

## Features

- Split Gate Trench MOSFET Technology
- High Density Cell Design For Ultra 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 ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

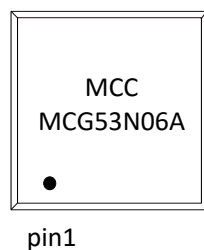
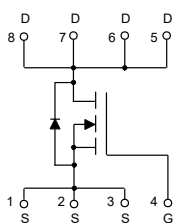
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 60°C/W Junction to Ambient<sup>(Note2)</sup>
- Thermal Resistance: 2.8°C/W Junction to Case

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	±20	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	53
		$T_C=100^\circ\text{C}$	33.5
Pulsed Drain Current <sup>(Note3)</sup>	$I_{DM}$	212	A
Total Power Dissipation <sup>(Note4)</sup>	$P_D$	45	W
Single Pulse Avalanche Energy <sup>(Note 5)</sup>	$E_{AS}$	162	mJ

Note:

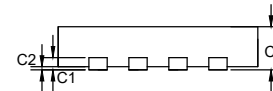
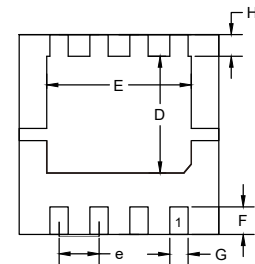
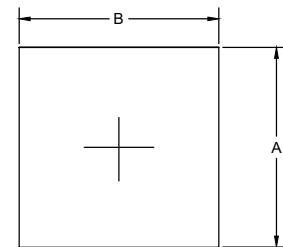
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment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

## Internal Structure and Marking Code



# N-CHANNEL MOSFET

## DFN3333



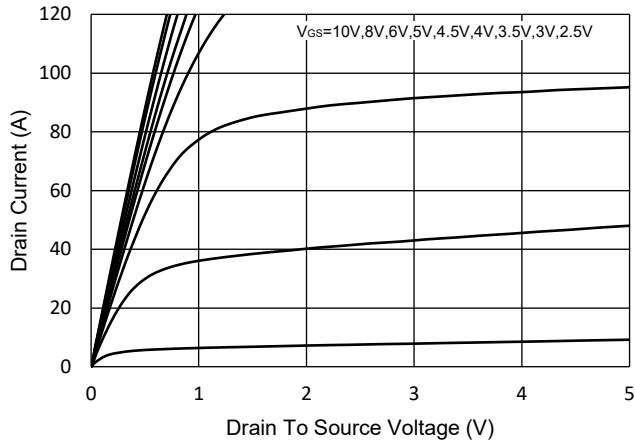
DIM	DIMENSIONS				NOTE
	INCHES		MM		
	MIN	MAX	MIN	MAX	
A	0.126	0.130	3.20	3.30	
B	0.126	0.130	3.20	3.30	
C	0.030	0.033	0.75	0.85	
C1	0.007	0.009	0.18	0.22	
C2	---	0.002	---	0.05	
D	0.071	0.079	1.80	2.00	
E	0.087	0.098	2.20	2.50	
F	0.016	0.020	0.40	0.50	
G	0.010	0.014	0.25	0.35	
H	0.012	0.016	0.30	0.40	
e	0.024	0.028	0.60	0.70	

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

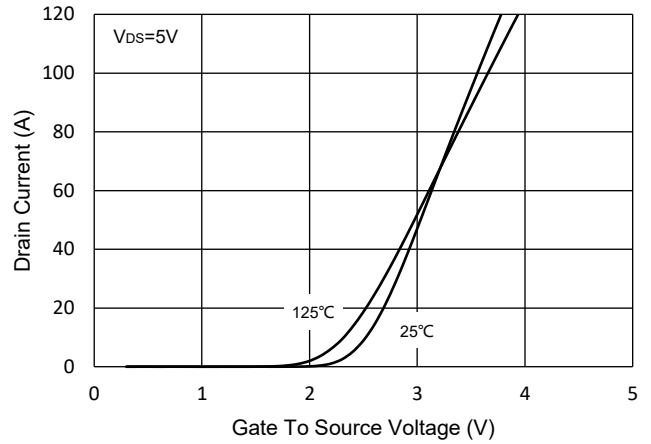
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.7	2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$		5.8	8.2	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$		7.3	12	
Gate Resistance	$R_g$	$V_{DS}=0V, V_{GS}=0V, f=1MHz$		1.5		$\Omega$
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$				53	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=20A$			1.3	V
Reverse Recovery Time	$t_{rr}$	$I_F=20A, di_F/dt=200A/\mu s$		31		ns
Reverse Recovery Charge	$Q_{rr}$			48		nC
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz$		1850		pF
Output Capacitance	$C_{oss}$			424		
Reverse Transfer Capacitance	$C_{riss}$			22		
Total Gate Charge	$Q_g$	$V_{DS}=30V, V_{GS}=10V, I_D=20A$		32		nC
Gate-Source Charge	$Q_{gs}$			4.5		
Gate-Drain Charge	$Q_{gd}$			5.6		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=30V, V_{GS}=10V, R_G=3\Omega, I_{DS}=12A$		8.5		ns
Turn-On Rise Time	$t_r$			5.5		
Turn-Off Delay Time	$t_{d(off)}$			29		
Turn-Off Fall Time	$t_f$			8.5		

