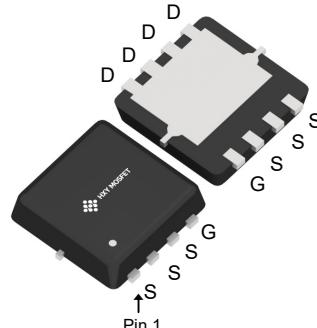




## Description

The TSM060N03PQ33 use advanced SGT MOSFET technology to provide low RDS(ON), low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness.



DFN3X3-8L

## General Features

$V_{DS} = 30V$   $I_D = 40A$

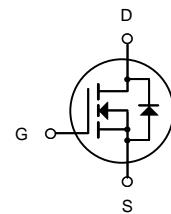
$R_{DS(ON)} < 6.3m\Omega$  @  $V_{GS} = 10V$

## Applications

Consumer electronic power supply Motor control

Synchronous-rectification Isolated DC

Synchronous-rectification applications



N-Channel MOSFET

## Ordering Information

Product ID	Pack	Brand	Qty(PCS)
TSM060N03PQ33	DFN3X3-8L	HXY MOSFET	5000

## Absolute Maximum Ratings ( $T_c = 25^\circ C$ unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_c = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	40	A
$I_D @ T_c = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	28	A
$I_{DM}$	Pulsed Drain Current	135	A
EAS	Single Pulse Avalanche Energy	29.8	mJ
$I_{AS}$	Avalanche Current	27	A
$P_D @ T_c = 25^\circ C$	Total Power Dissipation	30	W
$T_{STG}$	Storage Temperature Range	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance Junction-ambient	50	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case	4.6	°C/W



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$\text{V}_{\text{GS}}=0\text{V}$ , $\text{I}_D=250\text{uA}$	30	---	---	$\text{V}$
$\text{R}_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance <sup>2</sup>	$\text{V}_{\text{GS}}=10\text{V}$ , $\text{I}_D=20\text{A}$	---	5	6.3	$\text{m}\Omega$
		$\text{V}_{\text{GS}}=4.5\text{V}$ , $\text{I}_D=15\text{A}$	---	6.9	9	
$\text{V}_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$\text{V}_{\text{GS}}=\text{V}_{\text{DS}}$ , $\text{I}_D=250\text{uA}$	1.2	---	2.5	$\text{V}$
$\text{I}_{\text{bss}}$	Drain-Source Leakage Current	$\text{V}_{\text{DS}}=24\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $\text{T}_J=25^\circ\text{C}$	---	---	1	$\text{uA}$
		$\text{V}_{\text{DS}}=24\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $\text{T}_J=55^\circ\text{C}$	---	---	5	
$\text{I}_{\text{GSS}}$	Gate-Source Leakage Current	$\text{V}_{\text{GS}}=\pm 20\text{V}$ , $\text{V}_{\text{DS}}=0\text{V}$	---	---	$\pm 100$	$\text{nA}$
$\text{g}_{\text{fs}}$	Forward Transconductance	$\text{V}_{\text{DS}}=5\text{V}$ , $\text{I}_D=20\text{A}$	---	67	---	$\text{S}$
$\text{R}_g$	Gate Resistance	$\text{V}_{\text{DS}}=0\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $f=1\text{MHz}$	---	1.7	---	$\Omega$
$\text{Q}_g$	Total Gate Charge (4.5V)	$\text{V}_{\text{DS}}=15\text{V}$ , $\text{V}_{\text{GS}}=4.5\text{V}$ , $\text{I}_D=15\text{A}$	---	8	---	$\text{nC}$
$\text{Q}_{\text{gs}}$	Gate-Source Charge		---	2.4	---	
$\text{Q}_{\text{gd}}$	Gate-Drain Charge		---	3.2	---	
$\text{T}_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{DD}}=15\text{V}$ , $\text{V}_{\text{GS}}=10\text{V}$ , $\text{R}_g=3.3\Omega$ $\text{I}_D=15\text{A}$	---	7.1	---	$\text{ns}$
$\text{T}_r$	Rise Time		---	40	---	
$\text{T}_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	15	---	
$\text{T}_f$	Fall Time		---	6	---	
$\text{C}_{\text{iss}}$	Input Capacitance	$\text{V}_{\text{DS}}=15\text{V}$ , $\text{V}_{\text{GS}}=0\text{V}$ , $f=1\text{MHz}$	---	814	---	$\text{pF}$
$\text{C}_{\text{oss}}$	Output Capacitance		---	498	---	
$\text{C}_{\text{rss}}$	Reverse Transfer Capacitance		---	41	---	
$\text{I}_{\text{s}}$	Continuous Source Current <sup>1,6</sup>	$\text{V}_G=\text{V}_D=0\text{V}$ , Force Current	---	---	40	$\text{A}$
$\text{V}_{\text{SD}}$	Diode Forward Voltage <sup>2</sup>	$\text{V}_{\text{GS}}=0\text{V}$ , $\text{I}_s=1\text{A}$ , $\text{T}_J=25^\circ\text{C}$	---	---	1	$\text{V}$
$\text{t}_{\text{rr}}$	Reverse Recovery Time	$\text{I}_F=20\text{A}$ , $\text{dI}/\text{dt}=100\text{A}/\mu\text{s}$ , $\text{T}_J=25^\circ\text{C}$	---	15	---	$\text{nS}$
$\text{Q}_{\text{rr}}$	Reverse Recovery Charge		---	25	---	$\text{nC}$

