# CEP20N06/CEB20N06

N-Channel Enhancement Mode Field Effect Transistor

FEATURES

■ 60V, 28A, $R_{DS(ON)}$ = 40mΩ @V_{GS} = 10V.

   $R_{DS(ON)}$ = 50mΩ @V_{GS} = 4.5V.

■ Super high dense cell design for extremely low $R_{DS(ON)}$.

■ High power and current handing capability.

■ Lead free product is acquired.

■ TO-220 & TO-263 package.

CEB SERIES
TO-263(DD-PAK)
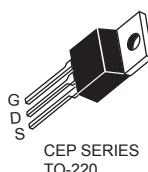
CEP SERIES
TO-220
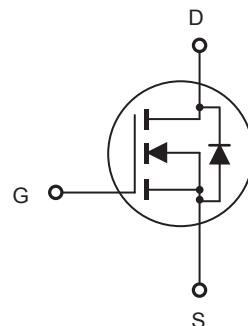
ABSOLUTE MAXIMUM RATINGS T_C = 25°C unless otherwise noted

Parameter	Symbol	Limit	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous @ T_C = 25℃	I_D	28	A
@ T_C = 100°C		20	A
Drain Current-Pulsed [a]	I_{DM}	112	A
Maximum Power Dissipation @ T_C = 25°C	P_D	50	W
- Derate above 25°C		0.4	W/℃
Operating and Store Temperature Range	T_J,T_{stg}	-55 to 175	$^{\circ}$C

Thermal Characteristics

Parameter	Symbol	Limit	Units
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3	℃/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	50	℃/W

Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V$, $I_D = 250\mu A$	60			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60V$, $V_{GS} = 0V$			1	μA
Gate Body Leakage Current, Forward	I_{GSSF}	$V_{GS} = 20V$, $V_{DS} = 0V$			100	nA
Gate Body Leakage Current, Reverse	I_{GSSR}	$V_{GS} = -20V$, $V_{DS} = 0V$			-100	nA
On Characteristics [b]						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	1		3	V
Static Drain-Source	$R_{DS(on)}$	$V_{GS} = 10V$, $I_D = 14A$		30	40	mΩ
On-Resistance		$V_{GS} = 4.5V$, $I_D = 10A$		35	50	mΩ
Dynamic Characteristics [c]						
Input Capacitance	C_{iss}	$V_{DS} = 30V$, $V_{GS} = 0V$, f = 1.0 MHz		750		pF
Output Capacitance	C_{oss}			110		pF
Reverse Transfer Capacitance	C_{rss}			70		pF
Switching Characteristics [c]						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30V$, $I_D = 4.4A$, $V_{GS} = 10V$, $R_{GEN} = 1\Omega$		16	32	ns
Turn-On Rise Time	t_r			5	10	ns
Turn-Off Delay Time	$t_{d(off)}$			38	76	ns
Turn-Off Fall Time	t_f			6	12	ns
Total Gate Charge	Q_g	$V_{DS} = 30V$, $I_D = 5.3A$, $V_{GS} = 10V$		22.2	29	nC
Gate-Source Charge	Q_{gs}			32		nC
Gate-Drain Charge	Q_{gd}			4.7		nC
Drain-Source Diode Characteristics and Maximun Ratings						
Drain-Source Diode Forward Current	I_S				28	A
Drain-Source Diode Forward Voltage [b]	V_{SD}	$V_{GS} = 0V$, $I_S = 28A$			1.5	V