## Curve Characteristics

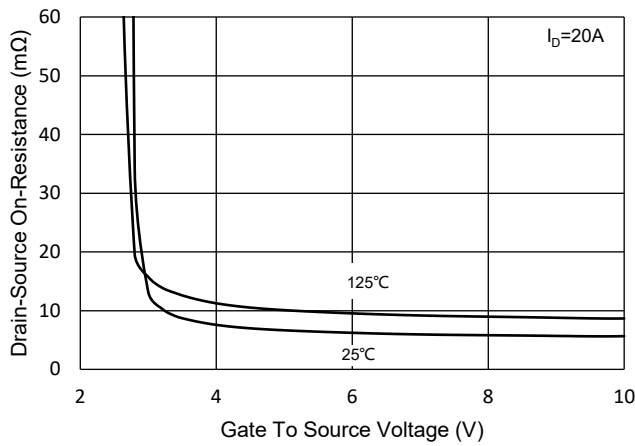
**Fig.1 - Typical Output Characteristics**



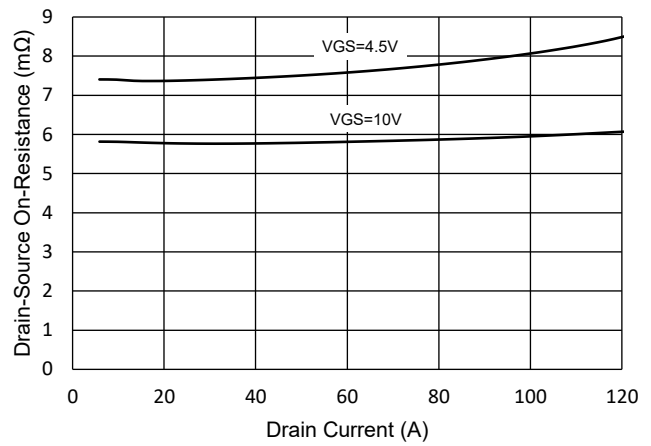
**Fig.2 - Transfer Characteristic**



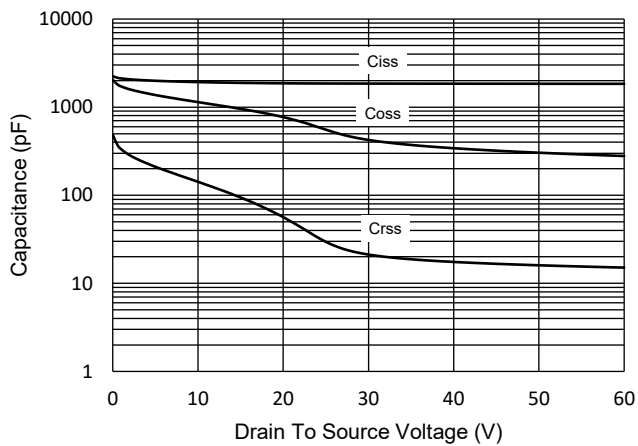
**Fig.3 -  $R_{DS(ON)} - V_{GS}$**



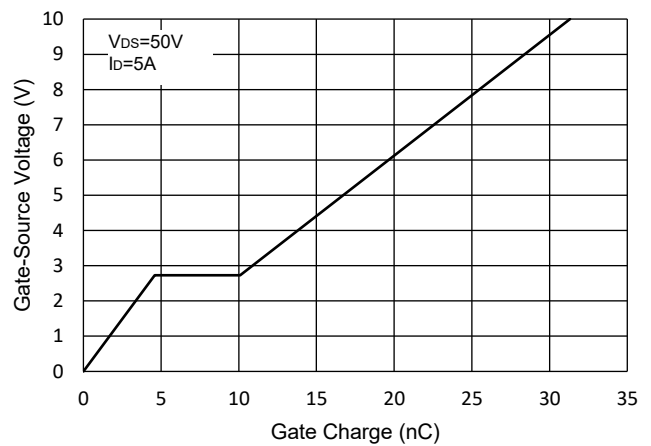