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\text{us}$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $\text{V}_{\text{DD}}=25\text{V}$ , $\text{V}_{\text{GS}}=10\text{V}$ , $\text{L}=0.1\text{mH}$ , $\text{I}_{\text{AS}}=24\text{A}$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 5.The data is theoretically the same as  $\text{I}_D$  and  $\text{I}_{\text{DM}}$  , in real applications , should be limited by total power dissipation.



## Typical Characteristics

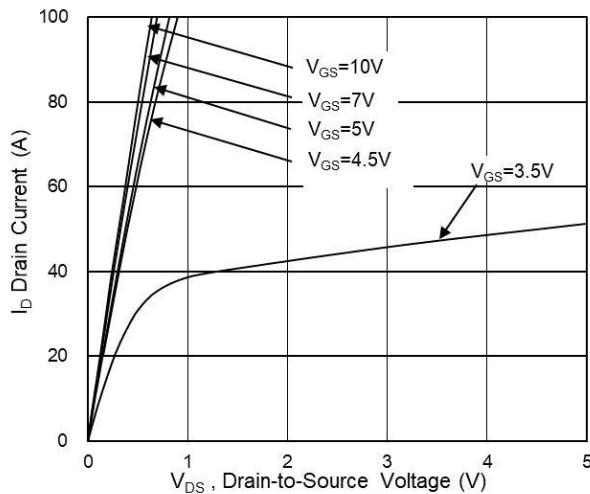


