

### Features

- Fully Automotive Qualified to AEC-Q101
- Trench MV MOSFET Technology
- ESD HBM Class 2
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note2)("P" Suffix Designates RoHS Compliant. See Ordering Information)

### Maximum Ratings

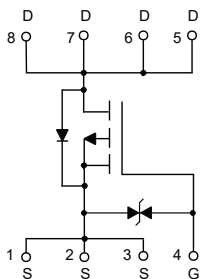
- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance: 56°C/W Junction to Ambient (Note3)
- Thermal Resistance: 1.2°C/W Junction to Case

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V <sub>DS</sub>	-60	V
Gate-Source Voltage <sup>(Note4)</sup>	V <sub>GS</sub>	±20	V
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C	-46
		T <sub>C</sub> =100°C	-32
Pulsed Drain Current <sup>(Note5)</sup>	I <sub>DM</sub>	-184	A
Total Power Dissipation <sup>(Note6)</sup>	P <sub>D</sub>	125	W
Single Pulsed Avalanche Energy <sup>(Note7)</sup>	E <sub>AS</sub>	110	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 7(a)-I.
3. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> =25°C.
4. VGS=-20V/+10V according AEC-Q101 at Tj=175°C
5. Repetitive rating; pulse width limited by max. junction temperature.
6. P<sub>D</sub> is based on max. junction temperature, using junction-case thermal resistance.
7. T<sub>J</sub>=25°C, V<sub>DD</sub>=-30V, V<sub>GS</sub>=-10V, R<sub>G</sub>=25Ω, L=0.5mH.

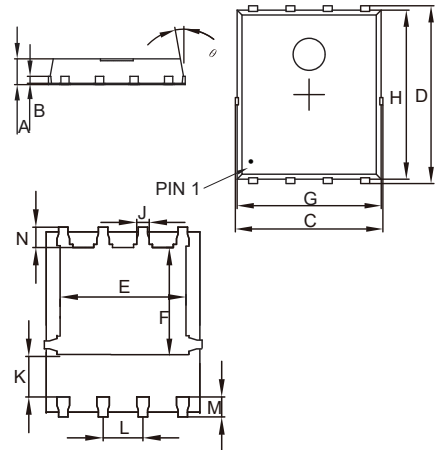
### Internal Structure and Marking Code



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

# P-CHANNEL MOSFET

## DFN5060



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.031	0.047	0.80	1.20	
B	0.010		0.254		TYP.
C	0.193	0.222	4.90	5.64	
D	0.232	0.250	5.90	6.35	
E	0.148	0.167	3.75	4.25	
F	0.126	0.154	3.20	3.92	
G	0.189	0.213	4.80	5.40	
H	0.222	0.239	5.65	6.06	
K	0.045	0.059	1.15	1.50	
J	0.012	0.020	0.30	0.50	
L	0.046	0.054	1.17	1.37	
M	0.012	0.028	0.30	0.71	
N	0.016	0.028	0.40	0.71	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-60			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 10$	$\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$			-1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.5	-2.0	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-23A$		20	27	m $\Omega$
		$V_{GS}=-4.5V, I_D=-10A$		30	41	
Gate Resistance	$R_g$	f=1MHz, Open Drain		5.5		$\Omega$
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$				-46	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=-23A$			-1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F=-23A, dI_{SD}/dt=100A/\mu s$		45		ns
Reverse Recovery Charge	$Q_{rr}$			50		nC
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-30V, V_{GS}=0V, f=1MHz$		3090		pF
Output Capacitance	$C_{oss}$			182		
Reverse Transfer Capacitance	$C_{rss}$			160		
Total Gate Charge	$Q_g$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-23A$		67		nC
Gate-Source Charge	$Q_{gs}$			11.9		
Gate-Drain Charge	$Q_{gd}$			13.3		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=-30V, V_{GS}=-10V, R_G=3\Omega, I_{DS}=-23A$		12		ns
Turn-On Rise Time	$t_r$			46		
Turn-Off Delay Time	$t_{d(off)}$			78		
Turn-Off Fall Time	$t_f$			51		

