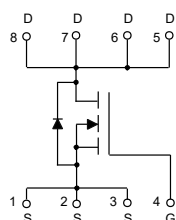
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 60°C/W Junction to Ambient<sup>(Note2)</sup>
- Thermal Resistance: 2.1°C/W Junction to Case

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	±20	V
Continuous Drain Current	$I_D$	30	A
		19	
Pulsed Drain Current <sup>(Note3)</sup>	$I_{DM}$	120	A
Total Power Dissipation <sup>(Note4)</sup>	$P_D$	59	W
Single Pulse Avalanche Energy <sup>(Note5)</sup>	$E_{AS}$	55	mJ

Note:

1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemption Applied, see EU Directive Annex 7a.
3. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ .
4. Repetitive rating; pulse width limited by max. junction temperature.
5.  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
6.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 40\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 0.5\text{mH}$ .

## Internal Structure and Marking Code

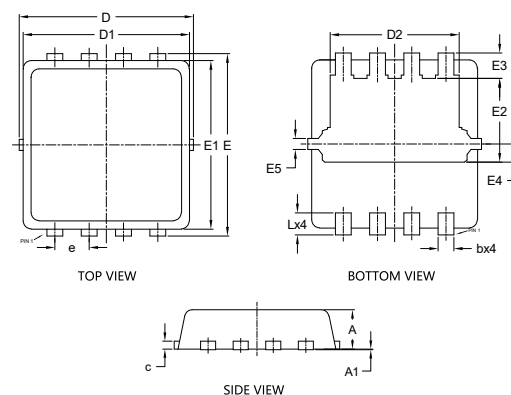


pin1

4 codes in total  
YY is the year  
WW is the week

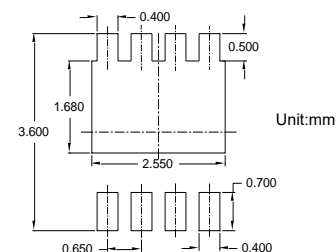
# N-CHANNEL MOSFET

## PDFN3333



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.028	0.033	0.70	0.85	
A1	0.000	0.002	0.00	0.05	
b	0.008	0.016	0.20	0.40	
c	0.004	0.010	0.10	0.25	
D	0.124	0.136	3.15	3.45	
D1	0.118	0.130	3.00	3.30	
D2	0.089	0.104	2.25	2.65	
E	0.124	0.136	3.15	3.45	
E1	0.114	0.126	2.90	3.20	
E2	0.052	0.068	1.32	1.72	
E3	0.011	0.026	0.28	0.65	
E4	0.013		0.330		TYP
E5	0.008		0.200		TYP
e	0.026		0.650		BSC
L	0.012	0.020	0.300	0.500	