Fig.1 Typical Output Characteristics

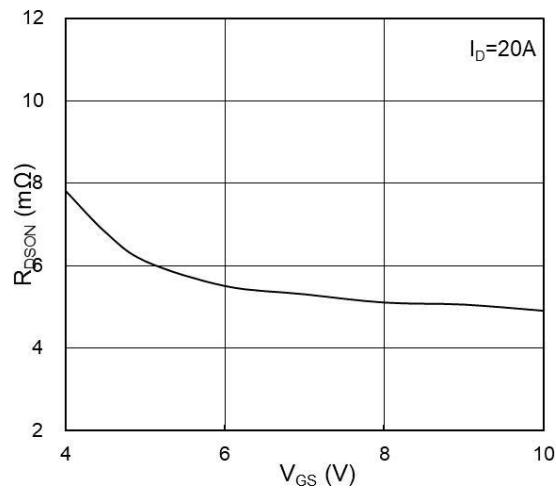


Fig.2 On-Resistance vs G-S Voltage

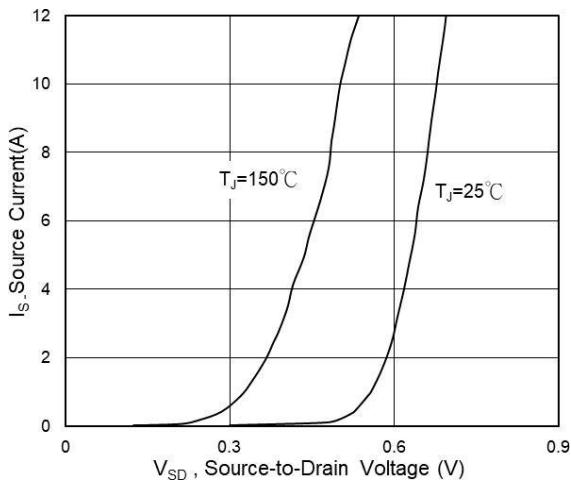


Fig.3 Source Drain Forward Characteristics

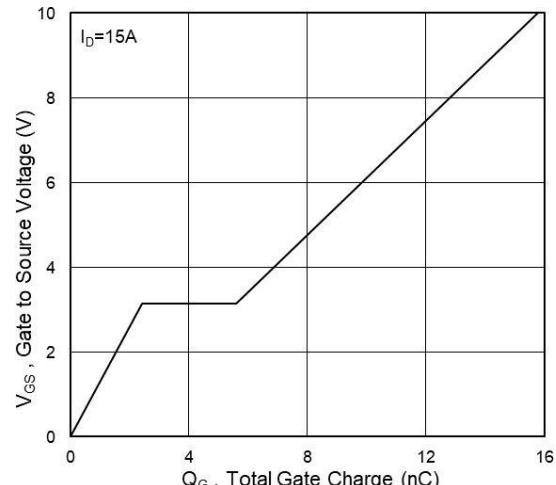


Fig.4 Gate-Charge Characteristics

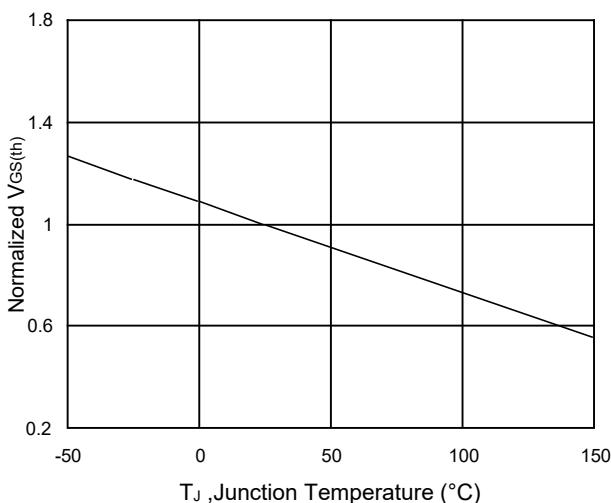


Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$

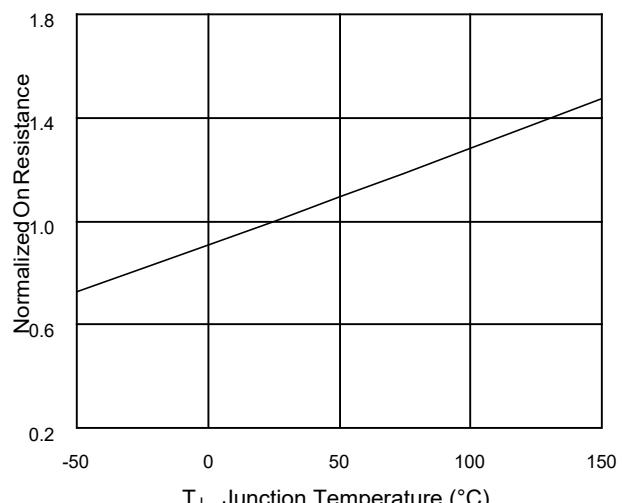


Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$

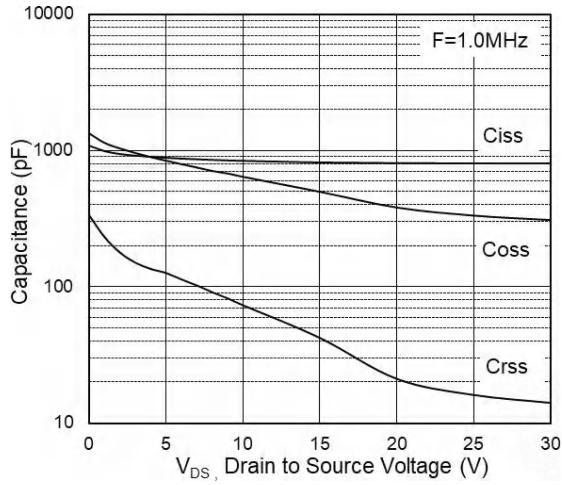


