

## P-Channel Enhancement Mode Power MOSFET

### Description

The PT F1 U60 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications. It is ESD protested.

### General Features

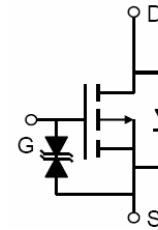
- $V_{DS} = -100V, I_D = -F1 A$   
 $R_{DS(ON)} < 58m\Omega @ V_{GS} = -10V$  (Typ: 44m $\Omega$ )  
 $R_{DS(ON)} < 65m\Omega @ V_{GS} = -4.5V$  (Typ: 48m $\Omega$ )
- Super high dense cell design
- Advanced trench process technology
- Reliable and rugged
- High density cell design for ultra low On-Resistance

### Application

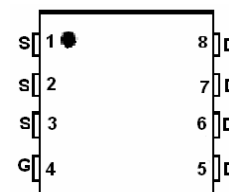
- Portable equipment and battery powered systems

**100% UIS TESTED!**

**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



Marking and pin assignment

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
PT F1 U60	PT F1 U60	TO-18			-

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-F1	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D (100^\circ C)$	-F6	A
Pulsed Drain Current	$I_{DM}$	Á1 Í	A
Maximum Power Dissipation	$P_D$	120	W
Derating factor		0.8	W/ $^\circ C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	1.25	$^\circ C/W$
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### Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

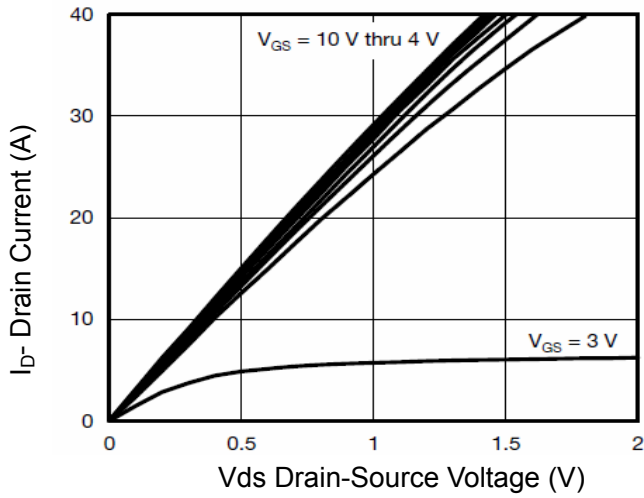
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-100	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-100V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±10	μA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.5	-1.9	-2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A	-	44	58	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A	-	48	65	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-50V, I <sub>D</sub> =-10A	5	-	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-50V, V <sub>GS</sub> =0V, F=1.0MHz	-	3810	-	PF
Output Capacitance	C <sub>oss</sub>		-	93	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	91	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-50V, I <sub>D</sub> =-15A V <sub>GS</sub> =-10V, R <sub>GEN</sub> =9.1Ω	-	17	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	80	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	45	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	65	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-50V, I <sub>D</sub> =-15A, V <sub>GS</sub> =-10V	-	136	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	22	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	26	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-10A	-	-	-1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>	-	-	-	-F <sub>I</sub>	A
Reverse Recovery Time	t <sub>rr</sub>	TJ = 25°C, IF = -15A	-	90	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs <sup>(Note3)</sup>	-	70	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

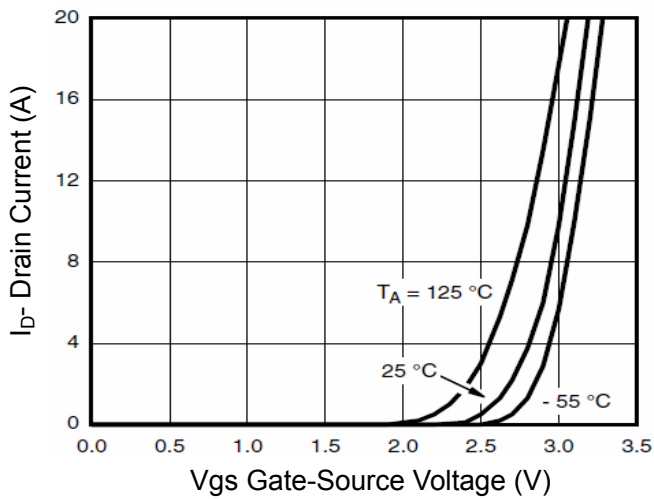
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production