**Curve Characteristics**

Fig. 1 - Typical Output Characteristics

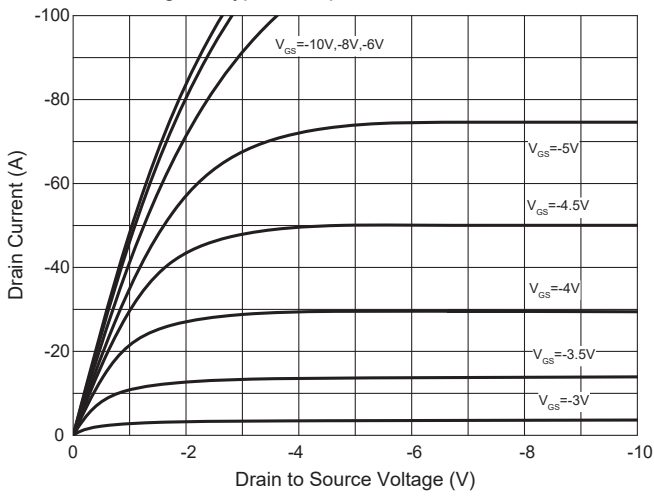


Fig. 2 - Transfer Characteristics

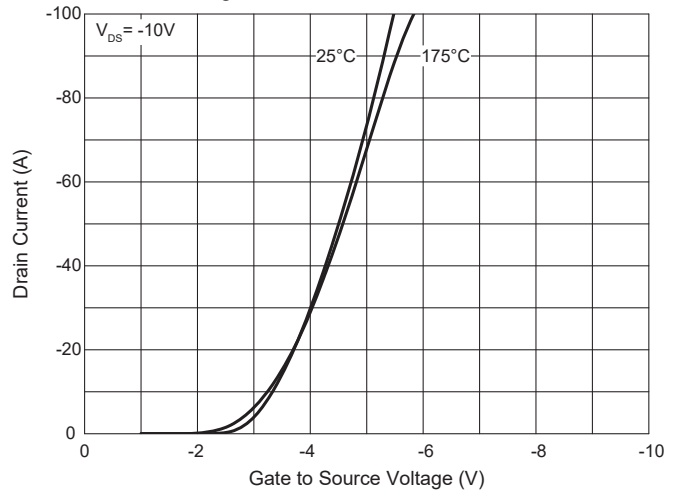


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