## Suggested Solder Pad Layout

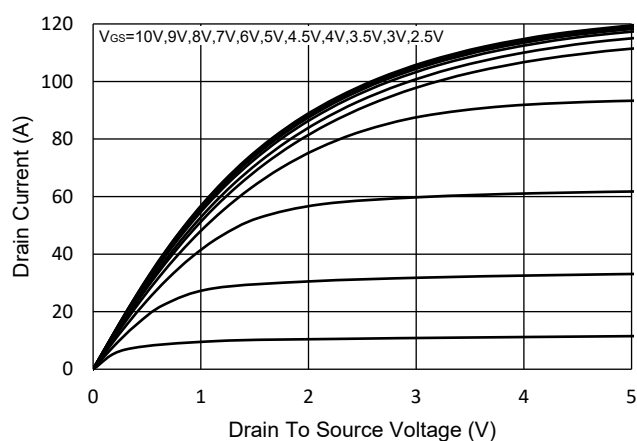


**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

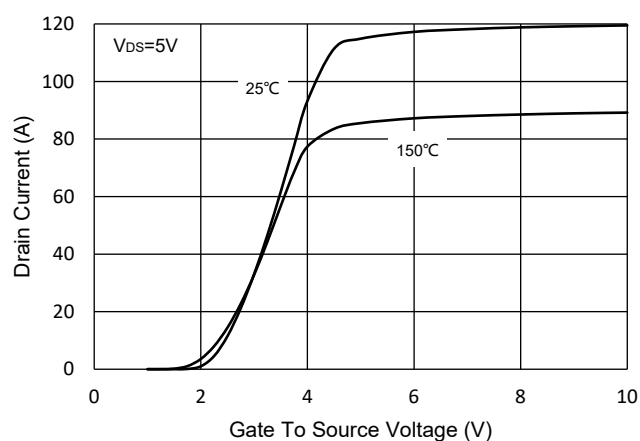
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60			V
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V			1	μA
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.0	V
Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A		13.7	18	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A		15.7	22	
Gate Resistance	R <sub>g</sub>	f=1 MHz, Open drain		2		Ω
Diode Characteristics						
Continuous Body Diode Current	I <sub>S</sub>				30	A
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A			1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs		18		ns
Reverse Recovery Charge	Q <sub>rr</sub>			16		nC
Dynamic Characteristics						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz		1850		pF
Output Capacitance	C <sub>oss</sub>			100		
Reverse Transfer Capacitance	C <sub>rss</sub>			90		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A		38		nC
Gate-Source Charge	Q <sub>gs</sub>			6.5		
Gate-Drain Charge	Q <sub>gd</sub>			6.8		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V R <sub>G</sub> =2.7Ω, I <sub>D</sub> =20A		11		ns
Turn-On Rise Time	t <sub>r</sub>			46		
Turn-Off Delay Time	t <sub>d(off)</sub>			36		
Turn-Off Fall Time	t <sub>f</sub>			8		

## Curve Characteristics

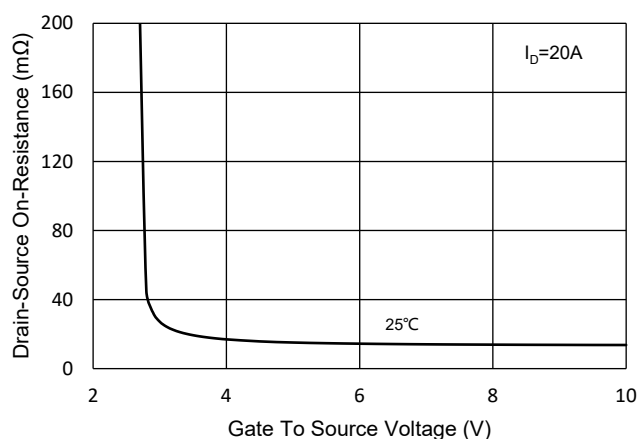
**Fig.1 - Typical Output Characteristics**



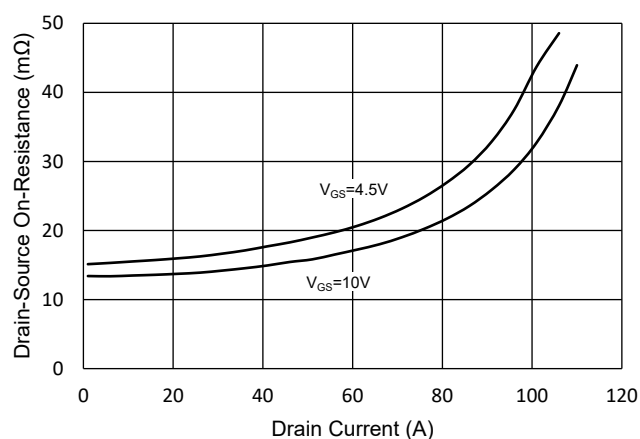
**Fig.2 - Transfer Characteristics**



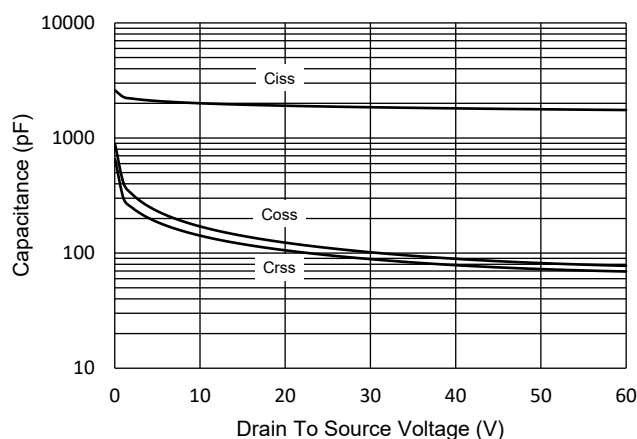
**Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$**