**Fig.4 -  $R_{DS(ON)} - I_D$**



**Fig.5 - Capacitance Characteristics**

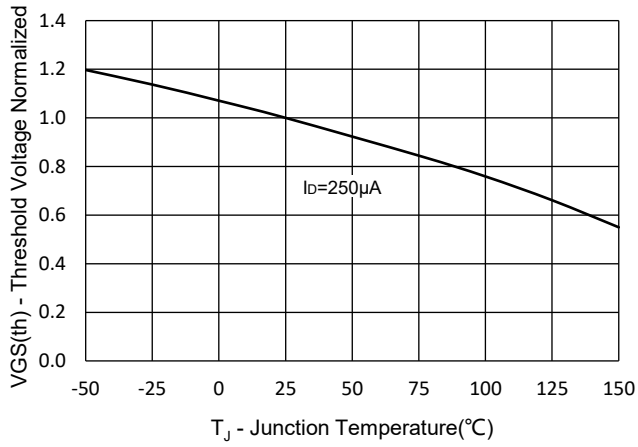


**Fig.6 - Gate Charge**

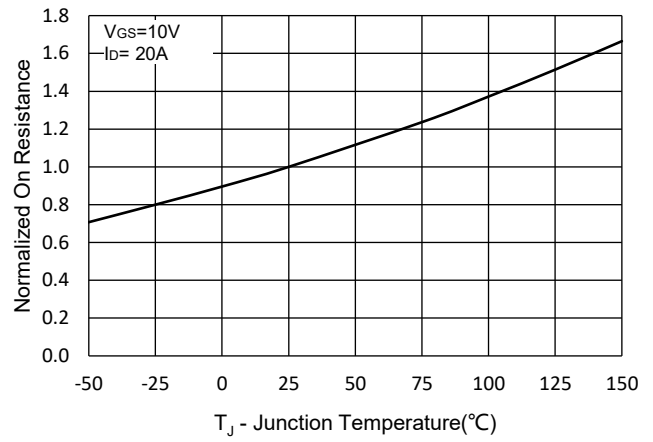


## Curve Characteristics

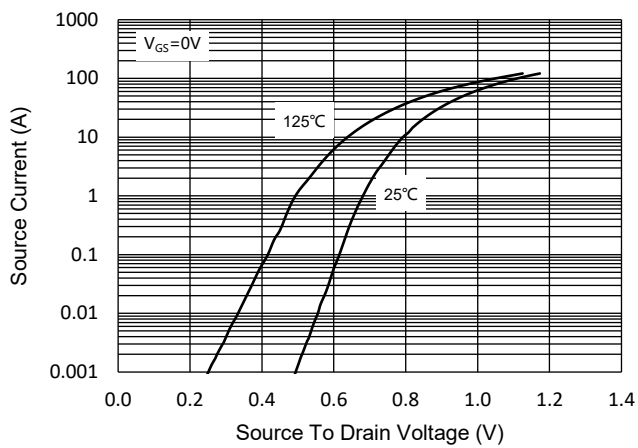
**Fig.7 - Normalized Threshold Voltage**



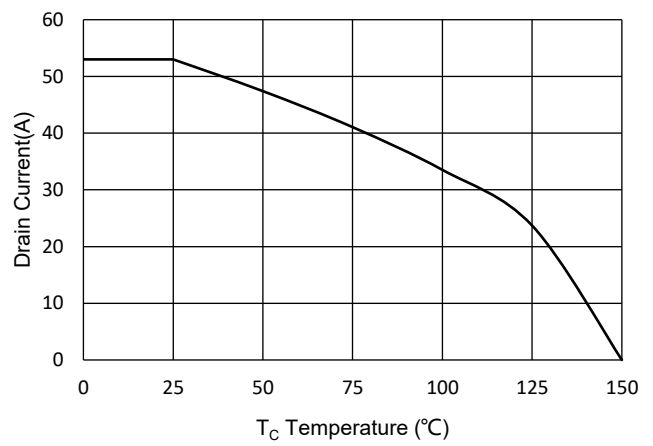
**Fig.8 - Normalized On Resistance Characteristics**