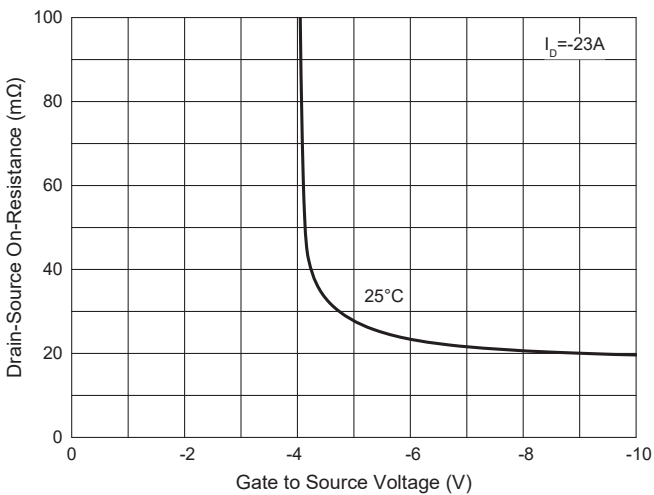


Fig. 4 -  $R_{DS(ON)} - I_D$

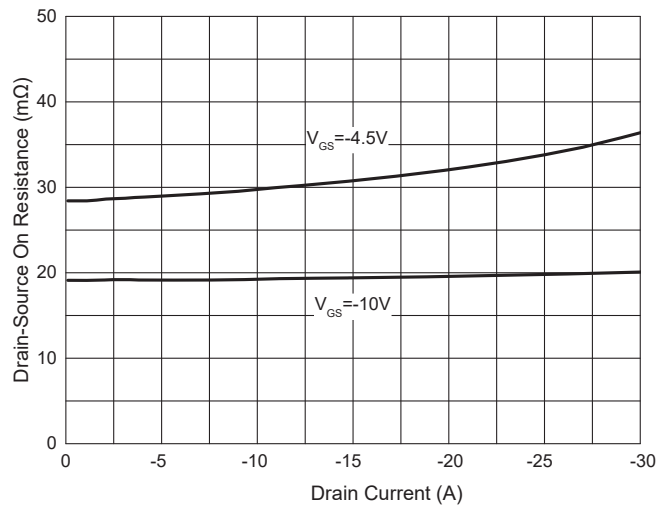


Fig. 5 - Capacitance Characteristics

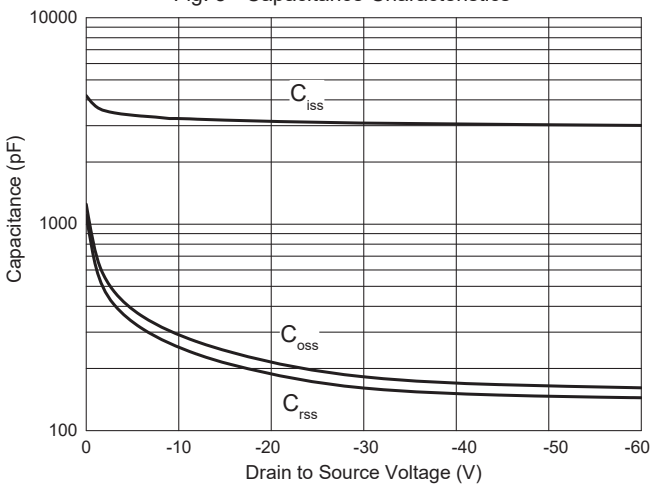
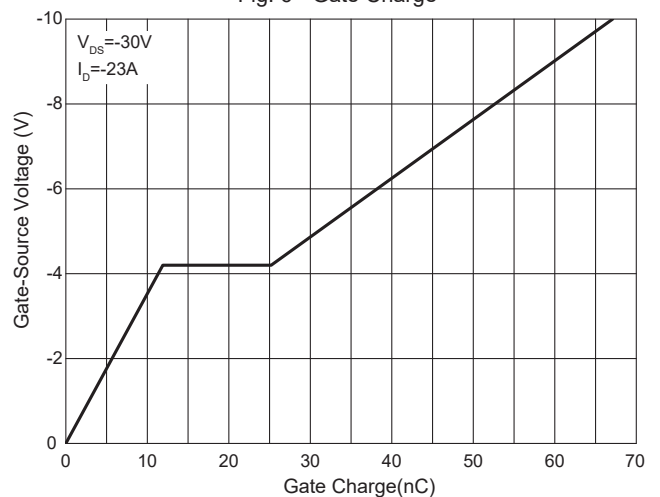