Notes :
a.Repetitive Rating : Pulse width limited by maximum junction temperature
b.Pulse Test : Pulse Width < 300μs, Duty Cycle < 2%.
c.Guaranteed by design, not subject to production testing.
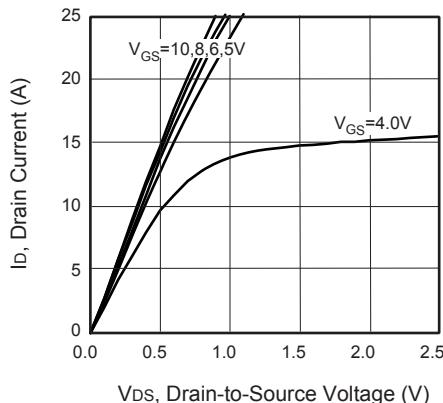
Figure 1. Output Characteristics
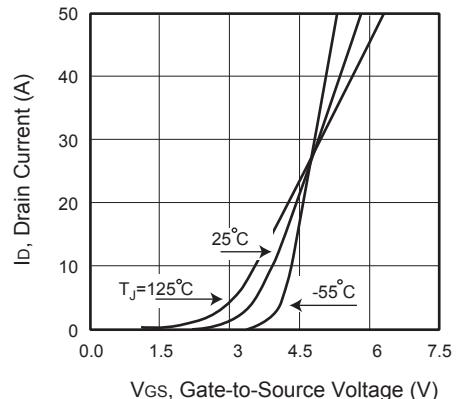

**Figure 2. Transfer Characteristics**
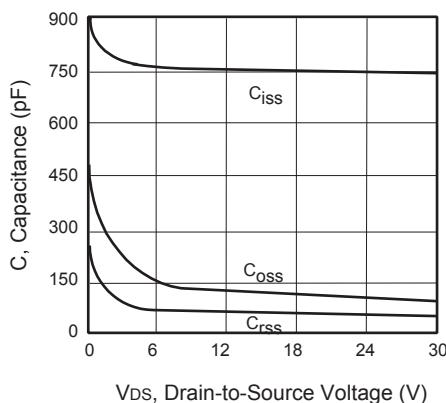


Figure 3. Capacitance
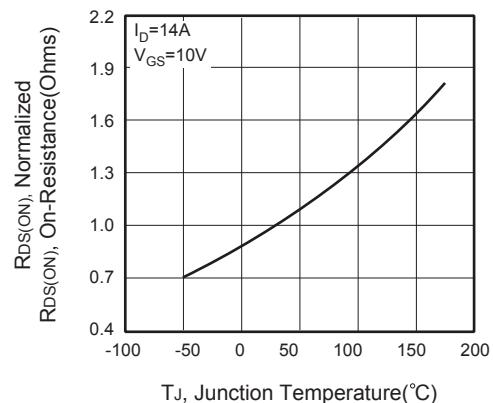
**Figure 4. On-Resistance Variation
with Temperature**
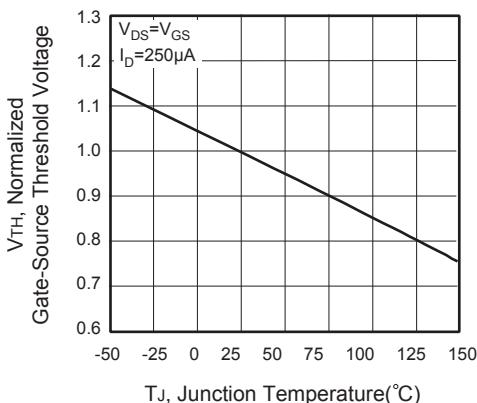
**Figure 5. Gate Threshold Variation
with Temperature**
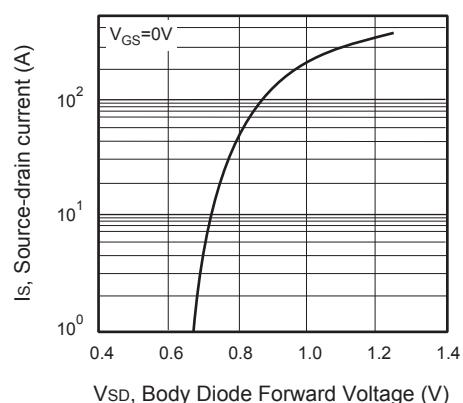
**Figure 6. Body Diode Forward Voltage
Variation with Source Current**
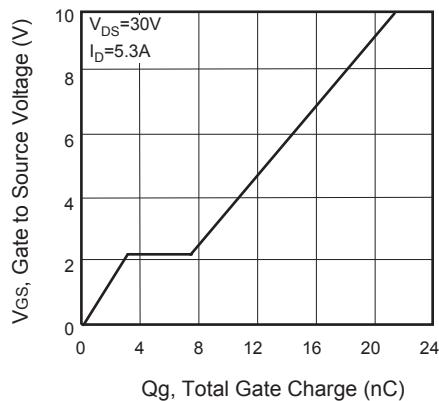
Figure 7. Gate Charge
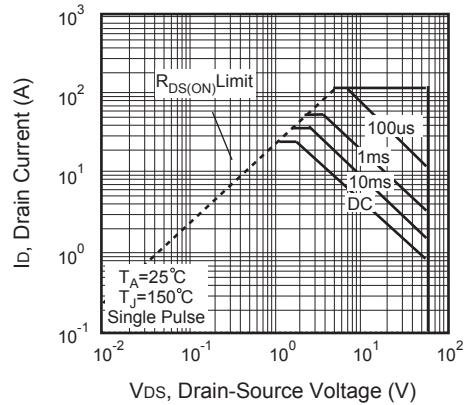
Figure 8. Maximum Safe Operating Area
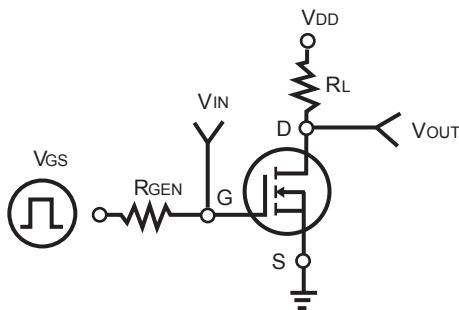
Figure 9. Switching Test Circuit
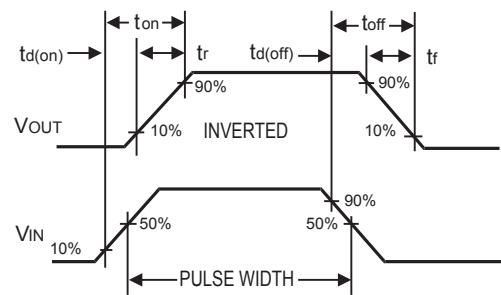
Figure 10. Switching Waveforms