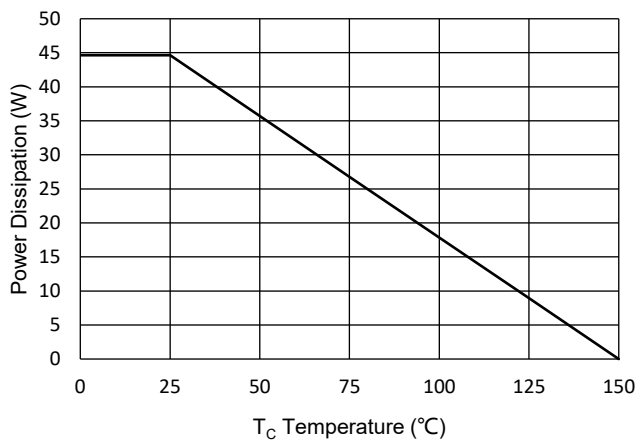
**Fig.9 -  $I_S - V_{SD}$**



**Fig.10 - Drain Current**



**Fig.11 - PD Dissipation**



Curve Characteristics

Fig.12 - Safe Operation Area

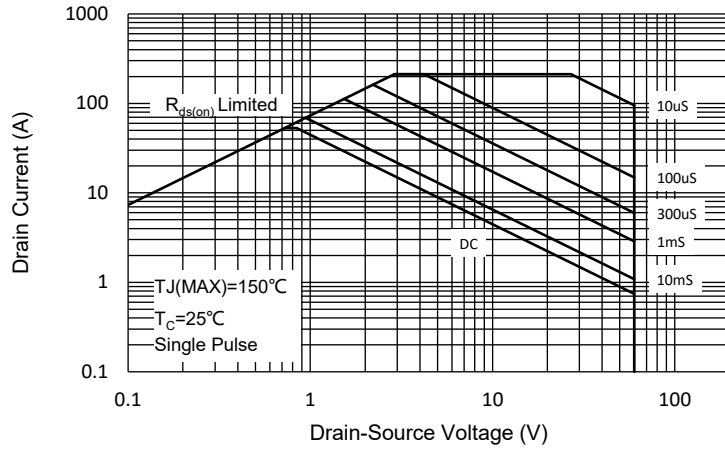
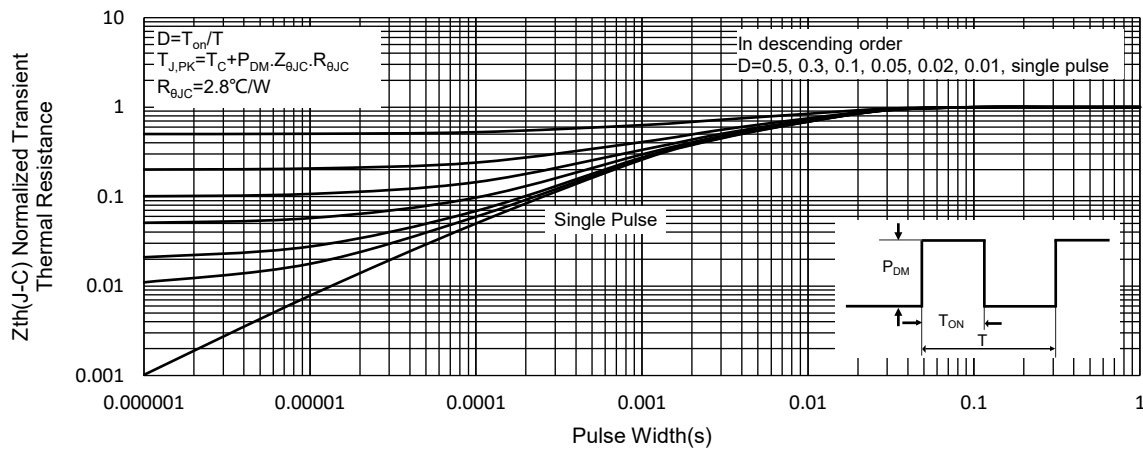


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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