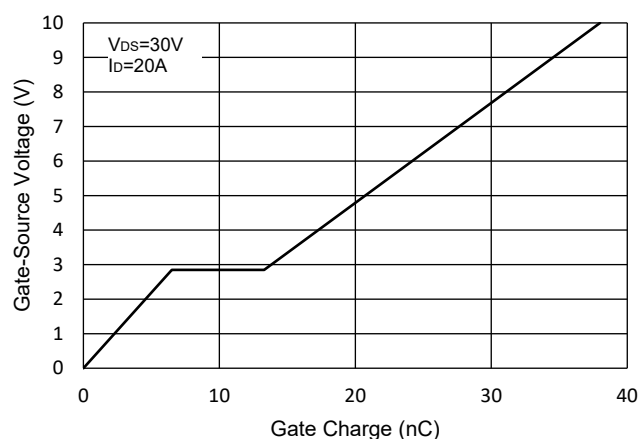
**Fig.4 -  $R_{DS(ON)}$  -  $I_D$**



**Fig.5 - Capacitance Characteristics**

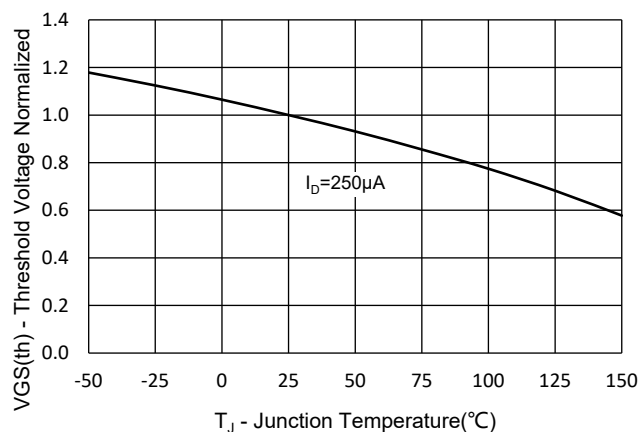


**Fig.6 - Gate Charge**

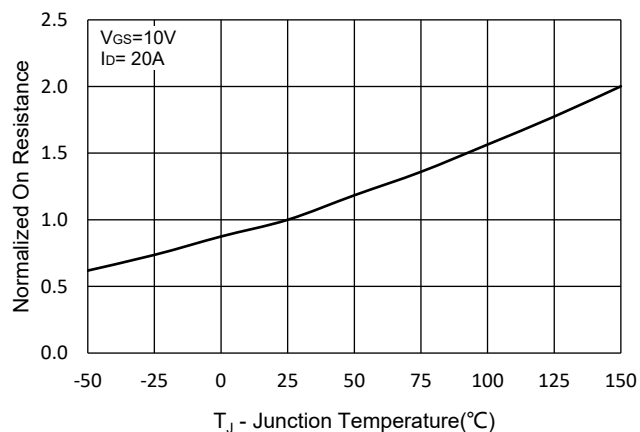


## Curve Characteristics

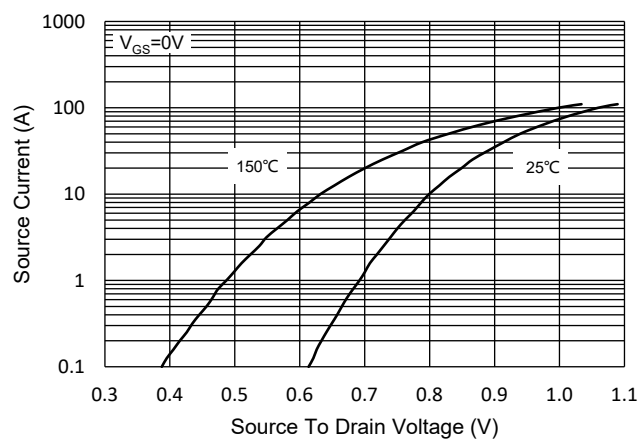
**Fig.7 - Normalized Threshold Voltage**



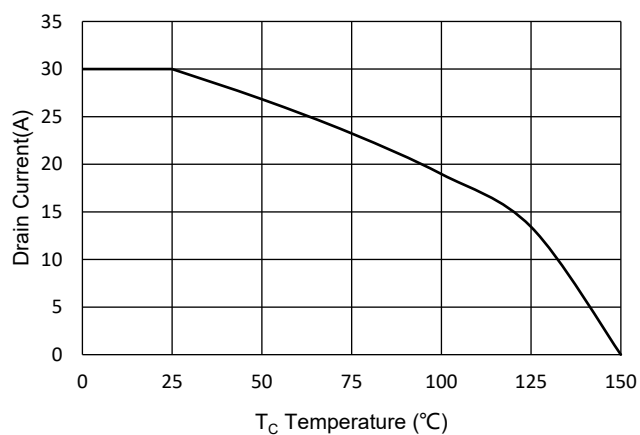
**Fig.8 - Normalized On Resistance Characteristics**