1. $R_{\theta JC}(t) = r(t) * R_{\theta JC}$
2. $R_{\theta JC}$ = See Datasheet
3. $T_{JM} - T_C = P * R_{\theta JC}(t)$
4. Duty Cycle, $D = t_1/t_2$
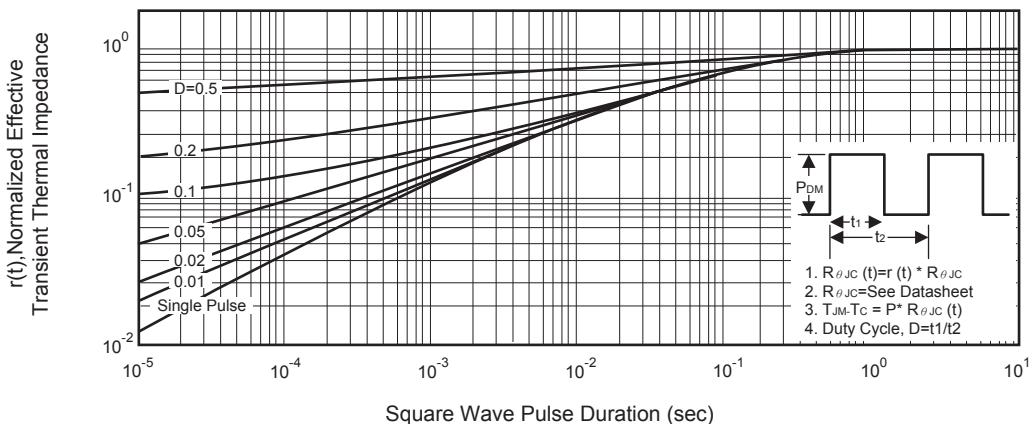
Figure 11. Normalized Thermal Transient Impedance Curve