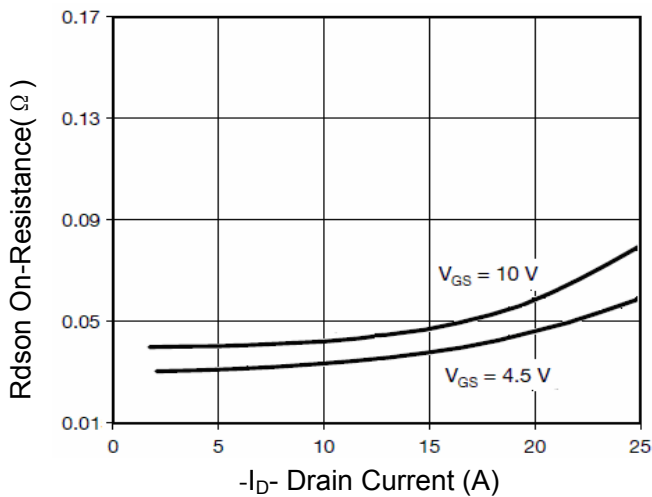
## Typical Electrical and Thermal Characteristics (Curves)



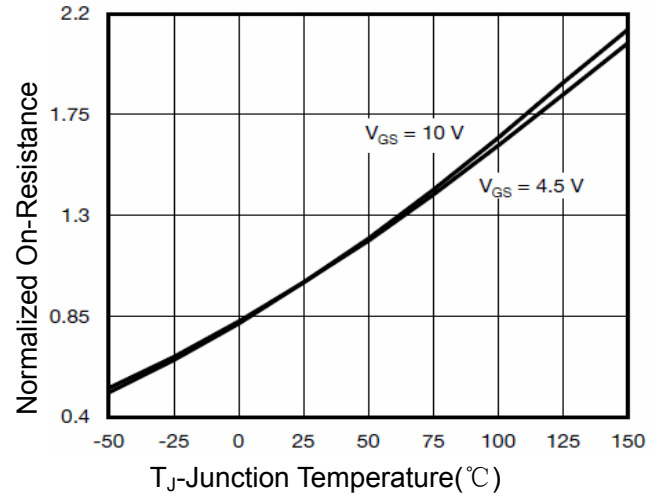
**Figure 1 Output Characteristics**



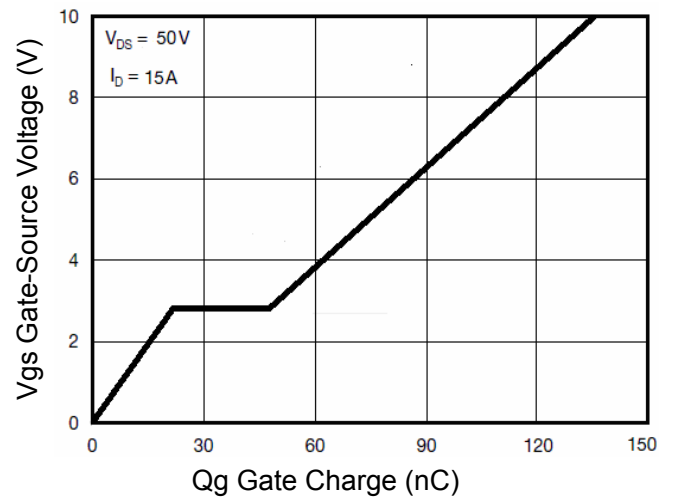
**Figure 2 Transfer Characteristics**



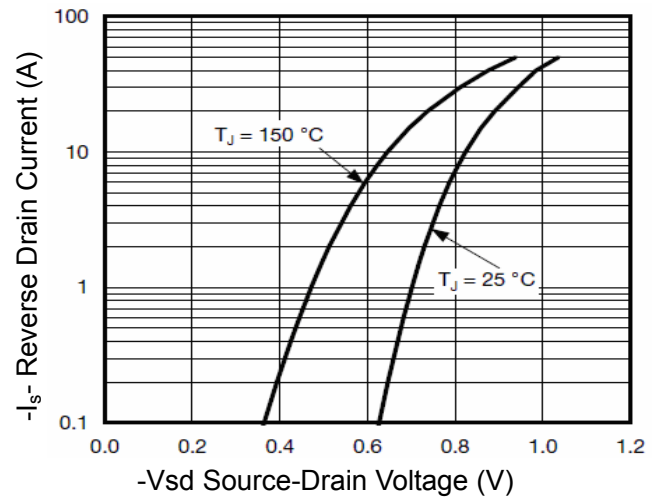
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