Fig. 6 - Gate Charge



Curve Characteristics

Fig. 7 - Normalized Threshold Voltage

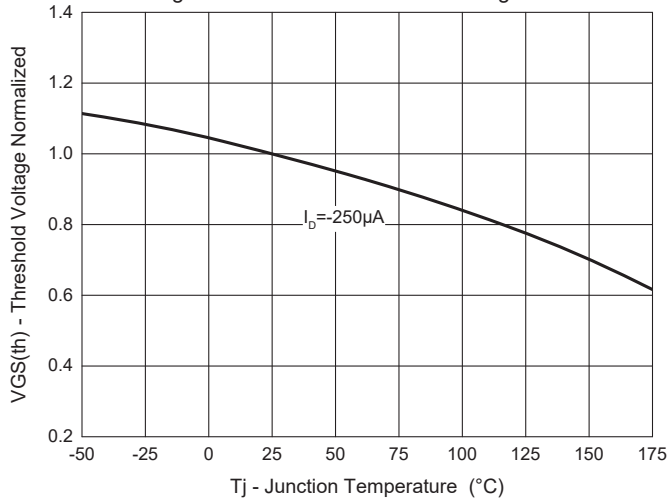


Fig. 8 - Normalized On Resistance Characteristics

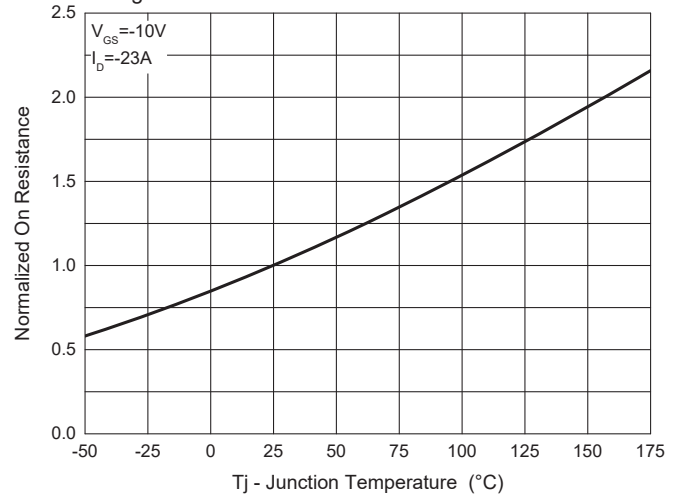


Fig. 9 -  $I_S - V_{SD}$

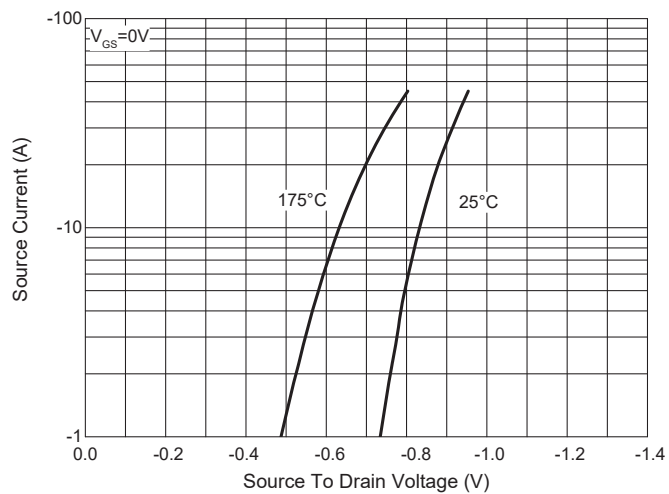


Fig. 10 - Drain Current

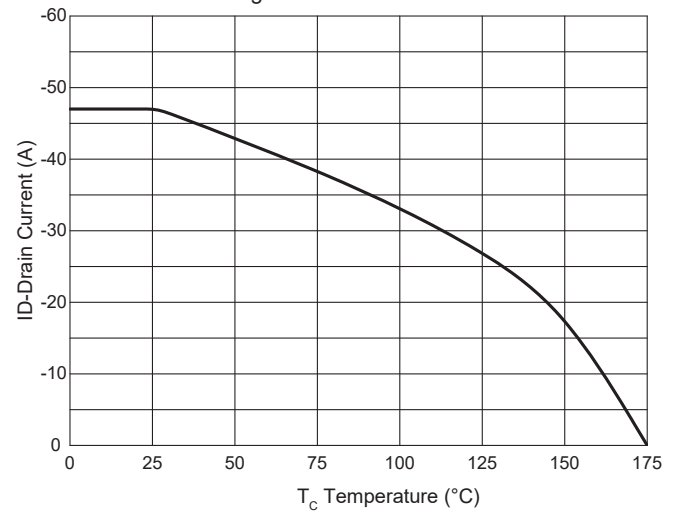
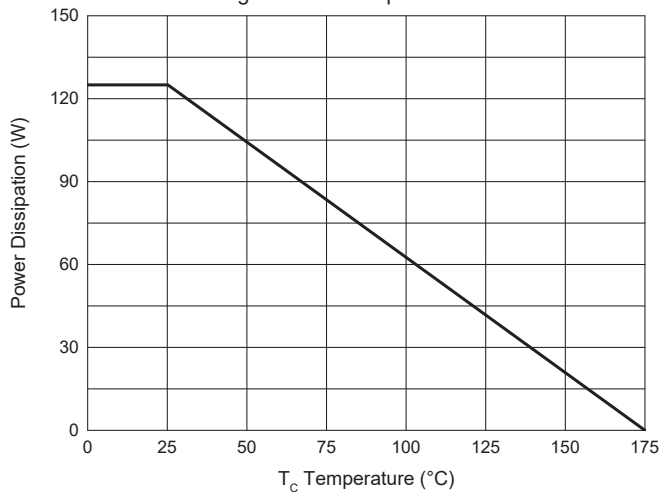