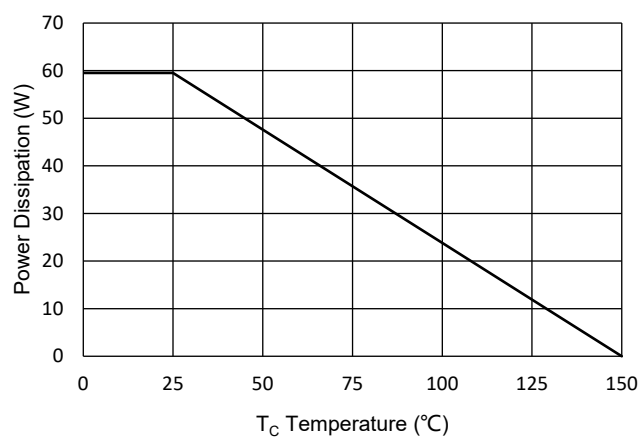
**Fig.9 -  $I_S - V_{SD}$**



**Fig.10 - Drain Current**



**Fig.11 - PD Dissipation**



## Curve Characteristics

Fig.12 - Safe Operation Area

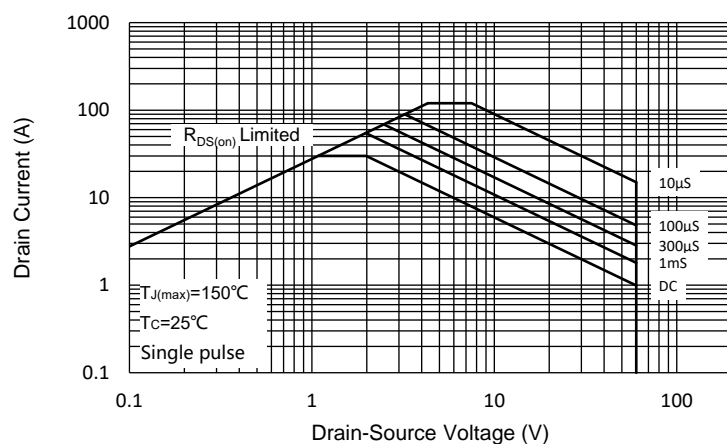
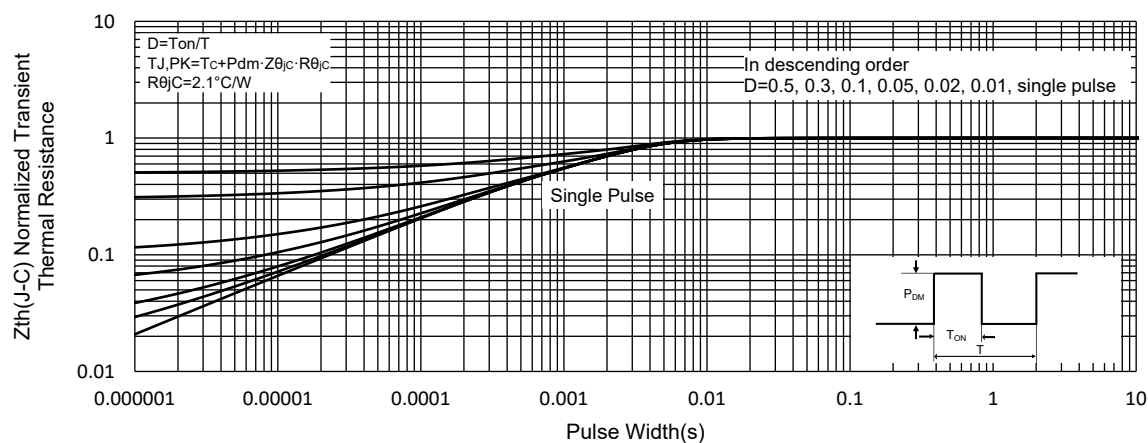


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

Device	Packing
Part Number-TP	Tape&Reel: 5Kpcs/Reel

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