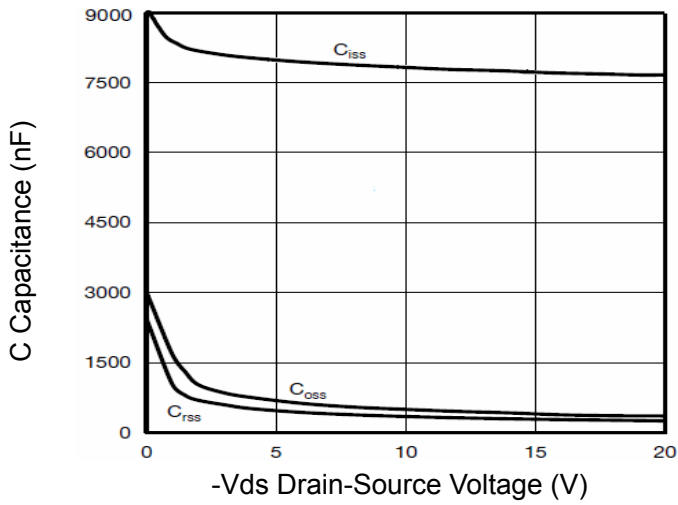


Figure 7 Capacitance vs Vds

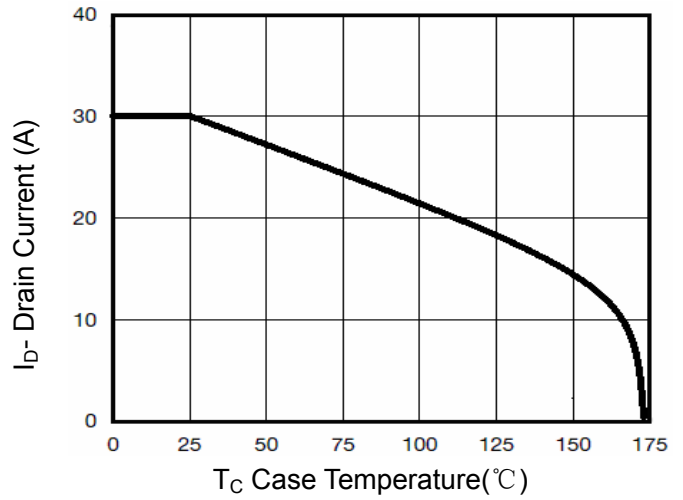


Figure 9 Drain Current vs Case Temperature

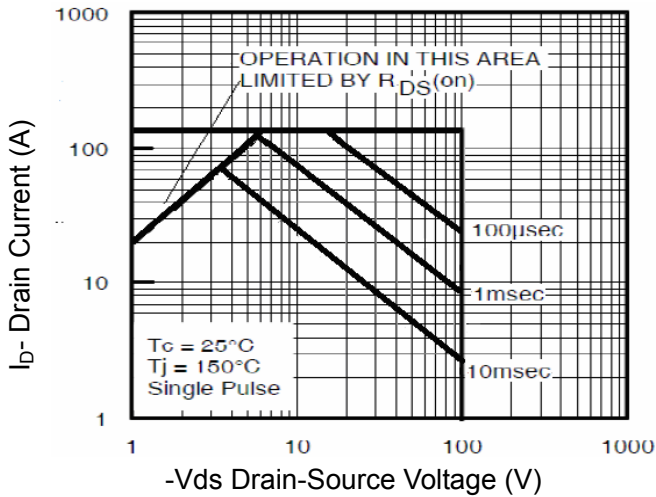


Figure 8 Safe Operation Area

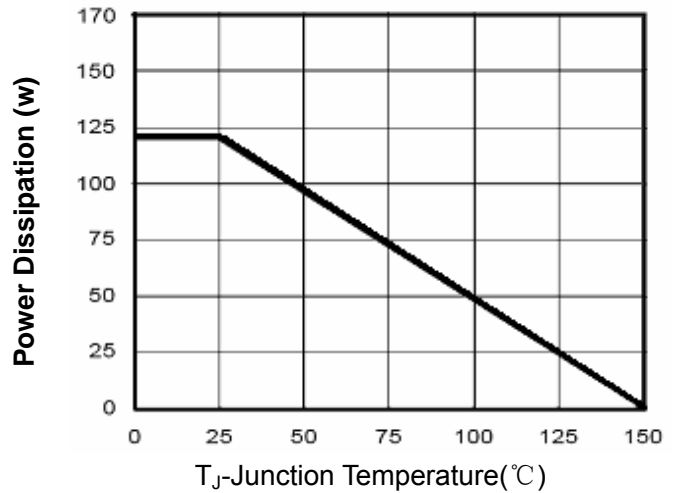


Figure 10 Power De-rating