Fig. 11 - PD Dissipation



Curve Characteristics

Fig. 12 - Safe Operation Area

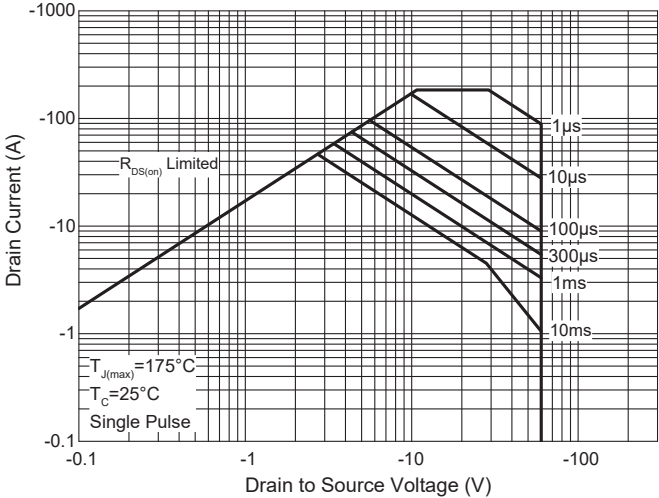
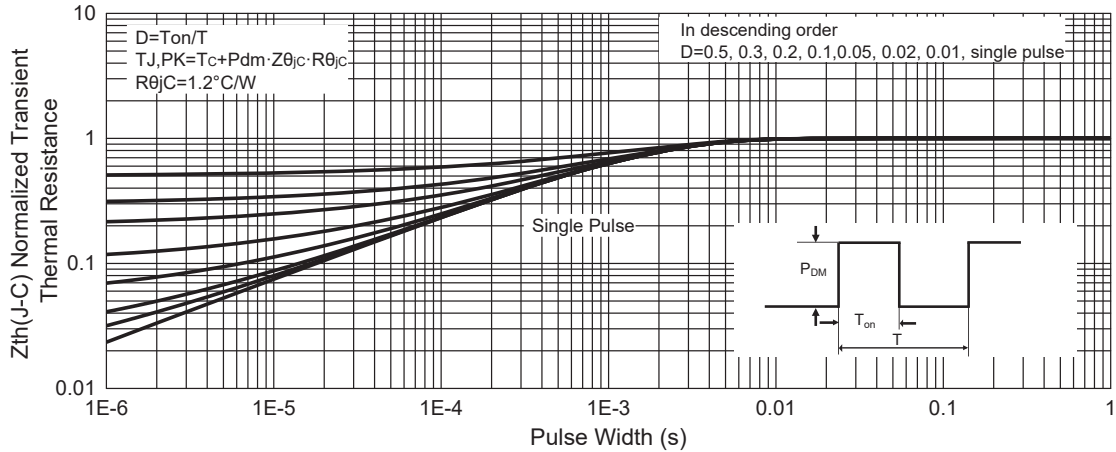


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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