Fig.7 Capacitance

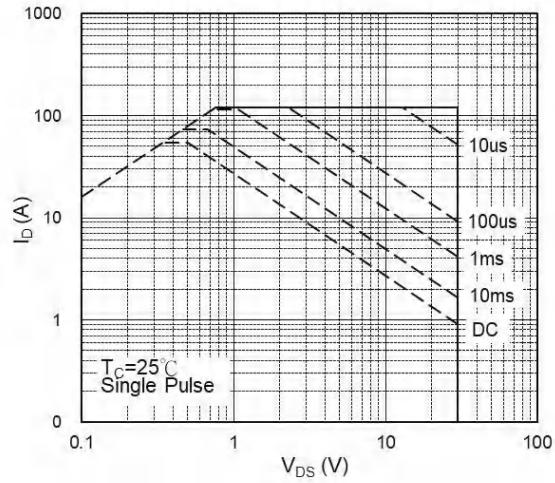


Fig.8 Safe Operating Area

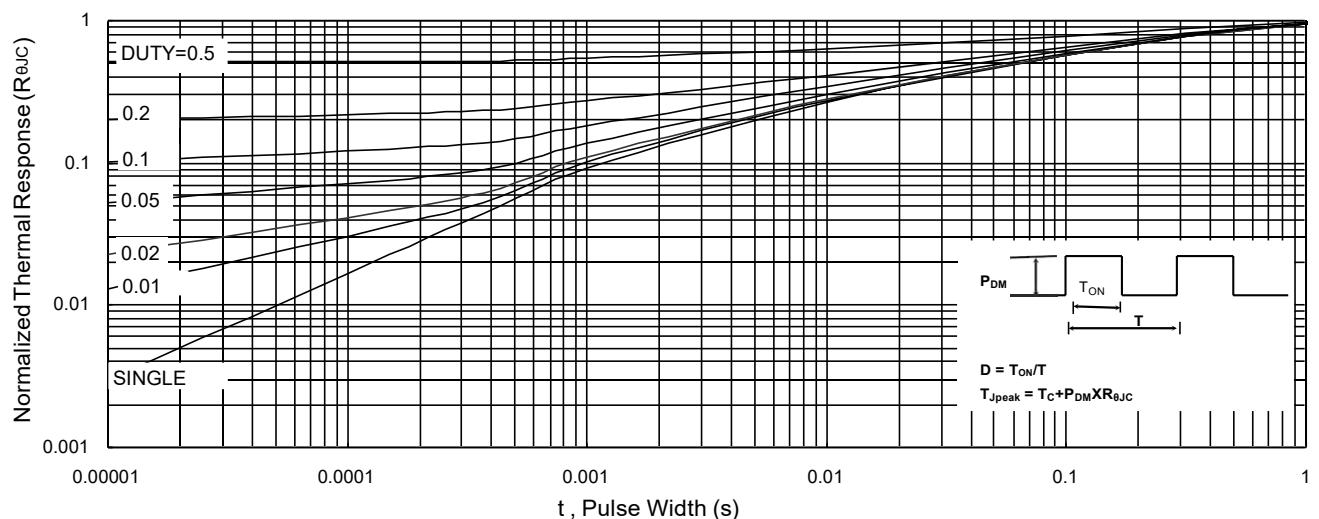


Fig.9 Normalized Maximum Transient Thermal Impedance

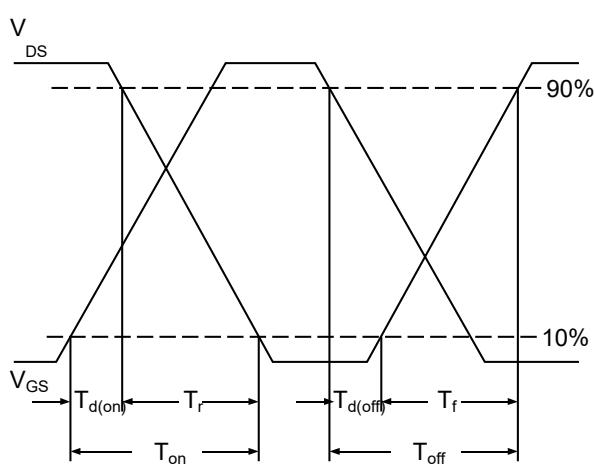


Fig.10 Switching Time Waveform

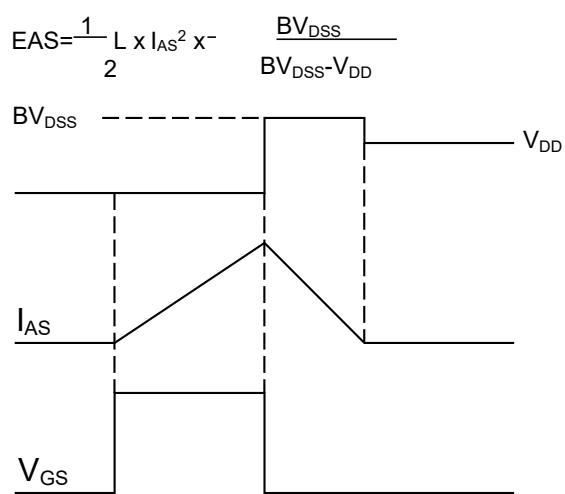
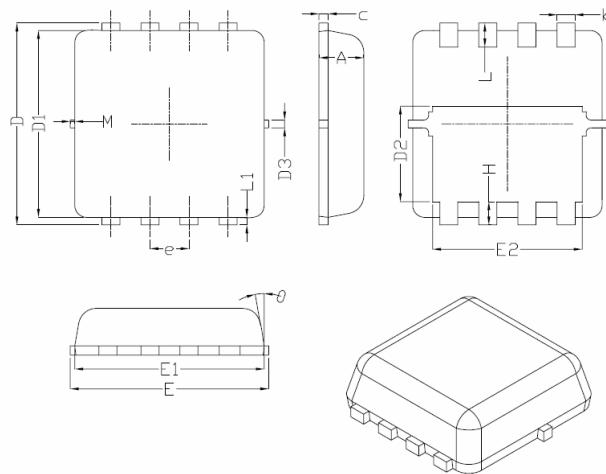


Fig.11 Unclamped Inductive Switching Waveform



### DFN3X3-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
$\theta$		10°	12°



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