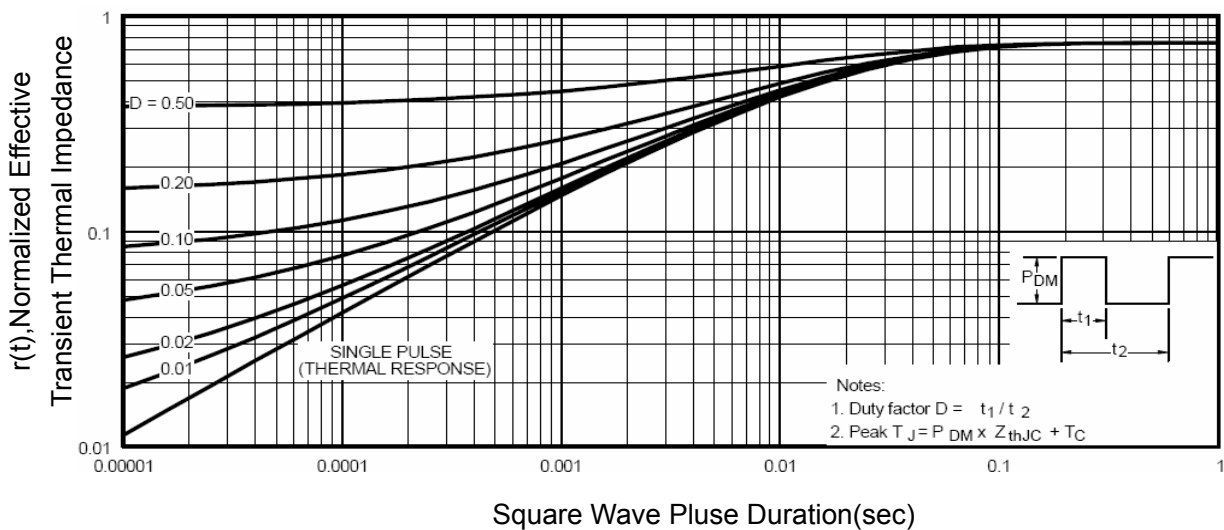
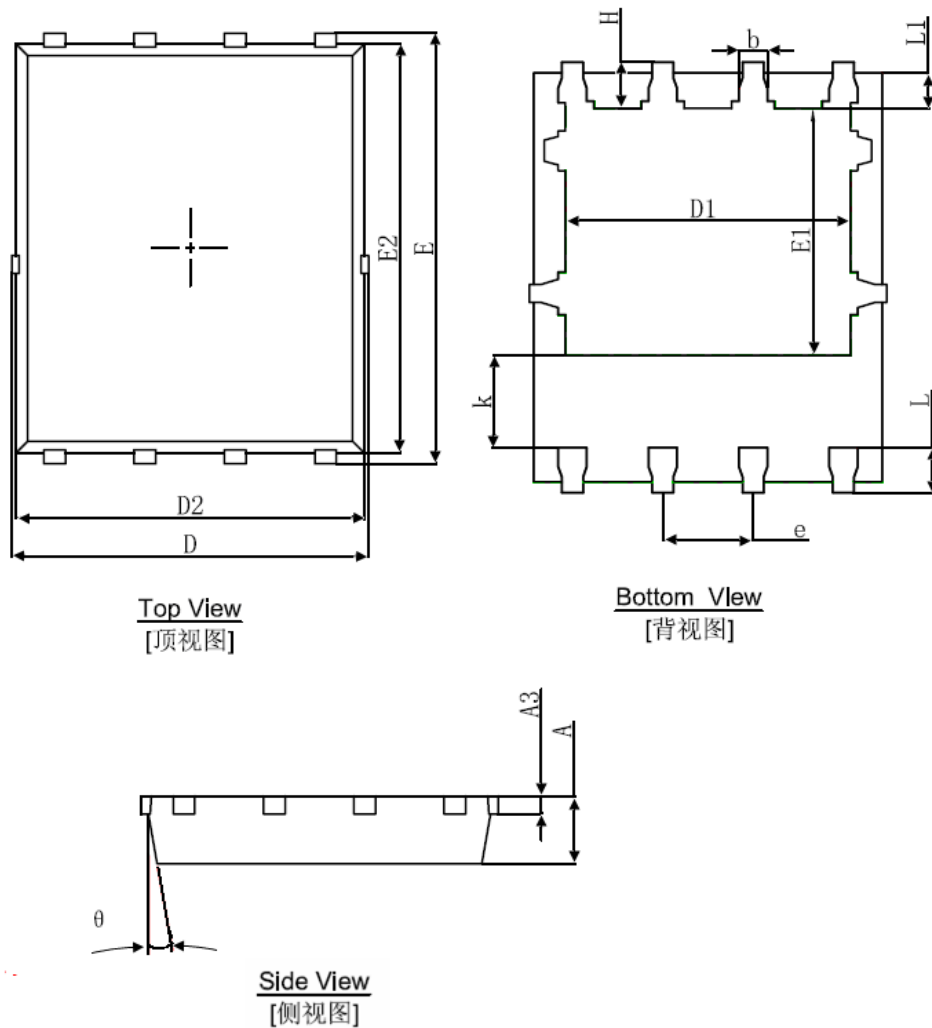


Figure 11 Normalized Maximum Transient Thermal Impedance

## DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
$\theta$	8°	12°	8°	12°

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